Pediatr Radiol (2008) 38 (Suppl 3):S570–S618
DOI 10.1007/s00247-008-0840-y

Posters

P1

MRI with SENSE evaluation of conotruncal defects in children

Hu Xihong, Huang Guoying, Pa Mier, Chen Zhanggen, Li Guoping
Children's Hospital, Fudan University, Shanghai, China

Objective To evaluate the accuracy of MRI combined with sensitivity encoded (SENSE) technique for diagnosis conotruncal defects (CTD) in children.
Materials and methods Twenty-seven patients with CTD and ten volunteers underwent MR. The patients were performed cardiac catheterization and surgical operations. MRI sequences included ECG-gated HASTE, TrueFISP, and fast cine (TrueFISP and fast cine with SENSE, the reduce factor = 2, 1.5-T Avanto, Siemens). The diameters of ascending aorta (AAO), main pulmonary artery (MPA), left and right pulmonary artery (L-RPA) in patients were measured, and the right ventricular function parameters including ejection fraction (EF), end diastolic volume (EDV), end systolic volume (ESV), and mean myocardial mass (MM) of 20 children (TOF, n=10, volunteers, n=10) were estimated by LEONARDO Syngo2004A software system. The anatomic findings of MRI were compared with those of catheterization, and the function results of patients compared with those of volunteers by SSPS 11.5 analysis software.
Results The relationship of great artery at the level of semilunar valves are depicted with axial TrueFISP and HASTE MR images. MRI diagnosis included TOF (n=15), L-TGA (n=2), and DORV (n=10). Compared to catheterization, MRI had 100% sensitivity and specificity for the diagnosis of CTD. MPA, RPA, LPA hypoplasia or stenosis were noted by MRI. There was complete agreement between catheterization and MRI identification of PA abnormality. There were significant differences for EF, EDV, ESV, and MM of RV in patients and volunteers.
Conclusion MRI combined with SENSE not only detects the cardiovascular anatomy abnormalities, but also comprehensively assess cardiac function.

P2

MRI evaluation of the right ventricular outflow tract and of the right ventricle in pediatric patients after the Ross procedure

Oleksandr Kondrachuk, Oleksandr Romaniuk, Andriy Kurkevych, Yevgeniya Yershova, Nadija Rokitska, Raad Tammo, Tetyana Yalynska
Children's Cardiac Centre, Kiev, Ukraine

Objective The Ross procedure (replacement of the aortic valve with a pulmonary autograft) is an excellent option in the treatment of left-sided outflow disease in children. Right ventricular function is an important determinant for long-term prognosis after the Ross procedure. Doppler echocardiography has limitations for evaluating pulmonary regurgitation, right ventricular volumes and ejection fraction. The purpose of this study was to assess the value of MRI evaluation of the right ventricular outflow tract and of the right ventricle in paediatric patients after the Ross procedure.
Materials and methods Twelve children undergoing the Ross procedure were evaluated by cardiac MRI. Various techniques for reconstruction of the right ventricular outflow tract were used (homograft insertion, xenograft insertion, reconstruction with autologous tissue). Imaging was performed on a 1.5-T scanner.
Results Severe pulmonary insufficiency (regurgitation fraction >40%) was observed in one patient. Two children had right ventricular outflow tract obstruction with pressure gradient >30 mm. Dilation of the right ventricle was present in nine patients. Two subjects had right ventricular ejection fraction <50%.
Conclusion MRI provides complete anatomic and functional information about right ventricular outflow tract and right ventricle in paediatric patients undergoing the Ross procedure.

P3

Coronary artery evaluation in children with MDCT angiography after arterial switch operation for transposition of the great arteries

Ibrahim Adaletli[1], Sebuh Kurugoglu[1], Nurper Onder Onol[1], Safa Baris[2], Isa Ozyilmaz[2], Alper Guzeltas[2], Funda Oztunc[2]
1. Cerrahpasa Medical Faculty, Istanbul University, Istanbul, Turkey
2. Department of Paediatrics, Cerrahpasa Medical Faculty, Istanbul University, Istanbul, Turkey

Objective The aim of this study was to evaluate the use of MDCT of coronary arteries in children who had undergone arterial switch operation (ASO) for transposition of the great arteries (TGA).
Materials and methods A 16-row detectors MDCT angiography was performed in 13 patients who were operated for TGA in the neonatal period. The patients' ages were between 8 to 17 years. CT imaging was performed in craniocaudal direction from 2 cm above the carina to heart basis using electrocardiogram gating. All patients received oral β blocker (propranolol, 1 mg/kg, daily, 72 h before the procedure). Additional intravenous beta-blocker was administered in four cases to reduce the heart rate. Nonionic intravenous contrast material (2 ml/kg) and 30 ml saline were given. The raw data were processed in the work-station and 3D MPR images were obtained. Coronary angiography images were achieved through maximum intensity projection and volume rendering technique.

Results In 11 of 13 patients the images were in good quality for coronary artery evaluation. Coronary artery variant was present in six patients. Two patients had intramuscular bridging in the left anterior descending artery. One patient had dextrocardia. Neither aneurysmal dilation nor stenosis was detected. In two patients no coronary artery abnormalities were present. No procedural complications were observed. In two patients due to breathing and movement artefacts, radiological evaluation of the coronary arteries was not accomplished.
Conclusion MDCT angiography of the coronary arteries is a non-invasive and feasible technique to evaluate the coronary arteries in patients with TGA who had undergone ASO.

P4

The effect of congenital heart disease on cerebral haemodynamics
Selim Kervancioglu[1], Osman Baspinar[2], Cagatay Andic[1], Resat Kervancioglu[1], Metin Bayram[1]
1. Department of Radiology, Faculty of Medicine, Gaziantep University, Gaziantep, Turkey
2. Department of Paediatrics, Faculty of Medicine, Gaziantep University, Gaziantep, Turkey

Background Affect of alteration in intracardiac blood circulation caused by congenital heart disease (CHD) to the distal circulatory beds has been described in fetus. In contrast to the fetal life, influence of CHD on brain haemodynamics has been mainly studied for patent ductus arteriosus (PDA) in infants.
Objective The aim of this study was to investigate the effect of CHD on cerebral blood flow in infants.
Materials and methods The study comprised 28 patients with CHD, and nine control subjects. Each patient had one or more heart anomalies, including PDA, ventricular septal defect, atrial septal defect, pulmonary stenosis, tetralogy of Fallot, etc. Patients with CHD were divided to three groups including 11 non-cyanotic CHD with PDA, eight non-cyanotic CHD without PDA, and nine cyanotic CHD. Colour Doppler examination of bilateral middle cerebral arteries (MCA) was performed for analysis of peak systole velocity (PSV), end-diastole velocity (EDV), PSV/EDV (S/D), resistive index (RI), and pulsatility index (PI).
Results Comparisons of mean velocities and indices in MCA between three CHD groups and control subjects disclosed the following statistically significant differences: Mean EDV in non-cyanotic CHD with PDA was lower than control subjects. Mean RI and PI were greater in non-cyanotic CHD with PDA than in cyanotic CHD and control subjects.
Conclusion We thought that low EDV, high RI and PI in non-cyanotic CHD with PDA could be related to effect of PDA due to diastolic flow-off. In contrast to non-cyanotic CHD with PDA, our study showed that non-cyanotic CHD without PDA and cyanotic CHD did not affect the cerebral haemodynamics.

P5

A segmental approach in the imaging of congenital heart disease
Chantale Lapierre, Julie Dery, Ronald Guerin, Laurent Garel
CHU Ste-Justine, Montreal, QC, Canada

Objective (1) To describe the sequential steps of the segmental approach in the analysis of CHD. (2) To review the most important notions of the cardiac embryology in relation to this approach. (3) To outline the practical value of the segmental approach in working-up clinical cases.
Material and methods We reviewed the literature regarding the imaging of CHD, especially in the light of the recent break through of multidetector-CT and MRI. In addition, through a retrospective review of our own material, we further conceptualized the logical sequential steps in the analysis of CHD by the radiologist.
Results The sequential steps of the segmental approach are made of: (1) viscero-atrial situs, (2) ventricular loop, (3) position of the great vessels. Many notions of cardiac embryology are mandatory for the proper integration of this diagnostic pathway. Relevant clinical cases illustrate clearly the underlying purpose of the method and its value.
Conclusion Imaging of CHD can seem complicated at first. By using the sequential and segmental approach, a reliable diagnostic algorithm is available for the general paediatric radiologist.

P6

Detection of coronary patency after coronary transfer for anomalous left coronary artery from pulmonary artery (ALCAPA) by MSCT scan in children
Davide Marini[1], Phalla Ou[1], Gabriella Agnoletti[2], Letitia Maurin[1], Damien Bonnet[2], Francis Brunelle[1]
1. Pediatric Radiology, Necker-Enfants Malades Hospital, Paris, France
2. Pediatric Cardiology, Necker-Enfants Malades Hospital, Paris, France

Background The main cause of long-term morbidity and mortality after a successful coronary transfer for ALCAPA is complications at the ostial and at the proximal segments. Coronary artery patency assessment after coronary transfer is an open issue in pediatric patients. Conventional coronary angiography (CAA) is considered the modality of reference in this setting. However, CCA is an invasive procedure and it is costly.
Objective The aim of this study was to investigate the clinical usefulness of MSCT scan in the evaluation of left coronary patency after coronary transfer in paediatric patients.
Materials and methods Between May 2005 and December 2007, 13 consecutive paediatric patients (median age 3.5 years, range 11 months–11 years) who were operated on coronary (left coronary artery = 12, infundibular artery = 1) transfer underwent to 64-slice CT (nine ECG-guided, four non-ECG guided). Significant and non significant stenosis were defined as narrowing of more and less than 50% of the vessel diameter respectively. The status of each coronary was compared with the available findings by CCA used as the reference standard.
Results All the coronary arteries were successfully visualized by MSCT. Visualization was excellent in eight out of 13, satisfying in the remaining five.
Of the 13 vessels six had catheterization data. By MSCT analysis 12 coronary arteries were scored as normal, one left coronary artery was scored as significantly stenosed. MSCT agreed with CCA in 100% of the available results (6/6). The significant stenosis was operated on by surgical bypass.
Conclusion These preliminary results suggest that MSCT may be chosen as the non-invasive alternate method for examining the coronary circulation after coronary transfer surgery in children.

P7

Coronary revascularization surgery in paediatric patients: evaluation of bypass graft and coronary angioplasty patency by using the 64-slice CT

Davide Marini[1], Phalla Ou[1], Gabriella Agnoletti[2], Letitia Maurin[1], Bonnet Damien[2], Francis Brunelle[1]
1. Pediatric Radiology, Necker-Enfants Malades Hospital, Paris, France
2. Pediatric Cardiology, Necker-Enfants Malades Hospital, Paris, France

Background Coronary artery patency assessment after revascularization surgery is an open issue in paediatric patients. Conventional coronary angiography (CAA) is considered the modality of reference in this setting. However, conventional coronary angiography is an invasive procedure and it is costly.
Objective The aim of this study was to investigate the accuracy of MSCT in the evaluation of bypass graft and coronary angioplasty patency after coronary revascularization surgery in paediatric patients.
Materials and methods Between July 2005 and July 2007, 15 paediatric patients (median age 11.5 years, range 21 days–18 years) who were operated on coronary revascularization surgery (coronary angioplasty by using a patch from the saphenous vein = 10; coronary bypass graft on the left anterior descending [LAD] coronary artery = 5) underwent 64-slice CT. Six main segments of the coronary arteries were analyzed: the left main coronary artery (LMA), the proximal and the middle segments of the left descending coronary artery (LAD1 and LDA2), the proximal segment of the circumflex artery (Cx), the proximal and the middle segments of the right coronary artery (RCA1 and RCA2). Bypass graft was analyzed as a single segment. Significant and non significant stenosis were defined as narrowing of more and less than 50% of the vessel diameter respectively. The status of each coronary segment was compared with the available findings by CCA used as the reference standard.
Results Quality was insufficient in five out of 95 segments (five of left main artery in the patients operated on coronary artery bypass graft). Ninety of 95 segments were successfully visualized by MSCT. Visualization was excellent in 47 out of 90 segments, and satisfying in the remaining 43. Of the 90 vessels 78 had surgical and/or catheterization data. By MSCT analysis 75 out of 78 segments were scored as normal, one segment scored as significantly stenosed, three segments as non-significantly stenosed. MSCT agreed with CCA in 100% of the available results (75/75, 1/1, 3/3). Patient with the significant stenosis underwent to surgical bypass.
Conclusion These preliminary results suggest that MSCT may be chosen as the non-invasive alternate method for examining the coronary circulation after revascularization surgery even in children.

P8

Common normal variations and pitfalls in sonographic imaging of the fetal heart: a pictorial review

Eun-Kyung Ji, Tae Hee Kwon, Do Yun Kim, Suk Sun Kang
CHA General Hospital, Pochon CHA University, Gyeonggi-do, South Korea

Objective To illustrate common normal variations and pitfalls encountered during sonographic imaging of the fetal heart that may be misdiagnosed as anomalies.
Results This exhibit will demonstrate (1) Common normal variations include: small amount of pericardial effusion, intraventricular echogenic foci, trivial tricuspid regurgitation. (2) Pseudolesions that may mimic anomalies include: pseudoventricular septal defect, pseudoprimum atrial septal defect, internal mammary artery mimicking high take off of left coronary artery, postvalvular dilatation of pulmonary artery and aorta, tortuous aorta and ductus arteriosus.
Conclusion Familiarity with normal variations and pitfalls of fetal echocardiography is important in diagnosis of fetal heart anomalies.

P9

Radiolucent lung lesions in the paediatric chest

Chandani Thorning[1], Joanna Danin[1], *Philippa Tyler*[1], Dipalee Durve[2], Annmarie Jeanes[1]
1. St Mary's Hospital, London, UK
2. Great Ormond Street Hospital for Sick Children, London, UK

Objective To illustrate a spectrum of causes of low attenuation lung lesion on CT and to explain the pathophysiology for each of the causes of low attenuation lung lesion described.
Results CT and radiographic imaging correlated with histopathological findings of the following conditions: persistent pulmonary interstitial emphysema, congenital lobar emphysema, CCAM, giant bullous disease and hyperinflation secondary to an endobronchial polyp. The current management for each of these conditions will also be discussed.
Conclusion Most causes of low attenuation lung lesion such as CCAM and congenital lobar emphysema undergo surgical management. However knowledge of the differences in radiological appearance in particular on CT imaging can assist in cases where surgical management is not always the first line treatment, such as persistent pulmonary interstitial emphysema where initial management may be conservative if there are no signs of respiratory distress.
References
1. Donnelly LF, Frush DP (1999) Localised radiolucent chest lesions in neonates. Causes and differentiation. AJR 172:1651–1658
2. Jabra AA, Fishman EK, Shehata BM et al (1997) Localized persistent pulmonary interstitial emphysema: CT findings with radiographic–pathological correlation. AJR 169:1381–1384

P10

Pediatric diaphragmatic pathology

Jeri Sue Plaxco, Vesna Kriss
Department of Diagnostic Radiology, University of Kentucky, Lexington, KY, USA

Background Numerous pathological entities may involve the diaphragm in the paediatric population. The paediatric diaphragm is an area that is traditionally difficult to evaluate clinically and radiographically. We present the various cases seen at our institution over the past 10 years that demonstrate the wide array of conditions that may affect the paediatric diaphragm.
Objective The purpose of our exhibit is to educate radiologists on paediatric diaphragmatic pathology, from common to rare entities, as

well as to demonstrate the proper usage of imaging modalities that can evaluate the paediatric diaphragm.
Materials, methods and results Cases pertaining to the paediatric diaphragm were reviewed from our institution from the last decade. Entities involving the paediatric diaphragm to be presented include *congenital* (Morgagni and Bochdalek hernias), *traumatic* (rupture and post-operative paralysis), *infectious* (neonatal Group B streptococcus), and *neoplastic* (rhabdomyosarcoma) conditions. Proper usage and pitfalls of the various imaging modalities will be discussed as it pertains to paediatric diaphragmatic imaging.
Conclusion Our exhibit will review diaphragmatic pathology in the paediatric population as well as the proper usage of the various imaging modalities in the evaluation of the paediatric diaphragm.

P11

Uncommon mediastinal disorders in pediatric patients—imaging features

Michalle Soudack[1], Lisa Raviv-Zilka[1], Aviva Ben-Shlush[1], David Mishali[1], Jeffrey Davidson[1], Ludmilla Guralnik[2]
1. The Chaim Sheba Medical Center, Tel Hashomer, Israel
2. Rambam Health Care Campus, Bat-Galim, Haifa, Israel

Background The differential diagnosis of paediatric mediastinal lesions is very long but, in reality, most radiologists will probably encounter only the more common ones during their career. These include lymphoma–leukaemia, teratoma, foregut cyst, oesophageal abnormalities, lymphadenopathy, neurogenic tumour, and the normal thymus [1].
Objective To depict the imaging findings of some of the less common paediatric mediastinal masses and abnormalities.
Patients and methods Sixteen patients aged 9 months to 15 years; six female and ten male from a 7-year period.
Results Six patients had neoplastic disease: one each chordoma, lipoma, melanoma, malignant thymoma, and two patients with extra osseous Ewing's sarcoma. Three patients had congenital malformations: generalized lymphangiomatosis, neurenteric cyst and one lymphatic–venous malformation with active bleeding. One patient each had extra-oesophageal extra-tracheobronchial foreign body; Alport syndrome with oesophageal leiomyomatosis; spontaneous pneumomediastinum; giant distended stomach post gastric pull-up; and achalasia due to cartilage remnant. Two patients had primary aneurysms, one left ventricle and the other ascending aorta.
Conclusions The list of disorders harboured by the mediastinum and its various structures is almost infinite. In this pictorial essay the imaging features of some of the less common mediastinal lesions are presented.
References
1. Hedlund GL, Griscom NT, Cleveland RH et al (1998) Respiratory system. In: Kirks DR, Griscom NT (eds) Practical pediatric imaging, 3rd edn. Lippincott Raven, Philadelphia, chapter 7, pp 619–819

P12

Aggressive thoracic lymphangiomatosis in a child

Jeffrey Foster
Pediatric Radiology, Phoenix Children's Hospital, Phoenix, AZ, USA

Thoracic lymphatic disorders are classified into five types: lymphangioma, pulmonary lymphangiectasia, lymphangiomatosis, lymphatic dysplasia, and lymphangioleiomyomatosis, each with relatively unique clinical and imaging presentations.
We demonstrate radiographic, CT, and MR imaging of a child with aggressive thoracic lymphangiomatosis with diffuse involvement of lung, mediastinum, and soft tissue and bone structures of the chest wall, who presented clinically with severe progressive cardiopulmonary distress due to pericardial effusion causing cardiac tamponade.

P13

Varicella-zoster infection with pneumonia, acute hepatitis, disseminated intravascular coagulation and renal failure: three paediatric cases

Cecilia Lanza, Miriam Pasqualini, Vittoria Galeazzi, Giancarlo Fabrizzi
Paediatric Radiology, Azienda Ospedaliero-Universitaria Ospedali Riuniti, Ancona, Italy

Background Primary infection with varicella-zoster virus usually is a mild, self-limiting childhood illness. However, certain rare but potentially life-threatening complications can be associated with the disease.
Objective We describe three cases of varicella infection in previously healthy children complicated with pneumonia, acute hepatitis, disseminated intravascular coagulation (DIC), renal failure and in one case brain abscesses.
Materials and methods Three children (two girls and one boy, mean age 3.5 years) with dyspnoea, skin rashes and fever were admitted. All patients underwent laboratory examinations, chest radiograph, abdominal and chest ultrasound, in two cases lung CT and in one patient total body CT.
Results Laboratory examinations showed abnormal liver function with high level of transaminases and ammonia; thrombocytopenia and acute renal failure. Chest radiography revealed nodular opacities and in one case area of consolidation. Sonographic examinations showed hepatomegaly, diffuse hyperechoic appearance of the kidney cortex and ascites. Chest CT showed multiple poorly-defined lung nodules, randomly distributed and in one case a large area of consolidation and pleural effusion. In one patient brain CT showed multiple abscesses with ventricular enlargement while abdominal CT showed hepatomegaly, spleen artery thrombosis with spleen infarct.
Conclusion Multiple organ involvement is a rare complication of varicella infection carried by a high rate of morbidity and mortality.
References
1. Chuang FR, Lee CH, Chuang CH et al (2007) Varicella-zoster infection with encephalopathy, pneumonia, and renal failure: a case report. Ren Fail 29:359–362
2. Kim JS, Ryu CW, Lee SL et al (1999) High-resolution CT findings of varicella-zoster pneumonia. AJR 172:113–116

P14

Use of 50 μm dual-side reading CR for chest radiography in newborns with the aim of reducing the radiation dose

Shigeko Kuwashima[1], Hiroko Hara[2], Yasushi Kaji[1], Tomoaki Kimura[1]
1. Radiology Department, Dokkyo Medical University, Mibu-machi, Tochigi, Japan
2. Kawaguchi Municipal Medical Centre, Kawaguchi, Japan

Background It has been reported that 50-μm Dual side reading CR (50-μm DL) offers visibility equal to that obtainable with current 100-μm Single side reading CR (100-μm SL) with approximately 30% lower dose in Howlett chart-based visibility-vs.-dose relationship assessments.
Objective Dose reduction in chest radiography in newborns.
Materials and methods Evaluation was conducted of 54 newborns who were subjected to portable radiography with 50-μm DL and 100-μm SL within 10 days of admission to the NICU of our hospital from January 2006 to December 2007. Differing from 100-μm SL radiographs, 30% lower doses were used for 50-μm DL radiographies. Two paediatric radiologists checked on CRT monitors for seven radiological findings: air trapping, linear- and band-like opacities, reticulogranular shadows, bubbly patterns, cardiomegaly, bony abnormalities, and normal findings. With a positive finding assigned a plus (+), a negative finding a minus (−) and an indeterminable case a zero (0), statistical processing was performed using the Wilcoxon rank sum test (5% critical rate).
Results Concerning the seven radiological findings, no statistically significant differences were found between the two exposure methods. Consequently, it is possible to use 30% lower radiation doses in newborn chest radiography with 50-μm DL compared with 100-μm SL. Therefore 50-μm DL is useful to reduce radiation dose for chest radiography in NICU.
Conclusion A 30% reduction in radiation dose was possible in newborn chest radiography in 50-μm DL compared with 100-μm SL in NICU.

P15

Can the distance from lung top to diaphragm on CT scans be used to estimate the lung inflation level for in- and expiratory CT and MRI protocols?

Martine Loeve[1], Maarten Lequin[1], Marleen de Bruijne[2], Ieneke Hartmann[3], Wim Hop[3], Harm Tiddens[1]
1. Erasmus MC Sophia Children's Hospital, Rotterdam, the Netherlands
2. University of Copenhagen, Copenhagen, Denmark
3. Erasmus MC, Rotterdam, the Netherlands

Background In- and expiratory CT scans are considered the gold standard to monitor CF lung disease. MRI has been advocated a radiation free alternative. Spirometric volume control improves scan standardization, but complicates the procedure. Lung top–diaphragm length after inspiration (I) and expiration (E) expresses as E/I ratio is used to estimate the quality of respiratory manoeuvres. However, E/I ratio has never been validated.
Objective To validate E/I ratio for assessment of in- and expiratory effort during CT scanning.
Materials and methods Twenty children with CF had routine volumetric in- and expiratory CT scans without spirometric control. E/I ratio was calculated from E and I measurements using a workstation. Total lung capacity (TLC) after inspiration ($TLC_{CT\text{-}in}$) and residual volume (RV) after expiration ($RV_{CT\text{-}exp}$) were calculated from the scans using a grid. TLC, RV and functional residual capacity (FRC) were determined by body box (TLC_{BB}, RV_{BB}, FRC_{BB}). Analysis included intraclass correlation coefficients (ICC) and Bland–Altman plots.
Results Mean (SD) E/I ratio was 0.82 (0.06) and comparable with literature values. $TLC_{CT\text{-}in}$ was 84% of TLC_{BB}. $RV_{CT\text{-}exp}$ was 42% of TLC_{BB}, 61% of RV_{BB}, and 117% of FRC_{BB}.

$TLC_{CT\text{-}in}$ and $RV_{CT\text{-}exp}$ showed good agreement with TLC_{BB} (ICC 0.87) and RV_{BB} (0.86). $RV_{CT\text{-}exp}/TLC_{CT\text{-}in}$ showed moderate agreement with RV_{BB}/TLC_{BB} (0.70) and E/I (0.68). Poor agreement was shown between E/I and RV_{BB}/TLC_{BB} (0.36) with systematic error in the Bland–Altman plot.
Conclusion E/I ratio is not valid for assessment of in- and expiratory effort during chest CT scanning. Automated computation of $RV_{CT\text{-}exp}/TLC_{CT\text{-}in}$ ratio could be promising in replacing spirometry during MRI. ICC showed good agreement between $TLC_{CT\text{-}in}$ and TLC_{BB} (ICC 0.87), $RV_{CT\text{-}exp}$ and RV_{BB} (0.86), moderate agreement between RV_{BB}/TLC_{BB} and $RV_{CT\text{-}exp}/TLC_{CT\text{-}in}$ ratio (0.70), E/I and RV_{BB}/TLC_{BB} (0.68) and poor agreement between E/I and $RV_{CT\text{-}exp}/TLC_{CT\text{-}in}$ (0.36).

P16

The radiographic findings in *Mycoplasma pneumoniae* infection: a pictorial review

Julie Yarr[1], David Gracey[2], Louise Sweeney[1]
1. Royal Belfast Hospital for Sick Children, Belfast, UK
2. Craigavon Area Hospital, Craigavon, UK

Background Mycoplasma pneumoniae is a common cause of community acquired childhood pneumonia. The organism lacks a cell wall and is resistant to the normal antibiotics used to treat other common pneumonias. The clinical features are non-specific and laboratory investigations are also either non-specific (WCC, ESR, CRP) or take time to process (serology, culture, PCR).
Objective This poster provides background information on *M. pneumoniae* and revises the presenting clinical features of infection and the extra-pulmonary manifestations that can accompany the illness. The radiographic findings of respiratory infection including focal and diffuse reticulonodular opacification, hilar lymphadenopathy, hazy opacification and the uncommon lobar consolidation are illustrated. Images of respiratory complications such as Swyer–James syndrome and bronchiolitis obliterans organizing pneumonia are also included.
Materials and methods A literature review was performed and the majority of the images were obtained from patients who attended our institution.
Results and conclusion As the clinical features of *Mycoplasma* pneumonia are non-specific, the laboratory confirmation of infection is slow and the organism is resistant to the antibiotics usually used to treat other common pneumonias, the chest radiographic findings, although variable, may have an important role in suggesting the diagnosis and guiding treatment.

P17

M-mode sonography of diaphragmatic motion: evaluation of normal movement in pediatric patients

Anke L. Raabe, *Oscar M. Navarro*
Hospital for Sick Children, Toronto, ON, Canada

Background M-mode sonography is an effective modality for evaluation of diaphragmatic motion in children. However, an assessment of normal diaphragmatic movement in children of different ages using M-mode sonography has not been made to date.
Objective To establish normal measurements of diaphragmatic excursion in children by M-mode sonography.
Materials and methods Ninety children (44 males/46 females; age range 2 weeks to 17 years; mean age 72.5 months) with no suspicion of diaphragmatic dysfunction were included in the study. The direction of motion and the range of excursion in inspiration of each hemidiaphragm (five measurements) were assessed during quiet breathing using M-mode sonography.
Results In all children, both hemidiaphragms were visualized and proved to move in normal direction. There was no significant difference of the range of excursion between the right hemidiaphragm (mean 13.5 mm, SD 5.2 mm) and the left hemidiaphragm (mean 12.8 mm, SD 4.6 mm). Mean values for children under 1 year were 8.3 mm (SD 2.8 mm) for the right and 9.6 mm (SD 3.3 mm) for the left hemidiaphragm. For children 1–18 years old the mean values were 14.4 mm (SD 5.0 mm) and 13.4 mm (SD 4.5 mm) respectively. Only two of the 900 measurements were below 4 mm but the average of all five measurements in these two children was greater than 6 mm (6.2 and 9.8 mm respectively).
Conclusions M-mode sonography is a valuable tool for the assessment of diaphragmatic motion in children. Our findings confirm a lower cut-off value of 4 mm of inspiratory excursion for normal diaphragmatic motion for children of all ages.

P18

Role of imaging in diagnosis of late presentation of congenital diaphragmatic hernia

Shruti Moholkar[1], M Gopal[2], Andrew Rickett[1]
1. Department of Radiology, University of Leicester NHS Trust, Leicester, UK
2. Department of Paediatric Surgery, University of Leicester NHS Trust, Leicester, UK

Objective To discuss the role of imaging in diagnosing late presentation of congenital diaphragmatic hernia.
Materials and methods Retrospective review of imaging records identified five cases in the last 2 years. Age range: 6 months to 3 years. All were left sided diaphragmatic defects.
Discussion Patients with congenital diaphragmatic hernia usually present soon after birth with respiratory distress. Occasionally presentation is delayed and presents a considerable diagnostic challenge. Most patients present with persistent gastrointestinal or respiratory problems associated with an abnormal or rarely a normal chest radiograph. An Upper GI contrast study should be a part of the diagnostic work-up of these patients and clearly demonstrates abnormal orientation of the stomach and small bowel loops. Occasionally a CT may be required if the above are inconclusive. MDCT with coronal and sagittal reconstructions often clearly demonstrates the location and size of the diaphragmatic defect and identifies the herniated viscera. Long-term prognosis is favourable and postoperative morbidity is minimal, despite the late presentation.
Conclusion The lack of typical clinical presentation in cases of late presenting congenital diaphragmatic hernia leads to a delay in diagnosis. This clinical entity should however be considered in the differential diagnosis of children with recurrent respiratory symptoms and/or gastrointestinal disturbances. The imaging studies are an essential diagnostic tool in these cases.
References
1. Mei-Zahav M, Solomon M, Trachsel D et al (2003) Bochdalek diaphragmatic hernia: not only a neonatal disease. Arch Dis Child 88:532–535
2. Elhalaby EA, Abo Sikeena MH (2002) Delayed presentation of congenital diaphragmatic hernia. Pediatr Surg Int 18:480–485

P19

The usefulness of CT in premature babies with severe respiratory symptoms

Anna Föhr, *Sanna Toiviainen-Salo*, Teija Kalajoki-Helmiö, Kirsi Lauerma
Medical Imaging Centre, Hospital for Children and Adolescents, Helsinki University, Helsinki, Finland

Background Preterm infants are at risk of serious lung complications due to immaturity. Though long term pulmonary sequelae of prematurity have been studied in survived children and young adults, the usefulness of lung CT in premature babies and its impact on clinical work has not previously been addressed.
Materials and methods All CT examinations of thorax performed in preterm babies from the tertiary neonatal intensive care unit in Finland from 2005 to 2007 were retrospectively analyzed, and clinical indications for the CT and the outcome of the patients were recorded.
Results Five patients with gestational ages ranging from 25 to 31.8 weeks were imaged with CT. All patients had severe respiratory symptoms. All were intubated/had tracheostomy during CT imaging performed at ages 38 gestational weeks to 6 months. In four patients, multislice CT with HR-algorithm images ($n=1$) or with additional HR slices ($n=3$) were obtained, in one patient only HR images at 5 weeks (30 gestational weeks) and follow-up at 6 months were taken. Except for severe BPD changes in all, these patients had bronchial strictures ($n=2$), lobar emphysema ($n=3$), bullae ($n=2$), and PIE ($n=1$). At follow-up, two patients had died of respiratory failure. In one surviving patient bronchial stricture causing lobar emphysema was dilated.
Conclusion In preterm infants with severe respiratory symptoms combined multislice CT with HR algorithm enables assessment of both airways (bronchial strictures) and lung parenchyma.

P20

The role of reconstruction techniques in MDCT of the pediatric airway imaging

Dinesh Kumar[1], Ashu Seith[1], Raju Sharma[1], Smriti Hari[1], Arun Kumar Gupta[1], Susheel Kumar Kabra[2]
1. Department of Radiology, All India Institute of Medical Sciences, Delhi, India
2. Department of Paediatrics, All India Institute of Medical Sciences, Delhi, India

Background With the advent of MDCT a plethora of reconstruction techniques have emerged, the utility of which needs to be evaluated in paediatric airway diseases as a supplement/alternative to invasive techniques.
Objective In this study we evaluated the individual utilities of multiplanar reformatting images (MPR), minimum intensity projection images (minIP), and virtual bronchoscopy (VB) in terms of degree of narrowing assessment, distal airway visualization, segment length evaluation, overall diagnostic confidence and the benefits of processing techniques over axial CT alone.
Materials and methods Nineteen patients (age range 4 days to 12 years) were examined by 40 row MDCT scanner. The lesions included were infective, malformations, foreign bodies and extrinsic compression.
Results The findings on axial, MPR, minIP and VB were individually compared with fibreoptic bronchoscopy (FB) using Kappa agreement value. MPR has the highest degree of agreement with FB in depicting the degree of narrowing. minIP and axial had poor agreement with FB. In terms of distal visualization and segment length evaluation, there was poor agreement of all these techniques with bronchoscopy due to poor distal visualization by bronchoscopy. MPR depicted airways and surrounding structures. Therefore MPR had the maximum diagnostic confidence.
Conclusion Three-dimensional reconstruction techniques improved the lesion evaluation relative to axial images alone. MPR was most accurate in the detection of lesion, the depiction of degree of narrowing, in the distal visualization. Complex congenital anomalies are best depicted by minIP. MDCT can obviate the need of FB in patients with congenital malformations and extrinsic compression.

P21

Comparing 3-D CT volume rendering to bronchoscopy in the evaluation of airway compression by tuberculous lymphadenopathy in children

Jaco Du Plessis, Savvas Andronikou, Salomine Theron
University of Stellenbosch Medical School, Stellenbosch, South Africa

Background Lymphobronchial tuberculosis (TB) causes airway compression in 38% of cases. Fibreoptic tracheobronchoscopy (FTB) is the gold standard in the evaluation of airway compression and is performed under general anaesthesia. FTB cannot accurately assess the cause of airway compression, necessitating a chest CT. Post processing techniques like three-dimensional volume rendering (3-D VR) can accurately demonstrate airway compression.
Objective To compare the assessment of airway compression due to TB lymphadenopathy between 3-D VR and bronchoscopy in terms of (1) locations, and (2) degree of compression.
Materials and methods Thirty children with pulmonary TB complicated by lymph node compression of the airway underwent both CT scanning of the chest and bronchoscopy. This was done to evaluate the location and extend of airway compression. Reconstructions of the airways with a 3-D VR technique were done and the tracheobronchial tree was evaluated for airway compression. Bronchoscopy and 3-D VR results were then compared.
Results Final data is still being processed but 58 bronchial stenoses were identified by bronchoscopy compared to 91 by VR. Fifty-one stenoses matched in terms of being site specific. This is 88% of the total number of stenoses found by bronchoscopy. VR was reliable and sensitive in demonstrating airway compression.
Conclusion Three-dimensional VR of the airway is accurate in demonstrating site and extend of TB lymphadenopathy airway compression. It compares very well to bronchoscopy findings.

P22

Estimation of total lung capacity by volumetric CT compared with plethysmography in school aged children with cystic fibrosis

Alistair Calder[1], Darren Boone[2], Cara Oliver[3], Cathy Owens[1]
1. Great Ormond Street Hospital for Children, London, UK
2. University College Hospital, London, UK
3. Institute of Child Health, London, UK

Background Volumetric MDCT evaluation of the thorax allows rapid estimation of total lung capacity (TLC).
Objective To compare MDCT estimates of TLC with plethysmographic measures in school aged children with cystic fibrosis (CF).
Materials and methods Thirty children aged 6–10 years with CF evaluated by volumetric MDCT during voluntary inspiration also underwent TLC measurement by plethysmography on the same day. Total lung volume (TLV) at MDCT was measured using automated software. Mean lung density in Hounsfield units (HU) was also recorded as a marker of inspiratory effort. TLV was compared with TLC. The difference between TLV and TLC was standardised by division by TLV.
Results There was strong and highly significant correlation between TLV and TLC (r=0.82, P<0.0001). TLV consistently underestimated TLC, by a mean of 0.5 l. The standardised difference between TLV and TLC correlated strongly and significantly with the mean lung density (Spearman's rank=0.79, P<0.0001), suggesting that differences in inspiratory effort may account for much of the variation between TLV and TLC. By excluding those with a lung density of greater than −825 HU, the correlation coefficient between TLV and TLC rose to 0.88 (n=20). Regression analysis of this group gave the following equation: TLV (litres)=0.9×TLC−0.098 (r^2=0.77).
Conclusion Total lung volume measured at MDCT in children with CF is approximately 90% of total lung capacity measured at plethysmography, provided a satisfactory inspiration is achieved.

P23

Diaphragmatic flattening measured at volumetric chest CT as a marker of disease severity in school aged children with cystic fibrosis

Alistair Calder[1], Darren Boone[2], Cara Oliver[3], Cathy Owens[1]
1. Great Ormond Street Hospital for Children, London, UK
2. University College Hospital, London, UK
3. Institute for Child Health, London, UK

Background Volumetric thoracic MDCT of children with cystic fibrosis (CF) allows assessment of diaphragmatic morphology.
Objective To evaluate whether diaphragmatic flattening relates to lung function and CT severity markers.
Materials and methods Volumetric CT scans in voluntarily held inspiration were analysed in 40 school aged children with CF undergoing same day lung function evaluation. A diaphragmatic flattening index (DFI) was derived by dividing the maximum length of each hemi-diaphragm by its height from a standardised para-sagittal section, and taking a mean from both measurements. Results were correlated with lung function indices expressed as *Z*-scores and CT Brody scores (Spearman rank).
Results There was weak (rho=0.351) but significant ($P<0.05$) correlation between DFI and specific airway resistance, for which a higher score implies worse lung function. There were weakly positive (rho=0.12–0.25) and statistically insignificant correlations ($P=0.13$–0.52) between DFI and other measures where a higher score implies worse lung function: lung clearance index, functional residual capacity, residual volume, total lung capacity and Brody score. There were weakly negative correlations between DFI and forced expiratory volume in one second (rho=−0.285, $P=0.08$) and forced vital capacity (rho=−0.14, $P=0.39$), measures where lower scores imply worse lung function.
Conclusion Diaphragmatic flattening in CF appears to relate weakly to specific airway resistance. There is no statistically significant relationship with other markers of severity. Diaphragmatic flattening measured at CT does not appear to be a very useful marker of disease severity in children with cystic fibrosis.

P24

Radiological experience of managing complicated pneumonia in a tertiary referral centre

Charlotte Roberts, Chinedu Nwokoro, Sam Chippingon, Siobhan Carr, Rosy Jalan
Barts and The Royal London Hospitals Trust, London, UK

Background There has been a dramatic increase in the last year in the incidence of complicated pneumonias resulting in empyemas requiring cross sectional imaging for diagnosis and image guided percutaneous drainage referred to our institution.
Objective To review clinical and radiological management and imaging of complicated pneumonias in a subpopulation of referrals requiring radiological intervention. We present our experience in the diagnosis and management of these patients using plain films, US, CT and image guided intervention.
Materials and methods Retrospective review of patients with confirmed pleural collection on ultrasound. Evaluation of size and character of the effusion with subsequent image guided drainage and radiological follow up. Microbiological correlation with ethnic sub-groups within our population were assessed, and compared with immunisation status.
Results Thirty-seven patients were included in the study. Thirty-one required radiological drainage of which three needed a second drain. CT scanning was required post drainage in some cases to assess post pneumonic complications such as pneumatocoeles, pneumothorax and persistent collapsed lung. No complications resulting from drain insertion occurred. One patient required cardiothoracic surgical intervention. Where positive cultures were elicited, the predominant organisms were *Pneumococcus* and TB. A tenth of positive drain cultures proved to be TB.
Conclusion An increased incidence of patients have been referred to this centre with complicated pneumonias requiring radiological drainage in the last year. Radiologically inserted pigtail drains are a safe, relatively non-traumatic, treatment option with small 6/8 Fr catheters.

P25

Radiologic evidence of overlapping lung lesions: a complete detection of lung malformations in infants

Floriana Zennaro[1], Gloria Pelizzo[2], Paola Martingano[1], *Flora Maria Murru*[1], Pierpaolo Guastalla[1]
1. Pediatric Radiology, IRCCS Burlo Garofolo, Trieste, Italy
2. Pediatric Surgery, IRCCS Burlo Garofolo, Trieste, Italy

Background The so called “overlapping lesions” (bronchiectasis, emphysema, vanishing lung) are described in cystic adenomatoid malformation (CAM) and lung sequestration (LS). The radiologic detection of these lesions is demanded for surgical management.
Objective Results obtained by comparing ultrasound prenatal aspect of lung disease with postnatal radiologic diagnosis are reviewed. The usefulness of postnatal radiologic findings on CT scan are evaluated on the basis of final histopathological features obtained after surgery.
Materials and methods Fetal ultrasonography (US) was performed at 21, 28–30, 36 gestational weeks in a series of 32 patients. There were 25 CAMs, seven LSs. All patients underwent surgery within 8 months of life and histological findings were compared with prenatal US diagnosis and postnatal CT findings.
Results Fetal US and postnatal CT findings confirmed the diagnosis in eight patients with CAM type 1. Associated lesions were found at CT scan and confirmed by histology in two babies.
No overlapping lesions were evidenced in CAM type 2 and type 3. A good correspondence between prenatal US and postnatal scan was found. Associated lobar emphysema on CT scan was detected in five patients affected with intralobar sequestration. Babies with extralobar sequestration had also a predictable associated microcystic aspect at CT scan.
Conclusion Fetal US investigation seems fairly limited into the detection of associated lung abnormalities. Postnatal CT scan seems to detect the presence of overlapping lesions in most of the CAM type 1 and in solid malformations such as lobar sequestration.

P26

Lymphangioma, a rare cause of mediastinal mass in children: CT and MRI findings

Maria Zarifi, Eleftherios Agiannotakis, Menelaos Malamas, Antonios Kourtesis, Kalliopi Stefanaki, Maria Moschovi
Aghia Sophia Children's Hospital, Athens, Greece

Background Lymphangiomas represent congenital malformations of the lymphatic system. They are classified as simple, cavernous or cystic. About 80% are located in the head/neck area, whereas mediastinal lymphangiomas represent only 5%. More commonly they locate in the anterior/superior mediastinum as extension of a cervical lymphangioma, whereas middle or posterior mediastinum is a rare site. Lymphangiomas belong to the group of congenital lesions that contain fluid (thymic cyst, pericardial cyst, neurenteric cyst, meningocele, lymphangioma) and should be differentiated from other cyst-like masses (lymphoma, germ cell tumour, thymoma, schwannoma) of the mediastinum.
Materials and methods We present the CT and MRI findings in two infants with mediastinal lymphangioma.
Results In the first patient a large cystic mass extended from the neck to the anterosuperior mediastinum, surrounding the major vessels of the area and showing characteristic fluid–fluid levels on both CT and MRI. The second patient presented with a posterior mediastinal mass with characteristic fluid–fluid levels. The mass surrounded the thoracic aorta and extended in both paravertebral spaces, as well as under the crura of the diaphragm in a symmetric way.
Conclusion Lymphangioma was highly considered preoperatively based on the location and way of extension of the mediastinal mass, along with the presence of fluid–fluid levels within the mass. Since mediastinal masses represent a rather common problem in children, these imaging findings could limit the differential diagnosis and may lead to a safe preoperative diagnosis and appropriate treatment.

P27

Ultrasonographic evaluation of the cranial sutures in the diagnosis of craniosynostosis in infants

Natalia Simanovsky, Nurith Hiller, Katia Rozovsky
Hadassah Hebrew University Medical Centre, Jerusalem, Israel

Objective To evaluate the effectiveness of ultrasonography in the diagnosis of craniosynostosis in infants, with the aim of reducing the number of CT examinations needed today to exclude the diagnosis.
Materials and methods Twenty children with clinically suspected craniosynostosis underwent a high-resolution ultrasound examination of the cranial sutures. The results were compared to other imaging modalities in nine children. The remaining eleven children were followed up clinically, with regular head circumference measurements.
Results In seven children the ultrasonographic diagnosis of craniosynostosis was confirmed by other imaging modalities.
In 12 infants US was normal. Two of them underwent head CT that confirmed the absence of craniosynostosis. Ten children were followed-up by head circumference measurements only, and demonstrated normal growth of the head.
In one patient an US examination was inconclusive, head circumference remained below normal after 2 month of the clinical follow-up, and CT demonstrated narrow but open cranial sutures, and signs of brain atrophy.
Conclusion US should be used to exclude craniosynostosis in infants, eliminating the need for high-resolution CT and the radiation exposure and sedation associated with it.

P28

Diagnostic value of proton MR spectroscopy and diffusion weighted MR imaging in inherited childhood neurodegenerative brain diseases

Handan Cakmakci[1], Yeliz Pekcevik[1], Uluc Yis[2], Aycan Unalp[3], Semra Kurul[2]
1. Radiology, Dokuz Eylul University Hospital, Izmir, Turkey
2. Paediatric Neurology, Dokuz Eylul University Hospital, Izmir, Turkey
3. Paediatric Neurology, Dr Behcet Uz Hospital, Izmir, Turkey

Background MRI is highly sensitive in the detection of white matter lesions. Quantitative MR techniques, such as DWI and proton MRS, may provide more insight into underlying pathologic changes in the white matter.
Objective The purpose of this study is to evaluate parenchymal diffusion properties and metabolite ratios in affected brain tissues of inherited neurodegenerative brain diseases and compare with normal subjects for diagnostic values.
Materials and methods The study group was consisted of 22 patients (16 male, six female; mean age, 7.8 months). Eighteen patients evaluated with MRS and DWI, two patients with only DWI and two patients with only MRS. Single and multivoxel proton MRS was carried out and (NAA)/Cr, Cho/Cr, mI/Cr, Glx/Cr ratios were calculated. Presence of lactate peak and abnormal different peaks were noted. Diffusion properties and ADC values were calculated from brain lesions. Results are compared with age and sex matched normal subjects.
Results Elevated NAA/Cr ratio (Canavan disease), galactitol peak (galactosaemia) at 3.7 ppm, branched chain amino acids (MSUD) at 0.9 ppm were seen on different diseases. On Van der Knaap disease NAA/Cr level were normal. Lactate peaks were noted in MLD and MSUD patients. In MLD and MSUD restricted diffusion was detected. Various diffusion properties were seen only in one Glutaric aciduria lesions. Metabolite ratios and calculated ADC values were significantly different from normal subjects ($P<0.05$).
Conclusion DWI combined with MRS are complementary methods to routine cranial MRI for evaluating neurodegenerative diseases which can give detailed information about neurochemistry of affected brain areas and helps to modify treatment regimens.

P29

Two preterm infants with hydrocephalus, controlled external ventricular drainage and slit ventricles on cranial ultrasound

Luc Breysem, Gunnar Naulaers, Els Ortibus, Frank Van Calenbergh, Philippe Demaerel, Marleen Smet
Department of Radiology, University Hospitals, Leuven, Belgium

Objective We describe two preterm infants with hydrocephalus requiring early external ventricular drainage (EVD), complicated with intermittently symptomatic slit ventricles.
Materials and methods In two premature babies (GA of 26 and 28 weeks with respectively aqueduct stenosis (baby 1) and intraventricular haemorrhage (baby 2)), progressive hydrocephalus required initial treatment with EVD. Intraventricular pressure was evaluated by the amount of drained cerebral spinal fluid (CSF), controlled by the height of the drip chamber and correlated with ventricular measurement on bedside ultrasound (US) and with clinical findings. On US, slit ventricles (SV) were diagnosed when there were no visible and measurable frontal and occipital ventricular lumen.
Results Baby 1: four episodes of EVD (between 38–107 days of age) with SV, documented on US. Mean height (centimeter) of the chamber and mean amount (milliliter) of CSF drained in each period: 15.5 cm and 17 ml with evidence of over drainage; 27 cm and 25 ml; 35.6 cm and 44.1 ml; 28.2 cm and 40.2 ml.
Baby 2: two episodes of EVD (between 27–89 days of age) with SV documented on US. Mean height (centimeter) of the chamber and mean amount (milliliter) of CSF drained in each period: 15.4 cm and 23.6 ml; 20 cm and 35.5 ml.
Each period of SV was accompanied by signs of irritability and/or overextension in both patients.
Conclusion In two patients, six periods of slit ventricles with normal drainage and high intraventricular pressure are described. This observation is similar to the slit ventricle syndrome as described in children with internal ventricular shunt.

P30

Cerebral cavernous malformations in young children—three cases
Maeve McPhillips, Simon McGurk, Kaseem Ajilogba, Graham Wilkinson, Kamath Tallur, Ailsa McLellan, David FitzPatrick
Royal Hospital for Sick Children, Edinburgh, UK

Background Cerebral cavernous malformations, cavernous angiomas, or cavernomas, are vascular malformations seen in the brain, and less commonly in the spine, retina and skin. They are usually small, but may be several centimetres in size. They may be incidental findings on imaging, or present with headache, epilepsy or intracranial haemorrhage. These lesions are very uncommon in children.
Objective We will present the imaging findings in three children, and discuss the demographics, inheritance and clinical manifestations of multiple cerebral cavernous malformations.
Results Three children less than 2 years of age were found to have cavernomas in the course of 1 year in our institution. Two of these patients were found to be related and further investigation revealed the father of one of these patients also to have cavernomas. An underlying genetic abnormality of the CCM1 gene on chromosome 7 has been identified in this family. In a 4-month-old girl, two cavernomas were identified as incidental findings on MR of the brain. In a 9-month-old boy, multiple cavernomas were seen when imaging was performed for clinical suspicion of an intracranial bleed. Findings included a giant cavernoma, over 5 cm in diameter. In a 14-month-old boy, who presented with prolonged seizure and hemiplegia, multiple cavernomas were also found, the largest measuring 2.5 cm diameter.

P31

Unusual cases of Dandy–Walker variant: appearances of fetal and postmortem MRI vs autopsy
Telugunti Lavanya[1], Marta Cohen[2], Saurabh Gandhi[3], Tom Farrell[3], Elspeth Whitby[4]
1. Sheffield Teaching Hospitals, Sheffield, UK
2. Sheffield Children's Hospital, Sheffield, UK
3. Department of Obstetrics and Gynaecology, Jessop Wing, Sheffield Teaching Hospitals, Sheffield, UK
4. Academic Radiology, University of Sheffield, Sheffield, UK

Background Accurate diagnosis of the fetal abnormality is essential for the management of current and future pregnancies. Autopsy is considered as the gold standard to provide the accurate diagnosis. Dandy Walker variant is an abnormality of the posterior fossa characterized by agenesis of the inferior vermis with communication of the 4th ventricle with the cisterna magna.
Results We present two cases of antenatally diagnosed Dandy Walker variant that had termination of pregnancy. The abnormalities were clearly demonstrated by the fetal and post-mortem MRI as well as antenatal USS. The autopsy was performed immediately following the post mortem MRI. To our surprise, following formalin fixation and examination, the autopsy revealed complete absence of the cerebellum. The cerebellum has undergone autolysis to such an extent that no 'solid' tissue was recovered at autopsy. Histology also failed to identify any cerebellar tissue despite serially sectioning and paraffin embedding the entire midbrain and brainstem. On the post-mortem MRI, the cerebellum was of high signal on T2W images indicating higher water content and presumably this equates with autolysis.
Conclusion It is known that isolated Dandy Walker variant can sometimes be difficult to diagnose from autopsy due to the loss of *in situ* anatomic relationship of the brain structures to bony skull but complete disappearance of an entire organ has not been reported previously. Our experiences demonstrates the usefulness of complimentary techniques such as post-mortem MRI and multidisciplinary team approach for the accurate diagnosis of CNS malformations and indicate that the 'gold standard' might not always be the autopsy.

P32

Age related gray matter changes in preterm subjects: an MRI study
Loukia Tzarouhi[1], Loukas Astrakas[1], Anastasia Zikou[1], Aikaterini Drougia[2], Paraskevi Kosta[1], Styliani Andronikou[2], Maria Argyropoulou[1]
1. Department of Radiology, Medical School, University of Ioannina, Ioannina, Greece
2. Neonatology Unit, Child Health department, Medical School, University of Ioannina, Ioannina, Greece

Background Developmental changes of cortical networks are expected to affect cortical and subcortical gray matter (GM) volume.
Objective To assess individual volume of 116 GM areas in normal preterm born children.
Material and methods Sixty seven preterm born children (corrected age 12.7±9.9 months, gestational age: 32.9±2.3 weeks) with normal

structural MRI were included in the study. Using a T1-weighted high-resolution three-dimensional spoiled gradient echo sequence, volumes of 116 GM areas were calculated after their segmentation using the Statistical Parametric Mapping (SPM5) and the Individual Brain Atlas Statistical Parametric Mapping (IBASPM) software packages. Non linear regression analysis assessed age dependency of volume data for every GM area. The model used was the monoexponential function $y=A-B\times\exp(-x/C)$ where y: volume at corrected age x, A: volume at the end of maturation, B: total change and C: rate of change. The 99% of the final volume (A99%) was reached at time $t(99\%)=-C\times\ln(0.01\times A/B)$.

Results All supratentorial GM areas followed the monoexponential function model reasonably but the pallidum and cerebellar structures had a poor goodness of fit. Volume increase of the individual GM areas followed a caudal to cephalad and a dorsal to ventral pattern. Thalamus, putamen and caudate nucleus reached A99% earlier than most cortical GM areas. Visual cortex, postcentral and precentral cortices reached A99% earlier than parietal, frontal and temporal cortices.

Conclusion GM volume changes follow age related maturational changes of the regional white matter. Maturation of white matter tracts connecting cortical and subcortical GM may be at the base of GM volume increase.

Acknowledgement Supported in part by Interreg IIIA Greece-Italy 2000–2006 Grant No I2101055

P33

MR imaging features of spinal dysraphisms: a pictorial review

Jans Lennart[1], Philip Vlummens[1], Anna Tietze[2], Valerie Meerschaut[1], Karel Deblaere[1], Eric Achten[1], Koenraad Verstraete[1], Laurence Abernethy[2]

1. Radiology and Medical Imaging, Ghent University Hospital, Ghent, Belgium
2. Royal Liverpool Children's Hospital 'Alder Hey', Liverpool, UK

Background Spinal dysraphisms are congenital malformations of the spine and spinal cord. Many of these malformations are diagnosed by antenatal ultrasound or at birth, but some are occult and are diagnosed only when investigation is prompted by subtle neurological symptoms, disorders of bowel or bladder function, or cutaneous markers. Accurate diagnosis of these disorders is essential for optimal management, and is aided by a simple and rational scheme of classification.

Objective (1) To review the classification of spinal dysraphisms, (2) To demonstrate the high-resolution MRI appearances of spinal dysraphisms.

Imaging findings and classification Spinal dysraphisms are divided into open (OSD) and closed (CSD). In OSD abnormal nervous tissue is exposed (e.g. myelomeningocele) and there is an invariable association with a Chiari II malformation. CSD are skin covered, and categorisation depends on whether an extraspinal lesion is present (lipomyelocele, meningocele, meningocystocele) or absent. CSD without an extraspinal lesion may be simple (tight filum terminale, filar or intradural lipoma, dermal sinus) or complex (split cord malformations, spinal segmental dysgenesis, caudal regression).

We present a pictorial review of the classification of spinal dysraphism using high resolution MR imaging at 1.5 and 3 T.

Conclusion Current MR imaging techniques can clearly demonstrate the morphology and extent of complex spinal dysraphisms. Application of a rational scheme of classification aids interpretation of the MR imaging findings and facilitates appropriate management.

References

1. Rossi A, Biancheri R, Cama A et al (2004) Imaging in spine and spinal cord malformations. Eur J Radiol 50:177–200

P34 WITHDRAWN

P35

Sinus pericranii: clinical and imaging features

Sarah Clegg, Robert Minns, Siobhan McLaughlin, Kaseem Ajilogba Royal Hospital for Sick Children, Edinburgh, UK

Background Sinus pericranii is a rare extracranial, vascular anomaly that connects directly with intracranial venous channels. It presents as lumps and bumps on the head of children. It may be mistaken for other vascular or cystic scalp/calvarial lesions unlike which it does not require surgery.

Objective The clinical, radiographic, ultrasonographic and magnetic resonance findings are described.

Case report A 4-week-old male presented with a centrally located, bluish coloured, expanding scalp lesion. He was born normally, without any instrumentation, following a normal pregnancy. A "bruised/bluish" scalp was observed at birth. It progressively became more prominent with increasing discoloration and felt "spongy" to touch. No other vascular or significant abnormality on physical examination. He was referred for imaging. The skull radiographs showed a soft tissue, non-calcified mass and a deficient underlying calvarium; colour Doppler ultrasonography demonstrated a low flow extracranial vascular mass which, connect via the anterior fontanelle with the superior sagittal sinus. These findings that are consistent with sinus pericranii were confirmed with magnetic resonance imaging. No other intracranial abnormality.

Conclusion Sinus pericranii is an extracranial venous anomaly that connects directly with intracranial venous channel. It should be considered in the differential diagnosis of scalp masses and calvarial lucent lesions in children. Imaging, particularly, colour Doppler ultrasonography is important and non-invasive for diagnosis.

P36

Diffusion-weighted MRI findings in metachromatic leukodystrophy

Murat Kocaoglu[1], Nail Bulakbasi[1], Sabahattin Vurucu[2], Inanc Guvenc[1], Guray Husmen[1]

1. Department of Radiology, Gulhane Military Medical School, Ankara, Turkey
2. Department of Pediatric Neurology, Gulhane Military Medical School, Ankara, Turkey

Background Metachromatic leukodystrophy is an autosomal recessive dysmyelinating disease that results from a deficiency of the enzyme arylsulfatase A. It has three forms including late infantile, juvenile and adult forms.

Objective We present the diffusion-weighted MRI findings of juvenile metachromatic leukodystrophy.
Materials and methods A 6-year-old child with declining school performance was evaluated with MRI including diffusion weighted MR sequences. Diffusion weighted imaging was performed by using an axial, multislice, single-shot echo-planar spin-echo sequence with *b* values of 0 and 1,000 s/mm^2. ADC map was calculated on pixel-by-pixel basis.
Results On trace diffusion weighted image (b=1,000 s/mm^2) hyperintense changes were seen at dentate nuclei. ADC values showed increased (e.g., 192×10^{-3} mm^2/s) and decreased (e.g., 107×10^{-3} mm^2/s) areas of diffusion at dentate nuclei, compared with the normal appearing cerebellum (e.g., 140×10^{-3} mm^2/s).
Conclusion We suggest increased and decreased diffusion in metachromatic leukodystrophy reflects its histopathological stage due to impaired myelin turnover and these findings may have therapeutic implication.

P37

A rare case of Sturge Weber syndrome with dilated medullary veins mimicking arteriovenous malformation: CT and MRI findings
Yasar Bükte, E. Mine Basaran, Asur Uyar, Aslan Bilici
Radiology Department, Faculty of Medicine, Dicle University, Diyarbakir, Turkey

Background Sturge–Weber syndrome (SWS), known as the encephalotrigeminal angiomatosis is a sporadic neurocutaneous syndrome with a facial port-wine nevus and neurological features, typically including seizures and hemiparesis [1]. A progressive atrophy and dystrophic calcification occurs in the cortex because of the cortical ischemia and congestion due to the abnormal venous drainage [2]. Arteriovenous malformation (AVM) is not a component of SWS however AVM can be confused with SWS because of the dilated perimedullary veins [3].
Objective We present a typical SWS syndrome and AVM-like vascular pathology with CT and MRI image diagnosis.
Materials and methods A 3-year-old mentally retarded boy with epileptic convulsions and only a port-wine nevus on the forehead is determined in the physical examination. In CT images there are cortical curvilinear hyperdense calcifications, hemicerebral atrophy, volume deficit and calvarial thickness at the right cerebral hemisphere. In T2 weighted MRI images not only a volume deficit and atrophy in the right hemisphere with curvilinear hypointensity due to the calcifications but also right calvarial thickness and choroids plexuses enlargement is seen.
Results and conclusion Enlargement of perimedullary veins in the SWS can be confused with the AVM. And some misdiagnosis as SWS can be done because of the ipsilateral facial nevus with ipsilateral cerebral AVM or other venous anomalies [3]. Consequently, a close inspection to the findings of imaging techniques and MRI angiography must be done to help the differential diagnosis.
References
1. Marti-Bonmati L, Menor F, Poyatos C et al (1992) Diagnosis of Sturge–Weber syndrome: comparison of the efficacy of CT and MR imaging in 14 cases. AJR 158:867–871
2. Bentson JR, Wilson GH, Newton TH (1971) Cerebral venous drainage pattern of Sturge–Weber syndrome. Radiology 101:111–114
3. Barkovich AJ (2000) Phakomatoses. In: Pediatric neuroimaging, 3rd edn. Williams & Wilkins, Philadelphia, pp 383–441

P38

Assessing ventricular size; is subjective evaluation accurate enough? New MRI-based normative standards for 19 year olds
Stein Magnus Aukland[1], Morten Odberg[2], Roxanna Gunny[3], W. K. 'Kling' Chong[3], Karen Rosendahl[3]
1. Section for Radiology, Haukeland University Hospital/Institute of Surgical Sciences, University of Bergen, Norway
2. Section for Paediatrics, Institute of Clinical Medicine, University of Bergen, Bergen, Norway
3. Department of Radiology, Great Ormond Street Hospital for Children, London, UK

Objective To create new standards for radiological indices of dilated brain ventricles in young adults and to report the accuracy of subjectively assessed ventricular size.
Subjects and methods One hundred healthy adolescents (54 females) at age 17–20 years were studied. All were born healthy with a birth weight >3,000 g and had been followed throughout childhood. They were a control group for a separate study on ex-prems. All had a 3-T MRI of the brain and the following measurements were performed: width and depth of the frontal and occipital horns, diameter of the 3rd ventricle and depth of the anterior subarachnoid spaces. In addition the ventricular size was judged subjectively as being normal, mildly, moderately or significantly dilated, by two experienced paediatric neuroradiologists.
Results New normative standards for commonly used ventricular measurements are presented. The range of the frontal horn width was 28.1–40.3 mm and the range of the depth was 0.9–7.3 mm (right) and 0.9–8.6 mm (left). There were no statistically significant differences in ventricular width between the two sides (P=0.06), but the depth of the left frontal horn was larger than the right (P=0.001). Moderate agreement between the two observers was found regarding the evaluation of the ventricular dilatation (kappa=0.43). Observer 1 judged 36% while observer 2 judged 14% to have mildly dilated ventricles.
Conclusion The new normative standards for commonly used brain measurements in young adults may be helpful in the analysis of dilated ventricles in young adolescents.

P39

Midline angiolipoma: failure of its detection with fetal MRI
Marzia Mortilla, Cecilia Cesarini, Laura Tasciotti, Claudio Fonda
Pediatric Radiology, Meyer Children's Hospital, Florence, Italy

Case report A fetus showed suspected agenesis of the corpus callosum (CC) on US performed at 20 weeks' gestation (WG). At 29 WG, fetal MRI showing mild colpocephaly of the ventricular system; absence of the posterior portion of the CC, and a thin tissue layer in the anterior portion suspicious of a vestigial CC. The girl was delivered at 40 WG (4,050 g, Apgar, 9, 9) and the clinical phenotype was interpreted as a mild fronto-nasal dysplasia due to a hypertelorism and a right naris schisis.
At 14 days the baby underwent brain MRI. It showed agenesis of the corpus callosum with colpocephaly, and a lipoma at this level surrounded by thin fan-shaped images that reach the cortex. Development of other structures such as the cerebellum, brainstem and hypophysis was normal.

Conclusion Fetal MRI can confirm the suspicion of agenesis of the CC, but in this case was not able to detect the angiolipoma that was clearly detectable after birth. Angiolipoma is a rare and benign mesenchymal tumour composed of adipocytes and abnormal vasculature. Although it may arise from the abnormal development of a primitive pluripotential mesenchymal cell from which adipose tissue, smooth muscle and ventricular endothelium develop it seems that it cannot be detectable in early stages of pregnancy.

P40

Case series of massive plexiform neurofibromas: clinical and imaging features

Musa Kaleem, Laurence Abernethy, Christine Steiger, Alan Fryer, Barry Pizer
Royal Liverpool Children's Hospital, Liverpool, UK

Background Neurofibromatosis type 1 (NF1) is a multisystem disorder that most commonly affects the central and peripheral nervous systems and skin. Other systems that are variably involved include skeletal, vascular, gastrointestinal and genitourinary systems. Plexiform neurofibroma (PNF) is pathognomonic for NF1 and usually presents as a large lobulated mass along the course of a peripheral nerve or as an infiltrating soft tissue lesion.
Objective To review the imaging features of a series of PNF that presented in a tertiary referral centre highlighting the difficulties encountered in management of these unusually large and complicated tumours.
Materials and methods Retrospective clinical and imaging review of three consecutive cases of massive deep seated PNF
Results PNF locations included cervico-facial, thoraco-abdominal and cervico-mediastinal regions in three cases respectively. These presented as visible or palpable masses in two cases and resulted in airway obstruction in the third case. All cases presented major challenges in management and parental counselling. One case was familial; the other two were due to new mutations. Debulking surgery in one patient produced short term benefit and one case required tracheostomy for airway compression.
Conclusion PNF may present in variable ways depending on their size, location and proximity to vital organs. A conservative approach is usually prudent unless there is suspected malignant change or mass effect on vital organs when careful surgery may be appropriate. Surgical treatment of PNF is challenging and is usually reserved for cosmetic reasons or suspected malignant change. Aggressive tumour regrowth after debulking surgery is a recognised hazard.

P41

Vein of Galen aneurysm malformation: the influence of antenatal MRI

Lynne Beattie[1], Emily Stenhouse[2], Joti Bhattacharya[2]
1. The Queen Mother's Maternity Hospital, Glasgow, UK
2. The Institute of Neurological Sciences, The Southern General Hospital, Glasgow, UK

Background Vein of Galen aneurysmal malformation (VGAM) is the commonest paediatric arteriovenous shunt, carrying a high risk of mortality.
Objective We present a case series of five infants, correlating antenatal (AN) and postnatal (PN) MRI, and outcomes.
Materials and methods MRI studies were performed on a 1.5-T MRI unit, using maternal body coil, with maternal breath hold. Single shot T2-weighted fast spin-echo images (TE 100–150 ms, 512×512 matrix, slice thickness 5 mm) were acquired in three orthogonal planes to the fetus; as fetal motion occurred throughout scan, each acquisition acted as the scout for that subsequently.
Results Five infants were identified: four presented with maternal symptoms, one after routine ultrasound. Four underwent PN MRI, corroborating AN appearances. Three infants had poor parenchymal AN MRI features: one died in-utero, while two were well at (term) delivery, but quickly incurred cardiac failure. One of these exhibited encephalomalacia on AN and PN scans, thus would not have undergone embolisation. The other had ventriculomegaly with parenchymal changes, identical on AN and PN scans. Both died suddenly (the latter pre-embolisation). The remaining two infants showed favourable AN and PN features. Shunt flow was terminated in both by embolisation. Morbidity: the former infant has asymptomatic hypoxic-ischaemic changes; the other remains neurologically normal.
Conclusion MRI gave prognostically significant parenchymal details, correlating with PN images. These were particularly important when counselling parents and considering management plans with the preparation of specialist multi-disciplinary teams. Optimal gestation at which AN MRI should be performed is yet to be ascertained due to small case numbers.

P42

Comparing brain white matter on sequential cranial ultrasound and early MRI in very preterm infants

Lara Leijser, Lishya Liauw, Sylvia Veen, Inge de Boer, Frans Walther, Gerda van Wezel-Meijler
Leiden University Medical Centre, Leiden, the Netherlands

Background Periventricular white matter (WM) echodensities, frequently seen in preterm infants, can be associated with suboptimal neurodevelopment. Major WM injury is well detected on cranial ultrasound (cUS). cUS seems less sensitive for diffuse or more subtle WM injury.
Objective To assess the value of cUS and early MRI for evaluating WM changes and the predictive value of cUS and/or MRI findings for neurodevelopmental outcome in very preterm infants with normal to severely abnormal WM on sequential high-quality cUS.
Materials and methods Very preterm infants (GA<32 weeks) who had sequential cUS and a neonatal MRI were included. Periventricular WM on cUS and MRI was compared and correlated with neurodevelopmental outcome at 2 years' corrected age.
Results Forty preterm infants were studied; outcome data were available in 32. WM changes on sequential cUS were predictive of WM changes on early MRI, performed 4.9 (range 0.6–15.9) weeks after birth. Severely abnormal WM on cUS/MRI was predictive of adverse outcome, and normal to mildly abnormal WM of favourable outcome. Moderately abnormal WM on cUS/MRI was associated with

variable outcome. MRI slightly increased the predictive value of cUS in severe WM changes.
Conclusion Sequential cUS in preterm infants is reliable for detecting WM changes and predicting favourable and severely abnormal outcome. Additional, early MRI has only limited value for predicting outcome in preterm infants.

P43

Malformations of cerebral cortical development: a pictorial review
Rebecca Kolawole, Daniela Bakalinova, Kong Jung Au-Yong
University Hospital of North Staffordshire, Stoke on Trent, UK

Background Malformations of cerebral cortical development cause significant morbidity in the paediatric population. Several studies have shown that they are the cause of 23–26% of intractable epilepsy in children and young adults. They have also been identified as a cause of severe psychomotor retardation, developmental delay and failure to thrive.
Objective The purpose of this poster is to provide a pictorial review of various cortical development malformations using MRI as the main imaging modality.
Materials and methods A 1.5-T MRI was used in all cases of children referred with intractable epilepsy, developmental delay and failure to thrive.
Results Cerebral malformations have been classified and illustrated in the following categories:

I. Abnormal neuronal proliferation/apoptosis: microcephaly, microlissencephaly, megalencephaly, hamartomas of tuberous sclerosis, hemimegalencephaly.
II. Abnormal neuronal migration: lissencephaly, heterotopia.
III. Abnormal cortical organization: polymicrogyria and schizencephaly.
IV. Malformations of cortical development, not otherwise classified.

Conclusion Malformations of cerebral cortical development are not uncommon in the paediatric population. In patients with intractable epilepsy, developmental delay and psychomotor retardation, every effort should be made to exclude this as the cause of their clinical symptoms.
References
1. Barkovich AJ, Kuzniecky RI, Jackson GD et al (2001) Classification system for malformations of cortical development: Update 2001. Neurology 57:2168–2178

P44

Short echo time single voxel 1H magnetic resonance spectroscopy in the diagnosis of pineal region tumours
Lisa Maria Harris[1,2], Shaun Wilson[1,2], Nigel Davies[1,3], Lesley MacPherson[2], Shaheen Lateef[2], Kal Natarajan[1,3], Martin English[2], Theodoros Arvanitis[2,4], Richard Grundy[5], Andrew Peet[1,2]
1. Academic Paediatrics and Child Health, University of Birmingham, Birmingham, UK
2. Birmingham Children's Hospital, Birmingham, UK
3. Medical Physics and Imaging, University Hospital Birmingham, Birmingham, UK
4. Electronic, Electrical, and Computer Engineering, University of Birmingham, Birmingham, UK
5. Children's Brain Tumour Research Centre, University of Nottingham, Nottingham, UK

Background Pineal region tumours are a diverse group accounting for 3–8% of intracranial tumours in children. Surgery may be associated with significant morbidity and mortality and many of these tumours do not require excision. Non-invasive methods for diagnosis would aid the clinical management of these tumours.
Objective To explore the potential of magnetic resonance spectroscopy (MRS) to diagnose pineal tumours.
Patients and methods Short echo time (30 ms) single-voxel MRS was performed on 16 newly diagnosed pineal tumours prior to diagnosis. The histological diagnoses were eight germ cell tumours (GCT) (six germinomas and two teratomas), five pineoblastomas, one pineocytoma and one intermediate grade parenchymal tumour. A secreting GCT was diagnosed on radiological appearances and serum markers. Data was processed using LCModel™ to determine metabolite and lipid + macromolecular (LMM) concentrations relative to water, and quality control parameters. Two-tailed *t* tests were used to test significance in these concentrations between groups of tumours.
Results LMM offered the best discrimination between GCTs and other tumours. LMM at both 0.9 and 1.3 ppm were significantly higher (P= 0.03 and P=0.04) in GCTs (10.8 at 0.9 ppm and 5.0 at 1.3 ppm) compared with other tumours (4.96 at 0.9 ppm and 12.6 at 1.3 ppm). Germinomas showed significantly (P=0.008) higher levels (1.44) of total choline, compared with teratomas (0.31), consistent with their more aggressive nature.
Conclusion This study shows the potential of MRS to distinguish GCTs from other tumours in the pineal region, and to distinguish between different histological types of GCT. These results should be confirmed in a prospective multicentre study.

P45

Imaging of acquired spinal cord lesions and spinal canal pathology in children
Jean-François Chateil[1], Béatrice Husson[2], Catherine Adamsbaum[3]
1. Hopital Pellegrin Enfants CHU, Bordeaux, France
2. Hôpital Bicêtre AP-HP, le Kremlin Bicêtre, Paris, France
3. Hôpital St Vincent de Paul AP-HP, Paris, France

Objective The purpose of this scientific exhibit is to illustrate the most frequent acquired spinal cord diseases and extramedullary pathologies encountered in childhood.
Material and methods Spinal canal diseases are quite infrequent in children. Symptoms are acute or chronic, with neurological or orthopaedic signs. Gray-scale sonography can be performed in neonates. MRI remains the method of choice for spinal canal evaluation in children. CT can be useful for associated bone lesions. Protocols regarding these techniques are given.

Results The following pathologies are described and illustrated:

- Spinal trauma with spinal cord injury, with or without bone lesion, including birth trauma.
- Intramedullary (astrocytoma, ependymoma) and intradural extramedullary acquired tumours.
- Primitive syringomyelia, in relation with Chiari I malformation, which has to be distinguished from other aetiologies.
- Spinal cord compression from an extramedullary process.
- Inflammatory diseases: acute transverse myelitis and acute disseminated encephalomyelitis (ADEM), Guillain–Barre syndrome, multiple sclerosis.
- Infectious diseases, rare in children, sometimes in relation with congenital abnormalities.
- Vascular intramedullary and extramedullary malformations.

Conclusion Knowledge of spinal canal diseases in children is mandatory for understanding the most frequents aspects observed with imaging.

P46

Lesion patterns in neonatal encephalitis due to human parechovirus type 3

Arjen Lex Van Zwol, Maarten Lequin, Coranne Aarts-Tesselaar, Annemiek van der Eijk
Matthijs de Hoog, Paul Govaert
Sophia Children's Hospital, Erasmus Medical Centre, Rotterdam, the Netherlands

Background Parechoviruses, part of the picornavirus family, are well known human pathogens responsible for several clinical manifestations including encephalitis in neonates and young children.
Objective We report three cases of late neonatal encephalitis caused by the recently discovered human parechovirus type 3 (HPeV3), to show different lesion patterns on ultrasound (US) and MRI.
Patients and methods Throat, nasopharyngeal and rectal swabs, urine, cerebrospinal fluid and serum were analyzed using PCR and immunofluorescence assay. EEG, US and MRI described the extent of virus-induced brain damage.
Results All three presented with respiratory insufficiency and status epilepticus, twice refractory to treatment. HPeV-3 was isolated from all specimens, except for urine. The samples were negative for other viruses. In one case autopsy was granted by parents and HPeV3 was found in brain and lung tissue. EEG revealed multifocal epileptic activity in all. Two infants suffered from a similar white matter pattern of brain injury, preferring frontal white matter, connected thalamic nuclei and cerebellar cortex. One of them, the only survivor, had polymicrogyria unrelated to encephalitis. The third infant only developed destructive lesions in hippocampus.
Conclusion Two patients died from either extensive brain injury or refractory status epilepticus due to HPeV3. The survivor developed mild spasticity of the left arm, compatible with the location of polymicrogyria and no sequelae of encephalitis. HPeV3 can be responsible for severe neonatal central nervous system infection and death. Radiological findings suggest the existence of different patterns of brain injury caused by HPeV3.

P47

MR spectroscopy in paediatric neuroimaging

Samuel Stafrace, David Rea, Stephanie Ryan, Eilish Twomey, Veronica Donoghue
Children's University Hospital, Dublin, Ireland

Background MR spectroscopy (MRS) allows in-vivo non-invasive analysis of brain chemistry and metabolism. MRS spectra are age and location dependant.
A number of specific diagnosis including creatine deficiency, non-ketotic hyperglycinaemia and Canavan disease can be obtained from evaluation of the MRS spectra. MRS can also provide information regarding the chemical composition of tumours aiding specific diagnosis, management planning and follow up. Where the MRS spectrum is less specific it may still provide more information than that obtained through the conventional sequences. Detection of lactate, for example, in the brain of infants with developmental delay and basal ganglia abnormality in the absence of ischaemia is strongly suggestive of mitochondrial disease. Detection of lactate in neonates with hypoxic ischaemic encephalopathy has prognostic significance.
Results In this poster we present the changing MR spectra with age, and present examples of abnormal MR spectra in a variety of diseases in children.

P48

Use of diffusion tensor MR imaging in patients with neuronal migration anomalies: preliminary findings at 3.0 T

Joshua Nickerson, Heather Burbank, Judy Tam, Gary Alsofrom, Christopher Filippi
Radiology, University of Vermont/Fletcher Allen Healthcare, Burlington, VT, USA

Background Heterotopic grey matter results from an abnormal migration of neurons during brain development. Variations include subependymal heterotopia, focal subcortical heterotopia, and band heterotopia. These malformations usually come to medical attention following seizure although patients may be asymptomatic. Magnetic resonance imaging is the primary imaging modality for diagnosis. Diffusion tensor MR imaging and fibre tractography are emerging modalities that may allow for the detection of the effects of abnormal neuronal migration on subjacent white matter fibre tracts.
Objective To quantify the fractional anisotropy on diffusion tensor MR imaging (DTI) at 3.0 T of the white matter fibre tracts surrounding various neuronal migrational anomalies.
Materials and methods Two girls and one boy infant, ages 8 days, 7 months, and 18 months, were imaged at 3.0 T with six-direction DTI. Fractional anisotropy (FA), fibre tracking, and apparent diffusion coefficients (ADC values) were determined and compared to normative data.
Results One patient had transmantle heterotopia, one patient had diffuse polymicrogyria with areas of band heterotopia in the frontal lobes bilaterally, and one patient had a closed-lip schizencephaly with associated abnormal cortical thickening and gray matter heterotopia.

In all cases, the fractional anisotropy of the surrounding white matter fibre tracts was decreased, ranging from 10% to 25%, when compared to contralateral normal-appearing white matter and normative data.
Conclusion High field strength MR imaging with diffusion tensor and fibre tractography may be a useful tool in evaluating neuronal migrational anomalies and their effects on surrounding white matter fibre tracts.

P49

Evaluation of MR perfusion imaging using arterial spin labelling and contrast perfusion imaging in the assessment of tissue at risk in Moya Moya disease

Nirmalkumar Prabhu, *Michael Ditchfield*, Fang Ke, Michael Kean, Mark Mackay
Royal Children's Hospital, Melbourne, VIC, Australia

Background Moya Moya disease in children often results in repeated and debilitating strokes. A sudden deterioration of the haemodynamics can result in a stroke. It is important to find a reproducible and quantifiable method of assessing the parenchymal perfusion so as to delineate tissue at risk.
Objective To compare the techniques in predicting the tissue at risk, and to follow up the patients using serial MRI to evaluate development of ischemic lesions and the extent.
Materials and methods Children with stroke or at risk of stroke secondary to Moya Moya disease were studied to quantify the amount of blood flow using arterial spin labelling and contrast perfusion in a 3-T MRI. Eight consecutive patients (two males and six females, age 3–10 years) with Moya Moya disease presenting during 2005–2007 were evaluated with arterial spin imaging and contrast perfusion, as well as routine sequences—T1- and T2-weighted images, FLAIR, Diffusion weighted images, and MR angiography. A total of 47 studies were performed. The perfusion and arterial spin labelling images were evaluated and quantified by a dedicated physicist, while two radiologists evaluated the other sequences.
Results Cerebral perfusion in children with Moya Moya is complex and non-uniform; nevertheless there is correlation with the development and extent of infarcts. In several cases, it was predictive of potential infarcts, and was useful in assisting the timing of revascularising surgical therapy.
Conclusion Both techniques can be used in children with Moya Moya disease, to assess perfusion of the brain parenchyma, and aid in triaging patients who will benefit from revascularisation surgery.

P50

Chromosomal alterations and brain MRI

Massimo Basile, Marzia Mortilla, Monica Antonello, Cecilia Cesarini, Claudio Fonda
Pediatric Radiology, Meyer Children's Hospital, Florence, Italy

Objective Numbers of chromosomal abnormalities are associated with brain structural alterations. MRI study may contribute to nosologic evaluation.
Introduction Autosomal or sex aneuploidies are associated to different expression of brain alteration. The chromosomal disorders are the most common cause affecting the human pregnancy from 50% to 75%. The genetic disorder causing human disease may be due alto to a single gene disorder or to a complex interaction between multigenic disorder.
Materials and methods MRI studies are performed in 72 children (46 female, 26 male) in 43 known and 29 suspected chromosomal abnormalities. The paediatric patients are studied using 1.5- and 3-T MRI scanners. Conventional T1-W and T2-W images are obtained. FFE T1-W 3-D acquisition, DWI and ADC TRACE, DTI completed the morphostructural evaluation.
Results Micro- and macrocephaly, prominent pericerebral CSF spaces, ventriculomegaly, dysmorphic ventricles, hydrocephalus, midline dysgenesis or agenesis of the corpus callosum are not rarely found. Focal white matter defects are frequent in chromosomal abnormalities. Posterior fossa malformations include the Dandy–Walker spectrum and various degrees of cerebellar hypoplasias. The different MRI modalities allow a better structural evaluation also in almost normal brain MRI of affected patients. A flow chart of different brain abnormalities may suggest the presence of chromosomal alterations especially in those patients in which only subtle anomalies are detected. Both morphometric parameters and the degree of brain abnormalities may be associated to the different phenotypes.

P51

A new phantom for quality assurance in brain chemical shift imaging (CSI)

Marco Esposito[1], Antonio Ciccarone[2], Giacomo Belli[3], Silvia Mazzocchi[4], Claudio Fonda[2]
1. Università Degli Studi Di Firenze, Florence, Italy
2. Meyer Children's University Hospital, Florence, Italy
3. Azienda Ospedaliero Universitaria-Careggi, Florence, Italy
4. Azienda Sanitaria, Florence, Italy

Chemical shift imaging is one of the most promising techniques in the magnetic resonance spectroscopy field. This technique allows for the determination of chemical composition as well as the spatial information of the specimen and therefore it is an efficient tool to assess internal characteristics of various biological tissues. It is fundamental to develop a quality assurance program in CSI, for reliability evaluation and to optimize the signal to noise ratio and the sequence scan time.
We developed a phantom to test the chemical shift imaging technique of the brain. This phantom, of oval geometry, has a substrate constituted of gel agarose (1.5%) to better mimic the brain tissue. The background gel solution was filled with a diluted paramagnetic salt to adjust T1 relaxation time, and organic compounds like Choline (15 mmol/l) and Acetate (45 mmol/l), to simulate two cerebral important metabolites. Four cylindrical cavities, still filled with gel agarose and different concentrations of the previous organic metabolites, were manufactured in the substrate. Further, some different concentration of the paramagnetic salt respect to the background was added in the holes, in order to distinguish these structures in the T1-weighted images.
The measures are obtained on a 3-T scanner installed in a paediatric radiology, using PRESS and STEAM CSI sequences.

P52

Pictorial review of mitochondrial encephalopathies in children

Germaine Pierre, *Katharine Foster*, Lesley MacPherson
Birmingham Children's Hospital, Birmingham, UK

Background Mitochondrial disease can present at any age. Due to the ubiquitous nature of the mitochondria, any organ system can be involved. Mitochondrial disease should be considered in any progressive disorder involving three or more organ systems. The central nervous system usually becomes involved either as part of disease progression or eventually in the latter stages of disease. Mitochondrial encephalopathy has a wide range of imaging appearances, ranging from bilateral symmetrical lesions of the basal ganglia and brain stem, to white matter involvement. Even if strongly suspected clinically, mitochondrial disease can be very difficult to definitively diagnose and the tests involved are often invasive. Reaching a genetically based diagnosis can be difficult as mitochondrial metabolism is controlled by both nuclear and mitochondrial DNA. Brain MRI, particularly diffusion weighted imaging is a useful tool in reaching the correct diagnosis.
Objective To illustrate brain MRI changes in paediatric patients with confirmed diagnoses (histological/mutation analysis) of mitochondrial disease.
Materials and methods A retrospective database search identified fifteen patients with confirmed mitochondrial disease. This was correlated with their brain radiological findings.
Results and conclusion There is a wide spectrum of appearances of mitochondrial encephalopathy. However, recognition of imaging findings, together with clinical pattern recognition can help to reach the underlying diagnosis.
References
1. Taylor RW, Turnbull DM (2005) Mitochondrial DNA mutations in human disease. Nat Rev Genet 6:389–402
2. Barragan-Campos HM, Vallee J, Barrerra-Ramirez CF et al (2005) Brain magnetic resonance imaging findings in patients with mitochondrial cytopathies. Arch Neurol 62:737–742

P53

Contrast enhanced MR Imaging features of stage III tuberculous meningitis: an illustrative tutorial

Athar Haroon, Fiona Dickinson, Andrew Rickett
University Hospitals of Leicester, Leicester Royal Infirmary, Leicester, UK

Stages of Tuberculous meningitis (Medical Research Council)
I- Conscious, non specific signs, no neurology.
II- Conscious, altered behaviour, signs of meningeal irritation and minor neurological deficit.
III- Convulsion, severe neurological deterioration or comatose.
Case report An eleven years old female patient with past history of Down's syndrome presented with acute onset encephalopathy.
MR at acute presentation: (illustrations on poster)
1. Hydrocephalus with dilatation of the lateral, third and fourth ventricles.
2. Increased white matter signal suggesting acute onset.
3. Diffuse meningeal enhancement extending deep into the sulci.
4. Lack of definition of the conus.
5. Clumping along the filum on axial imaging.
6. Dural enhancement along the cord and
7. Enhancement of the material in the lumbar dural sac.
A shunt was inserted at a neurosurgical centre. The patient had several cardiac arrests.
CT (illustrations on poster)
1. Effacement of the basal cisterns
2. Hypodensity (oedema) involving the brainstem, basal ganglia and cerebral white matter.
3. Diffuse severe hypodensity and mass effect affecting the subthalamic area, midbrain & pons.
Appearances at this stage were attributable to acute ischemia/infarction
Following delayed imaging features (2 months post infection) will be illustrated
1. Ventriculomegaly
2. Gliosis
3. Marked enhancement of the thickened basal meninges extending through-out the basal cisterns.
4. Circle of Willis encased by the abnormal soft tissue
5. Mass effect on the midbrain.
5. Diffuse enhancing material throughout the spinal canal.
6. Abnormally enhancing lesions in the cord.

P54

Brain CT findings in children after drowning

Suzanne DeGruchy, Michael Sargent, Jayasri Srinivasan, Elke Roland, Steven Miller
British Columbia Children's Hospital, Vancouver, BC, Canada

Background Drowning is the second leading cause of accidental death for Canadian children. CT is commonly the first imaging modality used to evaluate the neurological sequelae of drowning.
Objective To review the brain CT findings in children who drowned.
Materials and methods Over 17 years, 30 of 130 children who were admitted to our institution for a drowning episode had cranial CT during hospitalization. We retrospectively reviewed the CT scans for the presence and severity of edema involving the basal ganglia, thalami and cerebral hemispheres.
Results Eighteen of 30 patients demonstrated CT scan abnormalities related to drowning within 4 days of admission. Ten of these 18 died. All ten demonstrated hypodensities involving both the basal ganglia and thalami, with additional abnormalities in the cerebral hemispheres in nine of ten. Seven of the ten deceased patients showed these abnormalities within 2 days of admission. We noted preferential globus pallidus involvement. The eight nonfatal injuries either selectively involved the basal ganglia or the thalami, or demonstrated mild cortical oedema. In the remaining 12 children, 11 had normal CT scans and one showed unrelated disease. One of these 12 with a normal scan on the day of admission, died.
Conclusion Hypodensities involving both the basal ganglia and thalami with additional lesions in the cerebral hemispheres predicted a lethal outcome in our patient population. Brain CT performed within the first 4 days of admission can help predict outcome.

P55

Brainstem tegmental infarcts in neonates: clinical and neuroradiological findings in six patients

Daniela Longo, Luciana Nogueira Delfino, Olivier Danhaive, Francesco Randisi, Maria Roberta Cilio, Giuseppe Fariello
Bambino Gesu Children's Hospital, Rome, Italy

Background Watershed zone infarcts in the brainstem of neonates are not as frequent as cortical infarcts. In the brainstem tegmentum there is a watershed zone between the terminal perfusion zones of the paramedian penetrating and long circumferential arteries which arise from the basilar artery. This zone is vulnerable to more severe and prolonged periods of hypoxia.
Objective We aim to correlate clinical and MRI findings in neonates who presented dysphagia, aspiration, apnoea and ventilator-dependence.
Materials and methods From 2005 to 2007 we evaluated six neonates with ages between 7 days and 4 months that presented pre and postnatal hypoxic/ischemic insults with MR examination on a 1.5-T scanner. The sequences included multiplanar spin-echo (SE) and inversion recovery (IR), T1- and T2-weighted images in all patients.
Results MRI studies revealed symmetrical tegmental infarcts in the midbrain (two), pons (two) and medulla oblongata (two). These infarcts were localized in the brainstem watershed zones, particularly in the cranial nerve nuclei and nucleus solitarius.
Conclusion Even if most of the neuroanatomical structures in the brainstem are beneath the resolution of present imaging techniques, MRI can be helpful in the evaluation of neonates that present apnea, dysphagia and ventilator-dependence.
References
1. Sarnat HB (2004) Watershed infarcts in the fetal and neonatal brainstem. An aetiology of central hypoventilation, dysphagia, Moibius syndrome and micrognathia. Eur J Paediatr Neurol 8:71–87
2. Cortez SC, Kinney HC (1996) Brainstem tegmental necrosis and olivary hypoplasia: a lethal entity associated with congenital apnea. J Neuropathol Exp Neurol 55:841–849

P56

Comparative study of prenatal and postnatal MR imaging in CNS anomalies

Elida Vazquez, Deyna M. Gutiérrez, Amparo Castellote, Elena Carreras, Nuria Mayolas, Goya Enríquez
Pediatric Radiology, Hospital Vall D'Hebron, Barcelona, Spain

Background MR imaging is increasingly being used to confirm or provide further support for fetal CNS abnormalities detected sonographically. It is used to decide to terminate the pregnancy (unfavorable prognosis before 23 weeks' gestation), continue the pregnancy, direct the mode of delivery, or direct perinatal therapy.
Objective To assess the diagnostic capability of fetal MR imaging in the diagnosis of CNS anomalies and to correlate the prenatal findings with the postnatal exams, emphasizing the complementary fetal imaging modality to ultrasonography in deciding postnatal management.
Materials and methods Between 2000 and 2007, many fetal MR imaging studies were performed at our institution. A 1.5-T superconductive MR imaging unit was used to obtain half-Fourier acquisition single-shot turbo spin images. Fetuses with severe CNS pathology were subject of legal interruption of gestation. Forty-six fetuses with CNS and head and neck abnormalities finished gestation and were postnatally examined.
Results Several diagnosis included in the group of fetuses included: eight (17%) hypoxic–ischemic lesions, six (13%) intracranial cystic lesions, six (13%) neck malformations, five (11%) corpus callosum dysgenesis, three (7%) hydrocephalus, three (7%) posterior fossa anomalies, two (4%) neurocutaneous syndromes, two (4%) vascular malformations, two (4%) intracranial lipomas, two (4%) CMV infections, two (4%) cortical dysplasia, two (4%) dysraphisms, and one leukodystrophy (2%). Most prenatal diagnosis were confirmed by postnatal MR imaging. Those cases in which prenatal MRI findings did not correlate with neonatal diagnosis will be emphasized.
Conclusion Prenatal MR imaging can delineate and characterize these abnormalities, and thus assist in the diagnosis and in the planning of postnatal surgery and management.

P57

Imaging findings in Adams–Oliver syndrome with CNS involvement

Maria Raissaki, Eleftheria Papadopoulou, Stavros Sifakis, Ioannis Germanakis, Maria Kalmanti, Nicholas Gourtsoyiannis
University Hospital of Heraklion, University of Crete, Crete, Greece

Background Cerebral abnormalities are uncommon in Adams–Oliver Syndrome (AOS) with less than 35 described cases in the English literature.
Objective To present and discuss the antenatal and postnatal imaging findings in an AOS patient with CNS involvement.
Material and methods The propositus is a 14-month-old boy with aplasia cutis congenita, distal limb transverse defects, a wide atrial septal defect, growth retardation and central hypotonia. Two members of the patient's family had manifestations of AOS.
Results Hand and feet radiographs disclosed hypoplasia and aplasia of multiple phalanges. Fetal MRI, postnatal MRI at ages 4 weeks and 14 months showed dilated, distorted ventricles and thinning of corpus callosum. Antenatal MRI also disclosed small per ventricular cysts, which developed into high intensity lesions on T1-W sequences at age 4 weeks and into periventricular leukoencephalopathy at age 14 months.
Discussion Periventricular hyperintensities on T1-W sequences could be attributed to haemorrhage and/or calcifications. The sequence of MRI findings favours the theory of AOS vasculopathy causing abnormal vascular regulation during embryonic development.
Conclusion Radiographs suffice for the evaluation of transverse defects of the hands and feet in children with AOS. Antenatal and postnatal imaging of the brain in AOS patients may disclose PVL-like changes, attributed to abnormal embryonic angiogenesis.

P58

Bilateral polymicrogyria associated with neurofibromatosis type 1

Alberto Spalice[1], *Rosanna Mariani*[1], Mario Mastrangelo[1], Francesca Del Balzo[1], Claudio Di Biasi[2], Antonella Castronovo[1], Paola Iannetti[1]
1. Child Neurology Division, Department of Paediatrics, "Sapienza" University of Rome, Rome, Italy
2. Department of Medicine, Unit of Magnetic Resonance, "Sapienza" University of Rome, Rome, Italy

Background CNS malformations with subsequent epilepsy are relatively infrequent in patients with Neurofibromatosis type 1 (NF1) while they have a more elevated incidence in other neurocutaneous syndromes. Epilepsy has been observed in 3.8– 6% of the population with NF1.
Case report Female of 8 years old with NF1. At the age of 6 years old she had a brief episode characterized by generalized tonic clonic seizures. The EEG showed several spikes in the centro-occipital regions. Six months later she had a second episode with right partial seizure with occipital slow-waves at the interictal EEG. She came to our attention after 9 months when she had a third epileptic manifestation with the pattern of an atypical absence. MRI showed right opercular polymicrogyria, a second area of polymicrogyria in the left paracentral lobular cortex, and various UBOs. Because of the sporadic convulsive episodes antiepileptic treatment was not started. At 8 years old she had a complex partial status epilepticus that was solved with the administration of intravenous lorazepam (0.1/mg/kg). EEG was characterized by bilateral spike and waves in the fronto-temporal region with secondary generalization of the abnormalities. Antiepiletic treatment with topiramate (2 mg/kg/day) was begun. Three months later she presented a new status epilepticus with the same clinical features of the previous one. Intravenous lorazepam in the Emergency Department was effective again. Valproic acid was added at a dosage of 20 mg/kg/day with complete seizure freedom during 12 months of follow-up.
Discussion Many studies have pointed out a connection between NF1 and seizures and/or cortical malformations. Nevertheless it is very difficult to define the prevalence of seizures in NF1 patients because many factors influence it. The relationship between epilepsy and cerebral malformations has not been established but many studies have reported that patients with NF1 present an increased risk of seizures associated with intracranial masses, cytoarchitectural abnormalities and cerebrovascular diseases while it has not yet been observed a correlation between cerebral lesion localization, seizures type and clinical evolution. In other studies it has been evidenced that individuals with NF1 and large NF1 gene deletions have an increased frequency of structural defects of the brain that are not usually seen in this neurocutaneous syndrome [1]. The presence of cortical malformations in NF1 does not seem incidental. Neurofibromin, a protein that is encoded by a tumour suppressor gene and in NF1, is involved in the regulation of the development of cerebral cortex and, probably plays an important role in the evolution of CNS malformations.
Reference
1. Korf BR, Schneider G, Poussaint TY (1999) Structural anomalies revealed by neuroimaging studies in the brains of patients with neurofibromatosis type 1 and large deletions. Genet Med 1:136–140

P59

Dyke–Davidoff–Masson syndrome: three cases with MRI findings

Yasar Bükte[1], E. Mine Basaran[1], Asur Uyar[1], Aslan Bilici[1], A. Turan Ilýca[2]
1. Radiology Department, Dicle University Faculty of Medicine, Diyarbakir, Turkey
2. Military Hospital of Diyarbakir, Diyarbakir, Turkey

Objective Cerebral hemiatrophy or Dyke–Davidoff–Masson syndrome (DDMS) is a clinical entity with features of seizures, facial asymmetry, contralateral hemiplegia or hemiparesis and mental retardation [1]. Here, three children with this central nervous system malformation characterized by cerebral hemiatrophy and presence of seizures are presented.
Case reports
Case 1: A 5-year-old girl child with a history of retardation in walking, and speaking and mild mental retardation. Physical examination revealed facial asymmetry and right hemiatrophy. Cranial magnetic resonance (MRI) demonstrated severe atrophy of right cerebral hemisphere, gliosis and loss of white matter, and dilated right lateral ventricles, peripheral sulcus and cisterns.
Case 2: An 8-year-old girl child had seizures continuing for 2 or 3 min with a intervals 2 or 3 months and left dominant tonic–clonic spasms. MRI showed hemiatrophy of right cerebral hemisphere, mild enlargement of ipsilateral ventricles, hemispheric sulcus and cisterns. Also on T2-W images diffuse increase of gliosis intensity is confirmed.
Case 3: A 6-year-old boy was evaluated for recurrent seizures. He has taken antiepileptic therapy since 2 years old because of non febrile seizures. In his anamnesis, speech disorders, retardation in walking, and difficulty in learning is determined Radiologically, cranial MRI demonstrated the atrophy of right cerebral hemisphere, a wide encephalomalacia area at right temporoparietal and right basal ganglia and enlargement of subarachnoid space and right lateral ventricle and calvarial thickening due to the malacia.
Conclusion Cranial MRI imaging is the most important imaging modality to assess DDMS diagnosis and to establish the commonness of cerebral parenchymal damage [2].
References
1. Dyke CG, Davidoff LM, Mason CB (1933) Cerebral hemiatrophy with homolateral hypertrophy of the skull and sinuses. Surg Gynecol Obstet 57:588–600
2. Aguiar P H, Liu CW, Leitao H et al (1998) MR and CT imaging in the Dyke–Davidoff–Masson syndrome. Report of the cases and contribution to pathogenesis and differential diagnosis. Arq Neurosiquiatr 56:803–807

P60

Pictorial review of the intracranial subarachnoid spaces

Daniel Martin
Karolinska University Hospital, Stockholm, Sweden

Background New surgical techniques are created, used and reinvented to redirect abnormal accumulation of cerebral spinal fluid in their compart-

ments. Since Dandy's description of a puncture method of the lateral ventricles of the brain in 1918, the discoveries of Vieussen (1690), Magendie (1825, 1942), Luschka (1855), Key and Reutzius (1875) have been reused and refurbished. In addition to the lateral ventricles, the subarachnoid spaces have been described and classified by Locke and Naffziger (1924), Spatz and Stroescu (1934) and Liliequist (1959) among others.
Objective We aim to clearly picture the subarachnoid cisterns, their borders and communication with each other. The expressed goal is for the radiologist to better understand and comprehend patterns of pathology of cerebral spinal fluid motion.
Materials and methods The literature has been reviewed for new and old concepts and classifications. With a word search program we have retrieved and reviewed MRI and CT studies in our institution in paediatric patients with subarachnoid pathology between 2004 and 2007.
Results Subarachnoid spaces and their limitations were demonstrated in a pictorial review via their pathology.
Conclusion While new neurosurgical "drainage" techniques like third ventriculo-cisternostomi are being designed, innovative non-invasive imaging techniques are being developed that are, however, inadequately designed to visualize the detailed anatomy. Despite radiologists' striving for higher resolution, artefacts often undermine the clear visualization of the sometimes subtle limitations and membranes of these compartments. A firm grasp on the underlying anatomy is therefore key in understanding the effects of treatment and pathology.

P61

Frontal sinusitis complicated by Potts puffy tumour and intra-cranial abscesses: case report and discussion

Simon McGurk, Kaseem Ajilogba, Mary-Louise Montague, Maeve McPhillips
Royal Hospital for Sick Children, Edinburgh, UK

Introduction A 13-year-old boy presented with a short history of frontal headache associated with pyrexia. CT imaging at the referring hospital had revealed pan-sinusitis with a small extra-axial collection. The patient continued to deteriorate and on the 3rd day after admission developed frontal scalp swelling.
Imaging findings Ultrasound demonstrated a fluid collection in the subgaleal space. CT demonstrated frontal osteomyelitis with destruction of the posterior wall of the left frontal sinus and extensive lucency of the left frontal bone. The previous extra-axial collection had resolved. However, a new collection was seen stripping the superior sagittal sinus from the skull vault.
Urgent surgical drainage of the frontal sinuses and extra-axial collection was then undertaken. The patient remained unwell and MRI of the brain was performed to exclude superior sagittal sinus thrombosis. This showed multi-focal ring enhancing lesions, consistent with cerebral abscesses.
Outcome After a long, complicated hospital admission the patient was discharged 6 weeks after admission. At discharge MRI showed small areas of residual enhancement in areas of abscess formation.
Discussion Initially described in the eighteenth century, Potts puffy tumour is rare, with less than 30 published cases. While intracranial abscess formation is a recognised complication of sinusitis, the presence of Potts puffy tumour, extra-axial collection and intracranial abscess in one patient is extremely rare.

P62

In vivo 3-D modelling of the fetus with MRI

Jérémie Anquez[1], Elsa Angelini[1], Isabelle Bloch[1], Valérie Merzoug[2], Anne-Elodie Bellaiche-Millischer[2], Catherine Adamsbaum[2]
1. Télécom ParisTech, Paris, France
2. Saint Vincent de Paul Hospital, Paris, France

Background Fetal MRI has proved to be a useful tool complementary to US. However, 3-D applications of MRI remain limited.
Objective To show the interest of the Steady State Free Precession (SSFP) sequence for 3D segmentation and modelling of the fetus.
Material and methods Standard protocols for fetal MRI included SSFSE and SSFP sequences to study the placenta. MRIs were performed on different 1.5-T units without sedation nor breath hold. The feasibility of 3D segmentation and modelling of the fetus using the SSFP sequence data was assessed on 27 women who underwent a fetal MRI for various indications.
Results The short SSFP acquisition time prevents fetal motion artefacts and therefore preserves the 3-D data coherence. Moreover, the data shows a high signal to noise ratio. Physiological fluids present a high response and greatly contrast with fetal soft tissues. Thus, the fetal surface and fluid-filled organs can be easily delineated. Besides, gradient refocusing keeps flowing fluids response stable. It overcomes the main limitation of SSFSE sequences which often present drop of the amniotic fluid response, hence reducing the contrast with fetal soft tissues. The fetus and fetal organs (brain, lungs…) have been successfully segmented on the datasets using semi-automatic methods, showing that SSFP sequence provides adequate data for this purpose. Reliable measurements could be extracted from the reconstructed 3-D models.
Conclusion The SSFP sequence allows 3D segmentation and modelling of the fetus. Extracted 3-D information can be exploited in several domains, such as biometric (fetal weight estimation) or morphological studies.

P63

Prenatal MRI characteristics of foetal thoracic abnormalities: a pictorial essay

Irene Borzani[1], Marcello Napolitano[1], Salvatore Zirpoli[1], Alessandra Kusterman[2], Mariangela Rustico[1], Fabio Triulzi[1]
1. Department of Radiology and Neuroradiology, V. Buzzi Children's Hospital, Milan, Italy
2. Fondazione IRCCS Ospedale Maggiore Policlinico, Milan, Italy

Background Foetal MRI is increasingly being used in feto-maternal imaging to complete sonographic findings, because it can add important information in the diagnosis of foetal anomalies.
Objective To propose a pictorial review of MRI findings of the main fetal thoracic abnormalities.
Materials and methods Between December 2004 and November 2007 we performed 85 prenatal MRI in 79 pregnant women (19–37 weeks' gestation) to analyse MRI appearance of foetal thoracic abnormalities identified after sonographic screening.

Results Congenital diaphragmatic hernia (CDH) was the most frequent abnormality, identified in 35/79 patients, followed by congenital adenomatoid-cystic malformation (CCAM) found in 26/79 prenatal MRI and bronchopulmonary sequestration (4/79). In these cases MRI aids in planning surgery because this technique directly visualizes the position of the lung, liver and bowel. We identified also 3/79 lymphangioma of thoracic wall, 3/79 teratoma of the neck with mediastinal extension, 2/79 bronchial segmentary atresia, 2/79 pulmonary hypoplasia, 2/79 congenital high airway obstruction syndrome (CHAOS) and 1/79 hydrothorax.
Conclusion Ultrasonography is the method of choice for prenatal malformation screening, but foetal MRI is an useful diagnostic tool to identify and classify foetal thoracic abnormalities, because with its great field of view and excellent soft tissue contrast it allows good characterization of the pathology and a precise anatomical definition.

P64

Fetal brain imaging and pathological correlations

Anne Elodie Millischer Bellaiche[1], Catherine Fallet Bianco[2], Céline Falip[1], Valérie Merzoug[1], Gilles Grange[3], Catherine Adamsbaum[1]
1. St Vincent De Paul Hospital, Paris, France
2. Ste Anne Hospital, Paris, France
3. Cochin Hospital, Paris, France

Background Fetal brain MRI takes place after US if necessary and can lead to a termination of pregnancy (TOP) depending on the country.
Objective To highlight the benefits of correlations between prenatal imaging (US, MRI) and pathological findings.
Patients and methods Five fetal brain studies including US, MRI and pathological data were selected for their "messages".
Results
No. 1: MRI (32 GA) performed for a macrocephaly (US) disclosed a bilateral polymicrogyria histologically confirmed. Dysmorphic neurons were scattered in the parenchyma.
No. 2: MRI (22 GA, 6th chromosomal abnormality) disclosed posterior callosal agenesis associated with pontocerebellar hypoplasia and frontal polymicrogyria overlooked at US. Pathological data confirmed MR patterns.
No. 3: Large parasagittal tumour developed in the frontoparietal area (US, MRI). Its accurate location (intra or extra-ventricular) was uncertain. Neuropathological diagnosis was an immature teratoma. (32 GA)
No. 4: A right ventriculomegaly was depicted (28 GA) at US. MRI disclosed an atrophy of the right frontal lobe suggestive of an ischemic event. The neuropathological examination disclosed mainly hemorrhagic areas related to a coagulation disorder.
No. 5: MRI (23 GA) confirmed a large haematoma suspected at US and disclosed ischemic patterns of the surrounding parenchyma, neuropathologically confirmed. Familial thrombophilia was found.
No. 6: A posterior fossa abnormality was suspected at US (20 GA) in the context of Roaccutane (isotretinoin) exposure. The MRI (30 GA) diagnosed vermian agenesis without cyst; histologically confirmed.
Conclusion Imaging/pathological correlations help to improve the accuracy of prenatal diagnosis.

P65

Role of MRI in the diagnosis and characterization of fetal tumours

Leonor Alamo, *Tarek Laswed*, Pierre Schnyder, Francois Gudinchet
Centre Hospitaliere Universitaire Vaudois CHUV, Lausanne, Switzerland

Background The generalization of routine fetal US controls had led to an increase in the detection of congenital fetal anomalies, including fetal tumoural masses. Fetal tumours are a unique group of neoplasms with unique biologic behaviour. The extension of the mass as well as the determination of the organ of origin of the tumour are crucial factors to evaluate the prognosis and viability of the fetus. Fetal MRI appears as a diagnostic complementary method in these cases.
Objective To review the diagnostic accuracy of fetal MRI in the characterization of prenatal tumours detected in US.
Materials and methods We retrospectively reviewed all fetal MRI performed at our institution with suspicion of fetal tumours at the prenatal US. MRI reports were compared with US reports and with the final diagnosis, obtained by clinical reports, post-natal imaging methods and autopsy reports.
Results Between 01.01.00 and 13.12.07, 150 fetal MRI scans were obtained at our institution. In eight cases, indication for MRI was the suspicion of fetal tumours at prenatal US, including four tumours of head, two thoraco-cervical and three abdominal. MRI revealed the anatomic extension of the tumour and the organ of origin in all cases (100%). MRI characterized the lesions in six cases and provided additional information to US in three cases.
Conclusion The excellent anatomic detail provided by fetal MRI help to characterize the congenital tumours, to recognize the extension of the tumour and to limit the possible final diagnosis. This information may be useful to decide the therapeutic approach of the patient.

P66

Indirect signs for evaluation of gastroesophageal reflux in children

Mehrzad Mehdizadeh, Fallahi Gholamhosein, Shakiba, Saneian
Radiology Department, Children's Medical Centre, Tehran Medical University, Tehran, Iran

Background Gastroesophageal reflux (GER) is the most common reason infants are referred to the gastroenterologist. Although in many cases the diagnosis are based on history and physical examination, it is mandatory for atypical cases or nonresponder cases to confirm the diagnosis with further evaluation with Para clinical studies (such as upper gastrointestinal imaging series, esophagography, pHmetry, manometry and esophagogastroduodenoscopy) that are invasive. Regarding these points, the use of sonography as a noninvasive diagnostic tool could be of interest in these patients.
Objective This study is focused on the diagnostic efficacy of the sonography in diagnosis of this disease in a group of children involved in gastroesophageal reflux.
Patients and methods All children with symptoms and signs suggestive for gastroesophageal reflux that referred to the gastrointestinal

clinic of the children hospital were initially evaluated. Among these patients, all cases candidate for further studies with endoscopy and esophageal biopsy (with or without pHmetry) considered to enter the study. All these patients undergone a trans abdominal sonography of the gastroesophageal junction via liver window and seven parameter were assessed. These included esophageal diameter, esophageal wall thickness, esophageal mucosal thickness, hiatal diameter, subdiaphragmatic portion length, gastric wall thickness and presence of reflux. If the patient was proved to have GER in endoscopy and biopsy he or she entered the study. All patients proved to have systemic or metabolic diseases, gastrointestinal obstruction and gastritis and/or duodenitis were excluded from the study. At the end totally 57 patients were entered as the case group. For control group, we considered 46 patients (brother or sister of the cases) that referred to the outpatient clinic of the hospital for upper respiratory tract infections and didn't have any symptom or sign of GER. All of case and control groups entered the study after signing the written informed consent form. For the control group, we did a sonography with similar protocol with patients. All sonographies were done by a paediatric sonologist with the Aloka-SSD 170 pro machine with a linear 7.5-MHz probe (and if necessary a 3.5-MHz curved probe). For statistical analysis, we conducted the ROC curve for all the above mentioned parameters and assessed the area under the curve (AUC). For the best parameters among these parameters that was selected according to AUC, we selected the best cut off point for differentiation between cases and controls.

Results the mean age of the patients was 4.7±3.5 years old and for controls was a 5.2±3.9 year old (P=0.46). Sixty-five percent of the cases were male while 47% of the controls were male (P=0.065). The most common symptom or signs were seen in cases was vomiting in 41 cases (69.5%) and then loss of appetite in 38 cases (63.3%), iron deficiency anaemia in 35 cases (60.3%), weight loss and chronic cough in 30 cases (51.7%) and wheezing in 27 cases (45%). The mean esophageal diameter was 12.0±2.7 mm in cases and 10.1±2.4 mm in controls (P<0.0001). The mean esophageal wall thickness was 5.8±6.5 mm in cases and 4.0±1.3 mm in controls (P=0.05). The mean esophageal mucosal thickness was 2.8±1.2 mm in cases and 2.2±1.5 mm in controls (P=0.016). The mean hiatal diameter was 14.0±3.8 mm in cases and 12.0±3.5 mm in controls (P=0.010). The mean subdiaphragmatic esophageal portion length was 16.0±6.3 mm in cases and 22.2± 9.9 mm in controls (P<0.0001). The mean gastric wall thickness was 3.0±4.0 mm in cases and 2.9±4.6 mm in controls (P=0.87).

The AUC was 0.71 for the esophageal diameter [95% Confidence Interval (CI): 0.61–0.81, P<0.0001], 0.68 for esophageal wall thickness [95% CI: 0.58–0.78, P=0.002], 0.68 for esophageal mucosal thickness [95% CI: 0.57–0.78, P=0.002], 0.64 for hiatal diameter [95% CI: 0.53–0.75, P=0.015], 0.71 for subdiaphragmatic portion length [95% CI: 0.61–0.82, P<0.0001] and 0.63 for gastric wall thickness [95% CI: 0.52–0.74, P=0.025]. Choosing the cut off point of <=10 mm for the subdiaphragmatic esophageal portion length yielded a specificity of 93.5% and a positive predictive value of 70% for diagnosis of GER while choosing a cut of point of <=21 mm for this parameter yielded a sensitivity of 86% and specificity of 54%.

Conclusion Sonographic evaluation of the GEJ could be a useful and non invasive method in diagnosis of the GER in children. We found some indirect signs to estimate esophagitis and reflux in children.

P67

Correlation between blood HbA1C level and hepatic density evaluated by multidetector CT in children and adolescents with insulin-dependent diabetes mellitus

Shin-Lin Shih, Yu-Peng Liu, Yi-Shan Tsai, Yi-Fang Chen, Fei-Shih Yang
Mackay Memorial Hospital, Taipei, Taiwan

Objective To assess the correlation between blood HbA_1C level and hepatic density evaluated by multidetector CT (MDCT) in children and adolescents with insulin-dependent diabetes mellitus.

Materials and methods The institutional review board approved the study. The MDCT examination was performed on 42 diabetic patients (19 males, 23 females) aged 8–26 years after obtaining the written informed consent from the patients or their parents. A 16-slice CT scanner (Sensation 16, Siemens Medical System, Erlangen, Germany) was used with section thickness of 1 mm, beam pitch 1, and reconstruction interval of 0.7 mm. The selection of tube voltage and current followed the as low as reasonably achievable principle. We measured the hepatic density of a selected 1–1.5 cm^2 area in the right lobe of the liver in each patient. The HbA_1C data of the patients in last 3 years prior to CT examination were collected retrospectively.

Results The mean value of HbA_1C was 9.56±1.45% (normal 4–6%). The mean hepatic density was 65.66±5.82 HU. The hepatic density is significantly higher in the patients with higher blood HbA_1C level (β=0.37, P<0.05, hierarchical regression analysis).

Conclusion The hepatic density was higher in the patients with poorly controlled diabetes mellitus. Thus the changes in hepatic density may be a good indicator of long-term treatment response in diabetic patients.

P68

MR enterography compared to CT enterography in the evaluation of bowel disease in children and young adults

Lisa Raviv-Zilka[1,2], Michal Amitai[1,2]
1. Diagnostic Imaging Sheba Medical Centre, Tel Aviv, Israel
2. Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

Background The relatively high radiation exposure in CT enterography (CTE) constitutes a growing limitation when imaging the bowel in children and young adults.

Objective The purpose of our study was to compare the diagnostic ability and accuracy of MR-enterography (MRE) to CTE in the evaluation of children and young adults with bowel disease.

Materials and methods Between November 2005 and December 2007, 66 consecutive patients were referred for MRE. MRE without enteroclysis was performed on 1.5-T MR scanners. Manitol 5% (1,000 ml) was orally administered 60 min prior to the examination, followed by glucagon 1 mg and Gd-DTPA 0.1 mmol/kg IV. Fifteen CTE examinations performed within 6 months from the MRE examination were available for comparison in children and young adults (mean age 21 years, mean interval 1.75 months). Ten of the patients had known Crohn disease; three suffered from non specific abdominal pain, one patient had bowel wall vascular malformation and one celiac disease. CTE was

performed with oral Gastrografin and with injection of iodine IV. MRE findings were analyzed and compared with CTE examinations by two radiologists in consensus for wall thickening, bowel stenosis, and presence of abscess, phlegmon and fistula.
Results In comparison to CTE, MRE showed 14/14 (100%) wall thickening, 8/13 (61%) stenosis, 5/5 (100%) abscess, 4/6 (66%) phlegmon. Fistula was noted in six on MRE and three on CTE (50% more on MRE).
Conclusion Gadolinium enhanced MRE has similar diagnostic accuracy compared to CTE for the evaluation of wall thickening and luminal stenosis as well as for extraluminal complications. More fistulas were detected on MRE. Therefore we consider MRE a reliable modality for the evaluation of bowel disease in patients with chronic bowel disease necessitating recurrent imaging and in populations sensitive to radiation exposure.

P69

Small stomachs in small babies

Jonathan Albert Soye[1], Miriam Buckley[2], Louise Sweeney[1], Joanna Turner[3]
1. Royal Belfast Hospital for Sick Children, Belfast, UK
2. Belfast City Hospital, Belfast, UK
3. Ulster Hospital, Belfast, UK

Background Feeding difficulties are common in children. There are numerous potential causes, including structural abnormalities relating to the oropharynx, larynx, trachea, and oesophagus, and abnormalities of the neuromuscular control of swallowing. Radiological assessment in these cases can provide information on the anatomical structures involved, and an evaluation of the coordination of the swallowing process.
Materials and methods Two cases are described, in which the presentation was with feeding difficulties, and in which radiological assessment provided a diagnosis of microgastria in both, and allowed evaluation of other associated abnormalities.
Conclusions Congenital microgastria is a rare condition, resulting from impairment of normal foregut development. As the stomach is small, it fails to act physiologically as a reservoir, leading to oesophageal dilatation, gastro-oesophageal reflux, stricture formation, and aspiration pneumonia. The diagnosis of microgastria can be made with an upper gastro-intestinal contrast study, and imaging has a role in the evaluation of associated abnormalities and in the follow-up assessment of oesophagus and stomach.

P70

Malignant primary carcinoid of the common hepatic duct in a child: a case report

Csilla Balassy, Ernst Horcher, Marcus Hörmann
Medical University of Vienna, Vienna, Austria

Background Neuroendocrine tumours of the extrahepatic bile duct are extremely rare, with only three paediatric cases and a total of about 50 cases published in the literature.
Objective To report a rare case of a neuroendocrine tumour of the extrahepatic biliary tree in a child.
Materials and methods A 6-year-old girl presented with jaundice and pruritus with a history of 3 months. Serum bilirubin, cholesterol and liver enzymes were elevated. Ultrasound revealed a cystic dilatation of the common hepatic duct (CHD), elongated and dilated cystic duct (CD), intrahepatic cholangiectasis, and hydrops of the gall bladder. Subsequent MRI and MR-cholangiography confirmed the suspicion of a type I choledochal cyst and a conjunction of the CHD with the CD far distal to the normal site of the bifurcation, at the level of a pseudo-obstruction. Surgery was performed.
Results Intraoperative findings confirmed the diagnosis of hydrops of the gall bladder, elongated and dilated CD and the cystic dilatation of the CHD. The short common bile duct was normal. At the bifurcation the surgeon found a thickening and hardening of the wall of the CD. Histology revealed a locally invasive neuroendocrine tumour, leading to a second operation with extended resection and lymphadenectomy. There was no evidence of lymph node metastasis, or distant metastasis. The postoperative follow-up is unremarkable.
Conclusion This is the youngest patient so far with a carcinoid of the CHD, where surgery revealed a tumour in an anatomical variant of the extrahepatic bile system without radiological evidence of the tumour.

P71

Neonatal haemochromatosis: clinical, pathological and imaging features

David Scott[1], Maeve McPhillips[1], Peter Gillet[1], Margaret Evans[2], Kaseem Ajilogba[1]
1. Royal Hospital for Sick Children, Edinburgh, UK
2. Royal Infirmary of Edinburgh, Edinburgh, UK

Background Neonatal haemochromatosis is a rare cause of fulminant hepatic failure characterised by intrahepatic and extrahepatic deposition of iron with sparing of the reticuloendothelial system. It can be fatal; however, treatment with antioxidant medications prompted by characteristic imaging findings can be curative.
Objective To demonstrate the significant role of imaging in the early recognition and diagnosis of neonatal haemochromatosis.
Clinical features A 23-day-old girl presented with increasing abdominal distension and jaundice. Pregnancy was uneventful and delivery was normal. Physical examination highlighted jaundice, hepatosplenomegaly, ascites, and distended anterior abdominal wall veins. Antioxidant medications were commenced following imaging and biopsy. She is making satisfactory progress with decreasing bilirubin level, resolving ascites, improving weight gain and wellbeing. She is not on the liver transplant list.
Imaging Ultrasound showed a macro-nodular enlarged liver with irregular margin, splenomegaly, normal gall bladder, no biliary tract dilatation and marked ascites. Magnetic resonance imaging showed marked T2 low-signal intensity within the liver and pancreas in comparison to the spleen indicating hepatic and pancreatic iron deposition and confirmed the ultrasound findings.

Pathology Liver and lip biopsies demonstrate hepatocellular and acinar cellular siderosis with reticuloendothelial sparing confirming neonatal haemochromatosis.
Conclusion The specific paramagnetic effect of the presence of deposited iron in tissues, particularly on T2-weighted sequences, causing low signal intensity in the liver and pancreas with sparing of the spleen suggests the diagnosis of neonatal haemochromatosis. This feature can help in avoiding delay in diagnosis and commencement of potentially curative therapy.

P72

Pediatric appendix on high-resolution ultrasound; comparison of mural thickness with whole diameter between surgical and non-surgical appendices

Bo-Kyung Je, Seung Hwa Lee, Hwan-Hoon Chung, Ki Yeol Lee, Sang Hoon Cha
Korea University Hospital, Seoul, South Korea

Background For all ages, the diagnosis of acute appendicitis on ultrasound was mainly based on the size criteria of appendix with a whole diameter (WD) greater than 6 mm. However, some limitations of this criterion have lead to another criterion, the mural thickness (MT). Nevertheless, there was no specialized report for children concerning MT as well as WD.
Objective To compare MT and WD of appendix between the surgical appendix and non-surgical appendix.
To determine the cut-off value of MT as well as WD to diagnose acute appendicitis in children.
Materials and methods One hundred sixty-five children (male 83, female 82; mean age 7.93 years) underwent high-resolution abdominal ultrasound. They were prospectively followed and categorized two groups; 48 surgical appendices and 117 non-surgical appendices. Maximal MT in 134 appendices and maximal WD in 165 appendices were recorded and analyzed by *t* test and ROC analysis.
Results The statistical results of MT and WD of the two groups are demonstrated in Table 1. For the acute appendices, MT with highest accuracy is 2.20 mm (sensitivity 84.62%, specificity 95.79%) and WD with highest accuracy is 5.73 mm (sensitivity 89.58%, specificity 93.16%).

	Appendicitis	Non-surgical appendix	*P* value
MT			
No. of appendices	39	95	<0.001
Mean (95% CI)	1.58 mm (1.46~1.70 mm)	3.33 mm (3.00~3.66 mm)	
WD			
No. of appendices	48	117	<0.001
Mean (95% CI)	8.28 mm (7.59~8.96 mm)	3.87 mm (3.66~4.08 mm)	

Conclusion As well as WD, MT is significantly different between surgical and non-surgical appendix. The optimal diagnostic cut-off value of MT and WD in our study is 2.20 and 5.73 mm, respectively.

P73

Multifocal peliosis hepatis: diffusion-weighted MRI findings

Murat Kocaoglu[1], Nail Bulakbasi[1], Avni Atay[2], Cem Tayfun[1]
1. Department of Radiology, Gulhane Military Medical School, Ankara, Turkey
2. Department of Pediatric Haematology, Gulhane Military Medical School, Ankara, Turkey

Background and objective Peliosis hepatis is a rare benign entity, which is characterized by the presence of multiple blood-filled lacunar spaces within the liver. Peliosis hepatis can mimic other hepatic masses such as haemangioma, hepatocellular carcinoma, abscess, metastasis, adenoma and focal nodular hyperplasia. We present diffusion weighted MRI findings of a case with peliosis hepatis, which developed due to prolonged androgen therapy in a boy with Fanconi anaemia.
Materials and methods A 10-year-old boy with hepatomegaly was examined by MRI including diffusion weighted sequences. Diffusion weighted imaging was performed by using an axial, multislice, single-shot echo-planar spin-echo sequence with *b* values of 50, 400 and 800 s/mm^2. ADC map was calculated on pixel-by-pixel basis.
Results The lesions were slightly hyperintense both on T2- and T1-weighted images with mild homogeneous contrast enhancement. One of the lesions also showed fluid–fluid level on T2-weighted images. On diffusion-weighted sequences (with *b* values of 50, 400 and 800) and ADC map the lesions were hyperintense to liver. ADC values were high at the mass lesions (e.g., 160×10^{-3}/mm^2), compared with normal appearing liver (e.g., 121×10^{-3}/mm^2).
Conclusion Both fluid–fluid levels and increased diffusion on MR images were not reported previously and may help to differentiate peliosis hepatis from malignant lesions.

P74

Mesenchymal hamartoma of the liver: diffusion-weighted MRI findings

Murat Kocaoglu, Ýnanc Guvenc, Nail Bulakbasi, Cem Tayfun
Department of Radiology, Gulhane Military Medical School, Ankara, Turkey

Background Mesenchymal hamartoma of the liver is a rare benign tumour in children. Because of its various image characteristics, it frequently misdiagnosed as other masses.
Objective To describe MRI and diffusion-weighted MRI features in a child.
Materials and methods An 18-month-old boy with hepatomegaly was examined by MRI including diffusion-weighted sequences. Diffusion weighted imaging was performed by using an axial, multislice, single-shot echo-planar spin-echo sequence with *b* values of 50, 400 and 800 s/mm^2. ADC map was calculated on pixel-by-pixel basis.
Results The mass was hyperintense on T2- and hypointense on T1-weighted images with rim and septal enhancement. The lesion was hyperintense on diffusion weighted images with $b=0$ and 400 DWI and ADC map, whereas it was iso- to hypointense to liver on $b=800$ image. ADC values were high (e.g., 342×10^{-3}/mm^2), compared with the normal appearing liver (e.g., 109×10^{-3}/mm^2).

Conclusion DWI allows both qualitative and quantitative assessment of mesenchymal hamartoma to help differentiate it from malignant lesions.

P75

Radiation dose from paediatric pharyngeal videofluoroscopy

Julie Yarr[1], Lesley Grattan[2], Marjorie McClelland[1], Richard Wright[1]
1. Royal Belfast Hospital for Sick Children, Belfast, UK
2. Radiological Sciences and Imaging, Forster Green Hospital, Belfast, UK

Background Pharyngeal videofluoroscopy (PVF) is an X-ray screening technique used in the assessment of complex swallowing disorders. Little information is available on radiation doses to paediatric patients from this examination.
Objective To determine radiation dose from PVF in paediatric patients.
Materials and methods A commercially available software package (PCXMC) was used to calculate effective dose based on the dose area product (DAP) reading recorded during each examination for 65 paediatric patients, who underwent PVF assessment.
Results The mean effective dose calculated for all patients was 0.1 mSv (range 0.02–0.70 mSv). The results indicated no obvious trend in exposure factors or DAP with patient age. The DAP was shown to be approximately proportional to the screening time. The screening times (and hence DAP) for the examinations are determined by the severity of the condition affecting each patient and also the level of co-operation of individual patients throughout the examination. The paediatric PVF examination was shown to yield the same average effective dose as an AP radiograph of the paediatric abdomen.
Conclusion Based on this comparison, paediatric PVF may be regarded as a low dose procedure.

P76

Pictorial review of plain radiographic and contrast examination findings in neonatal bowel obstruction

David Rea[1], Eilish Twomey[2], Stephanie Ryan[2], Veronica Donoghue[2]
1. The Hospital for Sick Children, Toronto, ON, Canada
2. The Children's University Hospital, Temple Street, Dublin, Ireland

Background In contradistinction to adult radiology, it may be difficult to differentiate small bowel from colon in neonates due to the lack of well defined haustra and valvulae conniventes. Extra plain radiographs including decubitus views, prone or cross table laterals may be required. Contrast examinations are commonly required for low causes of intestinal obstruction.
Objective To describe the imaging appearances of bowel obstruction in the neonatal period.
Materials and methods The aetiology of neonatal bowel obstruction can broadly be divided into two broad groups. High lesions affecting the oesophagus, stomach duodenum and proximal small bowel and low lesions involving distal small bowel, colon and anus. Examples of the common high neonatal obstructions which will be demonstrated include midgut volvulus, duodenal atresia, duodenal web and annular pancreas. Common examples of low intestinal obstruction which will be illustrated include Hirschsprung disease, meconium plug syndrome, meconium ileus and anorectal malformations.
Conclusion The common imaging findings in neonatal bowel obstruction are illustrated with plain radiographs and contrast examinations using a simple classification system into high or low lesions on the basis of the anatomical site of obstruction.

P77

MDCT splenoportography and colour Doppler US in children with portal hypertension

Ibrahim Adaletli[1], Sebuh Kurugoglu[1], Gokce Yalcin Gulsen[1], Harun Ozer[1], Hakan Samsun[2], Gunduz Ogut[1], Osman Faruk Senyuz[2]
1. Department of Radiology, Cerrahpasa Medical Faculty, Istanbul University, Istanbul, Turkey
2. Department of Paediatric Surgery, Cerrahpasa Medical Faculty, Istanbul University, Istanbul, Turkey

Objective The objective of this study is to evaluate the combination of multidetector computed tomography (MDCT) splenoportography with colour Doppler US in children with portal hypertension.
Materials and methods Twenty-three patients with portal hypertension underwent two-phase contrast enhanced MDCT with 16 row-CT and colour Doppler US. The early and portal phases were started at 15 and 45 s, respectively, after intravenous non-ionic contrast material injection (1.5 ml/kg). The field of view covered from mid-thorax to pelvis. The raw data were processed in the work-station. Three dimensional MPR images were obtained. Splenoportography images were achieved through maximum intensity projection and volume rendering technique.
Results Splenomegaly (n=15), portal vein thrombosis (n=8), cavernous transformation (n=8), paraumbilical vein patency (n=3), splenic capsular collaterals (n=5), retroperitoneal collaterals (n=6) and ascites (n=2) were detected by both modalities. Colour Doppler US showed coarse echo texture of the liver in 15 cases, and increased calibre and peak velocity of the left renal vein in ten cases. MDCT demonstrated oesophageal and gastric varices in 14 cases, dilation of azygos vein in 11 cases, patent coronary vein in 11 cases, and splenorenal shunt in 13 cases.
Conclusion MDCT splenoportography and colour Doppler US is a valuable combination in the evaluation of portal hypertension in children. Liver echo texture and mapping of the vasculature in the abdomen and as well in the lower part of the thorax are readily achieved which is crucial in the decision of medical versus surgical therapy and follow-up.

P78

The role of sonography in the diagnosis of pancreatic head masses in children presenting with obstructive jaundice

Terry Humphrey, Helen Woodley
St. James's University Hospital, Leeds, UK

Background Pancreatic lesions are a rare cause of obstructive jaundice in children, and it is essential that the pancreatic head be examined

sonographically as it may harbour the lesion responsible for the patient's symptoms.
Objective To review the imaging findings (US, MRI, CT) in children presenting with obstructive jaundice caused by a pancreatic mass and define the role of initial sonography and follow up imaging in making the diagnosis.
Materials and methods The imaging and medical case notes of four children (2M, 2F) age 5 months to 12 years who presented with obstructive jaundice secondary to a pancreatic head mass were reviewed retrospectively.
Results The four cases comprised a pancreatic lymphoma, haemangioma, malignant vascular tumour and an inflammatory mass. Ultrasound performed at the time of presentation found a mass in the head of pancreas and dilated common and intra hepatic bile ducts in all cases. In two cases the pancreatic duct was dilated. The ultrasound findings were confirmed by MRI in three cases and CT in one. Ultrasound was unable to characterise any of the pancreatic lesions. The diagnosis in the inflammatory case was made by MRI, but the remaining three cases all required biopsy.
Conclusion Ultrasound plays an important role in the diagnosis of pancreatic head masses including the initial detection of biliary dilatation and the mass, focussing further imaging and guiding biopsy. However it is poor at characterising the lesions. MRI and CT can provide additional information but biopsy is often ultimately required to make the diagnosis.

P79

Rotation or malrotation: the use of metallic markers to reduce radiographic errors in diagnosing intestinal malrotation in children

Gerrit Dekker[1], *Savvas Andronikou*[1], Brand Louw[1,2]
1. University of Stellenbosch and Tygerberg Academic Hospital, South Africa
2. Private Radiologist, Bloemfontein, South Africa

Objective False positive diagnosis of intestinal malrotation is made in as much as 15% of cases, leading to unnecessary laparotomies. A less reported reason for this is radiographic rotation of the patient on the X-ray table when performing a contrast meal. The lack of anatomical landmarks in a well collimated study makes it very difficult to assess the patient's position. Metallic markers on the anterior abdominal wall are used in this study to assess this problem.
Materials and methods During the first leg of a prospective descriptive study vertically placed metal markers were attached to the anterior abdominal wall of 58 children presenting for routine contrast meals, mainly referred for reflux disease. The radiographic rotational status and its relationship with false features of intestinal malrotation were studied on the stored cine loops. The markers were not used to actively position the patient at this stage.
Results Ninety-eight percent of patients were rotated on the table at some stage during the AP part of the study. Forty-three percent of patients showed features of intestinal malrotation as a consequence.
Conclusion The use of metal markers demonstrates that patients are often rotated on the fluoroscopy table, giving rise to false features of intestinal malrotation. This may be avoided by the routine use of metallic markers. The second leg of the study is currently underway to investigate the use of markers to actively position the patient at the critical stage of recording the c-loop compared to patients positioned without the help of markers.

P80 WITHDRAWN

P81

MRI appearance of juvenile intestinal polyp: two cases

Sanna Toiviainen-Salo, Teija Kalajoki-Helmiö, Anna Föhr, Liisa Mäkinen, Kirsi Lauerma
Medical Imaging Centre, Hospital for Children and Adolescents, Helsinki University Hospital, Helsinki, Finland

Background Juvenile polyps are benign, usually small bowel lesions that are typically located in hepatic flexure or rectosigmoid colon. Patients, often under 10 years, may present with non-specific abdominal discomfort, intestinal bleeding or even intussusception, but the polyp can also be an incidental finding. We describe two patients with histopathologically verified juvenile intestinal polyps and their imaging findings.
Materials and methods First patient was a 4.5-year-old boy who was referred to the investigations because of daily abdominal pain during 3 months. US revealed a 3×2×2-cm well-defined heterogeneous vascular lesion that included microcysts. Malignant tumour could not be excluded and abdominal MRI was performed. The other patient was a 6-year-old boy who had respiratory infection and in clinical examination was suspected to have enlarged liver and spleen. Abdominal US with graded compression technique showed rounded heterogeneous vascular tumour (2×1.5×1.7 cm) with small cysts in the right lower abdominal quadrant, and slightly enlarged spleen. The patient was referred for abdominal MRI.
Results and conclusions MRI in both patients showed single well-defined round/oval expansions in the right colon, isointense on T1-W FS, and hyperintense in T2-W FS. Moderate peripheral enhancement with slight reticular enhancement pattern inside the polyp was seen. Juvenile intestinal polyp, though rare, should be kept in mind, even in asymptomatic patients. Despite imaging appearance suggestive of benign intestinal polyp, excision of the lesion by colonoscopy is both confirmatory diagnostic and therapeutic procedure.

P82

Cystic and solid spleen lesions in young patients: a pictorial review of MR and CT features

Manuela De Vivo, Gianluca Valeri, Giancarlo Fabrizzi, Andrea Giovagnoni
Ospedali Riuniti Di Ancona—Salesi Children's Hospital, Ancona, Italy

Background Focal lesions of the spleen are uncommon in childhood: most of them may appear to be cystic or with cystic spaces, many

others are solid or mostly solid nodules; their nature is complex, including epithelial cysts up to malignant tumours. Although malignant neoplasms of the spleen are rare in childhood, radiologists need to be aware of the various lesion features and patterns in order to recognise the masses and the pseudo masses witch often are found incidentally.

Materials and methods We describe the most common spleen lesions observed in children from 2 to 15 years old and seen on US, MRI and CT. Benign tumours that originate from vascular endothelium that include: haemangioma, hamartoma, lymphangioma, haemangiopericytoma. Non-vascular benign tumours that comprise inflammatory pseudotumour. Non-neoplastic lesions as abscesses, histiocytosis and Gaucher disease localizations. Malignant neoplasm as lymphoma and leukaemia.

Results We present a pictorial review of these various splenic abnormalities delineating their CT and MRI features.

Conclusion Spleen lesions are not so rare in children: they may present non-specific imaging findings with the exception of cysts and haemangioma characterized by a nodular and progressive fill-in appearance. Ultrasound is used as screening modality for the spleen with CT and MRI helpful for characterisation of lesions.

References

1. Kamaya A, Weinstein S, Desser TS (2006) Multiple lesions of the spleen: differential diagnosis of cystic and solid lesions. Semin Ultrasound CT MR 27:389–403

2. Goerg C, Schwerk WB, Goerg K et al (1990) Sonographic patterns of affected spleen in malignant lymphoma. J Clin Ultrasound 18:569–574

P83

Imaging features of malrotation

Shruti Moholkar, Fiona Dickinson
Leicester Royal Infirmary, Leicester, UK

Objective We present some unusual presentations of malrotation on an upper Gastrointestinal contrast examination and pitfalls we have encountered.

Imaging features of malrotation The classic feature of malrotation on an upper GI contrast examination is abnormal position of the duodenojejunal flexure. Other features include jejunum in the right upper quadrant or unusual duodenal redundancy. Normal variants like isolated finding of jejunum in the right upper quadrant, DJ flexure over the left pedicle but not completely to the left of the spine, proximal redundancy of the duodenum or duodenum inversum can mimic malrotation. Abnormal caecal position on a delayed film is present in 80% of patients with malrotation.

Conclusion An upper GI series remains the gold standard for diagnosis of malrotation. Various measures used to overcome the pitfalls and improve diagnostic accuracy include (a) aspiration of the stomach before starting the procedure to avoid displacing the DJ flexure by a distended stomach, (b) direct fluoroscopic observation of the first pass of barium through the duodenum (c) limiting the amount of barium used and (d) review AP and lateral views for duodenojejunal junction position. Delayed abdominal radiograph is useful to document caecal position if the diagnosis is in doubt. Knowledge about anatomic subtleties/normal variants is also important.

References

1. Long FR, Kramer SS, Markowitz RI et al (1996) Intestinal malrotation in children: tutorial on radiographic diagnosis in difficult cases. Radiology 198:775–780

2. Applegate KE, Anderson JM, Klatte EC (2006) Intestinal malrotation in children: a problem-solving approach to the upper gastrointestinal series. Radiographics 26:1485–1500

P84

Ultrasonography vs. pH monitoring in the diagnosis of gastroesophageal reflux in children

Cristina Cecamore, Alessandra Savino, Concettina Elio, Piernicola Pelliccia, Francesco Chiarelli
Department of Paediatrics, University of Chieti, Chieti, Italy

Background pH-metry is widely accepted as the most reliable investigation for detection of gastroesophageal reflux (GER); nonetheless gastroesophageal ultrasonography has recently been proposed as screening test for its low invasiveness and cost. Sonography also proved helpful in providing both functional and morphological data in addition to pH-metric results.

Objective To evaluate the accuracy of ultrasonography in the early diagnosis of GER, in term of specificity and sensitivity, comparing to 24-h pH-monitoring.

Materials and methods The study was performed on 54 children (mean age 5.6 month), admitted to the Department of Paediatric, University of Chieti, for symptoms suspicious for GER. Both sonographic evaluation and pH monitoring were performed. Pathological GER was classified as mild or severe on the basis of number and duration of refluxes at sonography and on the basis of Boix-Ochoa score at pH-metry. Data were examined by χ^2 testing.

Results When compared to pH-metry, ultrasonography showed a sensitivity of 93% and a specificity of 58% in the diagnosis of pathologic GER. In addition, sonography permitted to detect a hypertrophic pyloric stenosis in one child and a malignant hepatic lesion in another one.

Conclusion Ultrasonography is highly sensitive and easier to use than pH monitoring. It may be a useful non-invasive, non-ionising screening method for detection of morphological as well functional data in vomiting babies.

P85 WITHDRAWN

P86

Imaging findings in Johanson–Blizzard syndrome

David Rea, Peter Durie, Susan Blaser
The Hospital for Sick Children, Toronto, ON, Canada

Background Johanson–Blizzard syndrome (JBS) is a rare autosomal recessive multisystem disorder which is poorly documented in the radiology literature.
Objective To describe the spectrum of imaging findings in two unrelated cases of JBS.
Results Both cases had classic cranial imaging findings of nasal alar hypoplasia, malar hypoplasia and microcephaly. Petrous bone CT in both children who had sensorineural deafness showed incomplete partition type 1 (IP-1) morphology of the vestibulocochlear apparatus [1]. Review of the only other two cases of JBS where petrous CT findings are published also demonstrates IP-1 morphology [2].
In one case MRI demonstrated lack of olfactory gyri. Review of published brain autopsy data describes reduced brain volumes for this disorder. Spine imaging revealed near total absence of L1 vertebral body with intact posterior elements, gibbus deformity, tethered cord and fatty filum. No published spinal associations are known. One case showed delayed bone age and osteopenia secondary to hypothyroidism. This case also had midline scalp defects that are described for JBS. One case had a cloacal malformation and renal pelviectasis requiring surgical intervention.
Conclusion Investigation of JBS should include high resolution imaging of the petrous bone. Bone age evaluation is advised considering the association with hypothyroidism. Imaging of brain, spine, gastrointestinal and genitourinary systems should be on the basis of clinical requirements.
References
1. Sennaroglu L, Saatci I (2004) Unpartitioned versus incompletely partitioned cochleae: radiologic differentiation. Otol Neurotol 25:520–529
2. Braun J, Lerner A, Gershoni-Baruch R (1991) The temporal bone in the Johanson–Blizzard syndrome. Pediatr Radiol 21:580–583

P87

Sports-related abdominal injuries in children: imaging review
Nagabathula Ramesh, Nabil El Saeity
Midland Regional Hospital, Portlaoise, Ireland

Most sports are either contact sports, like rugby, boxing judo, or non-contact sports like tennis, swimming and cricket. Abdominal injuries occur less frequently than musculoskeletal injuries despite the fact that, even in contact sports, the abdomen is usually unprotected by special padding.
Abdominal injuries are frequently as a result of blunt force and vary from abdominal wall contusions to severe visceral injuries. Spleen is the most commonly injured organ and rupture spleen is one of the most frequent causes of death. Liver, kidney and bowel injuries occur infrequently. Early diagnosis and treatment is essential as most abdominal injuries present with vague signs and symptoms. Though the sports medicine physician may not always provide definitive treatment of many of these conditions, he or she should be familiar with the preferred diagnostic modalities and latest treatment options. This information is not only essential to appropriately participate in treatment decisions, but is also important in order to make return-to-play determinations. The pictorial review presents the various injuries and their imaging appearances.
Coaches, trainers and team physicians should be aware of the vague symptomatology of abdominal injuries to prevent morbidity and mortality.

P88

Testicular tumors in children and adolescents
Thomas Riebel, Siegfried David, Christian Kebelmann-Betzing, Dirk Schnabel
Charité-Universitätsmedizin, Berlin, Germany

Background Testicular tumors represent a rare entity of childhood and adolescence neoplasms.
Objective A survey on own clinical and sonographic observations is given, therefore.
Materials and methods From a time period of 16 years the clinical charts and sonograms of 13 consecutive patients (age range: 6 months to 16 years) were analyzed retrospectively.
Results The observed cases covered all the different histological entities of primary testicular tumours. Ten lesions were of benign dignity (teratoma: three, Leydig cell tumor: three, Sertoli cell tumor: two, epidermoid: one, hemangioma: one). Two lesions were malignant (choriocarcinoma, mixed germ cell tumour) and one semimalignant (yolk sac tumour). Additional testicular microlithiasis was found in two cases. Ultrasound did not miss any lesion and, together with the patient's clinical constellation (age, history, physical findings, serum tumour markers/hormone levels), allowed a correct preoperative estimation not only regarding its dignity, but also a rather distinct diagnosis in most of the observed cases. This was of great help for surgical planning as well as additional preoperative imaging in suspected malignant lesions.
Conclusion Still to date, ultrasound is the primary imaging method of choice in testicular tumours. Along with the other patient's clinical data, it enables a rather correct preoperative diagnosis in the vast majority of cases. It has to be pointed out, that even very small lesions may reflect a high malignant process. Finally, the coincidence of testicular microlithiasis and tumour must be emphasized again.

P89

Comparison of differential renal function using technetium-99m mercaptoacetyltriglycine (MAG3) and technetium-99m dimercaptosuccinic acid (DMSA) renography in a paediatric population
Gillian Ritchie[1], Alistair Graham Wilkinson[1], Robin J Prescott[2]
1. Royal Hospital for Sick Children, Edinburgh, UK
2. Medical Stats Unit, University of Edinburgh Medical School, Edinburgh, UK

Background To determine if there is a statistical difference in differential renal function (DRF) using 99mTc-DMSA and 99mTc-MAG3.
Objective We hypothesise there is no significant difference in DRF calculated from these tests and hope to use only 99mTc-MAG3 in some circumstances.

Materials and methods We retrospectively identified children imaged with 99mTc-DMSA and 99mTc-MAG3. We recorded DRF values, age, indication, and renal pelvis diameter. For 99mTc-DMSA we recorded imaging time after injection. For 99mTc-MAG3 we recorded delay between injection and data acquisition, diuretic use and evidence of delayed drainage or reflux.
Results We identified 100 episodes where children underwent both 99mTc-DMSA and 99mTc-MAG3 within a few days, the commonest indication was UTI or PUJO. Ninety-two children with mean age 6.96 years. A significant but clinically acceptable trend was seen between abnormal DRF and difference between tests. A significant link was found with the difference between tests and time of imaging post DMSA injection, and also with scarring. No significant effect was caused by renal pelvis dilatation, delayed drainage, furosemide, or delayed 99mTc-MAG3 imaging.
Conclusion If 99mTc-MAG3 has been performed, then 99mTc-DMSA is unnecessary, provided DRF is normal on 99mTc-MAG3 and there is no scarring. Change of practice will cause considerable savings in time, cost and radiation burden.

P90

Do kidney sizes on ultrasonography correlate with glomerular filtration rate in healthy children?

Atoosa Adibi, *Iman Adibi*
Isfahan University of Medical Sciences, Isfahan, Iran

Objective The objective of this study was to determine the correlation between ultrasonographic kidney sizes and glomerular filtration rate (GFR) in healthy children.
Materials and methods This was a cross-section study on 116 healthy children. Renal diseases were ruled out by a paediatric nephrologist. Ultra sonography of both kidneys was carried out by an experienced radiologist. The volume was calculated by ellipsoid formula. We defined net volume as kidney volume − sinus fat volume'. The sum of right and left kidney sizes was defined as total sizes. We calculated GFR by means of the Schwartz formula. Correlations between kidney sizes and GFR were studied with Pearson correlation coefficient.
Discussion The mean age of the children was 8.4+/−3.4. The GFR mean was 108+/−30 (ml/min per 1.73 m^2). GFR correlated to total renal volume (r=0.52, P<0.001), total net volume (r=0.53, P<0.001) and total kidney length (r=0.59, P<0.001). Ultrasonographic kidney sizes, especially the kidney length, correlate to GFR in healthy children. Kidney sizes assessment by ultrasonography may play a role in renal function evaluation in children.

P91

Renal changes in children and adolescents with insulin-dependent diabetes mellitus evaluated by multidetector CT: correlation with blood HbA1c level

Yi-Shan Tsai[1], Shin-Lin Shih[2], Kwok-Kuen Pang[1], Yu-Pen Liu[2], Yi-Fang Chen[2]
1. Mackay Memorial Hospital, Taitung Branch, Taipei, Taiwan
2. Mackay Memorial Hospital, Taipei Branch, Taipei, Taiwan

Objective To assess the correlation between blood HbA_1c level and renal changes evaluated by multidetector CT (MDCT) in children and adolescents with insulin-dependent diabetes mellitus.
Materials and methods The institutional review board approved the study. The MDCT examination was performed on 42 diabetic patients (19 males, 23 females) aged 8 to 26 years after obtaining the written informed consent from the patients or their parents. A 16-slice CT scanner (Sensation 16, Siemens Medial System, Erlangen, Germany) was used with section thickness of 1 mm, beam pitch1, and reconstruction interval of 0.7 mm. The selection of tube voltage and current followed the as low as reasonably achievable principle. We measured the density of selected 0.5–1 cm^2 area in middle portion of each kidney. The renal volume was calculated by CT volumetry technique. The HbA_1c data of the patients in last 3 years prior to CT examination were collected retrospectively.
Results The mean HbA_1c level and renal density was 9.56±1.45 and 34.97±2.50 HU, respectively, with positive correlation (β=0.44, P< 0.05, hierarchical regression analysis). The ratios of renal volume to body surface area (BSA) and body mass index (BMI) were 99.18± 17.55 and 7.04±1.45, respectively, and both were significantly higher in patients with higher blood HbA1c level (γ=0.36 and 0.34, respectively, both P<0.05, Pearson's correlation analysis).
Conclusions The renal density and ratios of renal volume to both BSA and BMI were higher in patients with poorly controlled diabetes mellitus. Thus these renal changes may be a good indicator of long-term treatment response in diabetic patients.

P92

MR urography in children: morphological study and differential renal function in uropathy

Brigitte Bourliere-Najean[1], Guillaume Gorincour[1], Gérard Morisson-Lacombe[2], Audrey Aschero[1], Hélène LeHors[3], Catherine Desvignes[1], Marie Paris[1], Philippe Devred[1], Jean Michel Guys[3], Philippe Petit[1]
1. Service d'Imagerie, CHU Timone Enfants, Marseille, France
2. Service de Chirurgie Pédiatrique, Hopital Saint Joseph, Marseille, France
3. Service de Chirurgie, CHU Timone Enfants, Marseille, France

Objective To assess the value of MR urography in the evaluation of uropathy in children.
Material and methods Ninety-one children, between age of 2 and 154 months (57 males and 34 females, mean age 40.5 months, median 5 months) were evaluated with MR urography. T2-weighted and contrast-enhanced T1-weighted MR sequences were obtained. Differential renal function was calculated.
Results Morphologic evaluation was of good quality, with diagnosis of ureteropelvic junction in 50 cases, ureterovesical junction in 11 cases and duplex kidneys in 17 cases. Dynamic MR urography was helpful to assess the grade of obstruction and allowed a semi-quantitative determination of renal function. Results were compared to scintigraphy in 46 cases (Tc99m-MAG3 in 38 cases).
Conclusion MR urography, with morphological and functional studies may assist in treatment of children with uropathy.

References
1. Avni F, Bali MA, Regnault M (2002) MR urography in children, Eur J Radiol 43:154–166
2. Rohrschneider W, Haufe S, Wiesel M et al (2002) Functional and morphologic evaluation of congenital urinary tract dilatation by using combined static–dynamic MR urography: findings in kidneys with a single collecting system. Radiology 224: 683–694
3. Ozcan Z, Anderson PJ, Gordon I (2002) Assessment of regional kidney function may provide new clinical understanding and assist in treatment of children with prenatal hydronephrosis. J Urol 168:2153–2157

P93

Sonography of paediatric ovarian pathology: a pictorial essay

Elizabeth Dillon, Romney Pope
Chelsea and Westminster Hospital, London, UK

Background Paediatric ovarian abnormalities may be found in infants and prepubertal and adolescent girls. They may be identified incidentally or during investigation for symptoms such as pain or endocrine dysfunction.
Objective To review the sonographic appearance and significance of ovarian abnormalities in the infant, child and adolescent.
Content
1) Simple cysts
2) Complex cysts
3) Solid masses
4) Complications of cystic and solid masses
Teaching points Ovarian abnormalities can present in several ways in the paediatric population. It is important that radiologists are able to distinguish normal from abnormal ovaries, understand the significance of a lesion producing endocrine dysfunction, and identify ovarian pathology as a cause for pelvic pain. Sonographic findings can significantly influence subsequent management of ovarian pathology in infants, children and adolescents.
Conclusion Ovarian abnormalities have the potential for significant morbidity and it is therefore crucial to identify sonographically abnormal ovaries in the paediatric population.

P94

Urolithiasis in paediatric age: our experience in diagnosis and treatment

Domenico Noviello[1], Salvatore Angelone[2], Carmine Bianco[2], Francesco Esposito[1], Patrizia Oresta[1], Maria Luisa Valentino[1], Antonietta Cavallera[3]
1. Radiology, Santobono Children's Hospital, Naples, Italy
2. Pediatric Urology, Santobono Children's Hospital, Naples, Italy
3. Radiology, Mauro Scarlato Hospital, Scafati (Salerno), Italy

Objective Urolithiasis (UL) is rare in paediatric age, with low incidence in western countries and with no significant difference in incidence between sexes. It is connected to different causes: metabolic disorders, urinary tract infections (UTI), malformative uropathies (MU), chronic gastroenteropathies, excessive immobilization. No precise guidelines are indicated in children, even though extracorporeal shockwave lithotripsy (ESWL) or percutaneous nephrolithotomy (PCNL) and ureterorenoscopy (URS/URL) are also used in paediatric field. We present our experience about diagnosis and treatment in pathologic lithiasis.
Materials and methods From 2002 to 2006, 75 patients (45 M–30 F/ aged 1–16) diagnosed with lithiasis, showing renal colic (52 patients), UTI (13), recurrent pains (11), haematuria (nine), urination disorders (four), were studied (ultrasonography, XR, urography, cystography) and treated; in 11 patients UL was occasional finding. Laboratory studies were performed to define possible dysmetabolic causes (75%).
Results Calculi were found in renal (44 patients), ureteral (28), vesical (three) site. In 37 patients crystalluria was found as well as hyperechogenic spots at ultrasonography; the remaining 38 patients were treated with ESWL (20 patients), PCNL (one), URS/URL (ten) and open surgery (seven). In six patients pyelo-ureteral-vesical "double J" stent was positioned; all patients were recommended potassium citrate support, correct diet and fluid intake.
Conclusions In paediatric age UL is more frequently caused by metabolic disorders. Technological progresses in ESWL and instrument miniaturization allow the achievement of good results even in paediatric age with minimum hospitalization.

P95

Evolution of hydronephrosis of pyeloureteral junction diagnosed in neonatal age: our experience

Domenico Noviello[1], Salvatore Angelone[2], Francesco Esposito[1], Carmine Bianco[2], Patrizia Oresta[1], Antonietta Cavallera[3], Maria Luisa Valentino[1]
1. Radiology, Santobono Children's Hospital, Naples, Italy
2. Pediatric Urology, Santobono Children's Hospital, Naples, Italy
3. Radiology, Mauro Scarlato Hospital, Scafati (Salerno), Italy

Objective Hydronephrosis (HN) owing to pathology of pyeloureteral junction (PUJ), the most frequent neonatal malformative uropathy (MU), is caused by obstructions or dysfunction (immaturity) of PUJ with possible spontaneous regression. We present our experience in the diagnosis of HN owing to PUJ pathology by correlating dilation degree and renal function to prognosis and therapy.
Materials and methods Since 2006, following Society For Fetal Urology criteria based on the presence of pyelectasis associated or not with caliectasis and involvement of renal parenchyma (C/M index), we have been studying, using ultrasonography, 75 patients with HN diagnosis in neonatal age (95 Renal Units, RUs). VCUG was performed on patients with bilateral HN, MAG3 nephroscintigraphy with diuretic test to assess renal functionality and washout pattern with appropriate timing according to HN severity.
Results Fifty-one 1° and 2° pyelectasis cases, out of 95 concerned RUs (75 unilateral and 22 bilateral HNs), had spontaneous resolutions in the first year of life. Twenty-seven out of the remaining 34 RUs were of 3° and seven of 4°: Dilation was solved in 15 out of 27 cases, it improved in eight and worsened in four, the latter surgically treated in the first year of

life. The 4° dilations underwent percutaneous nephrostomy and following pyeloureteral plastic surgery in the first 3 months of life.
Conclusion Sixty-nine percent of cases had spontaneous resolution; in remaining 31%, dilation stabilization and increase led to surgical correction. The importance of early diagnosis is confirmed in assessing which patients need follow-up and which need surgical approach.

P96

Herlyn–Werner–Wunderlich syndrome with thin glomerular basement membrane disease in the contralateral kidney. Follow-up sonographic
CT and MR findings: a case report

Noh Hyuck Park, Mi Sung Kim, Jeong A Ryu, Chan Sup Park
Myongji Hospital, Kwandong University, College of Medicine, Gyeonggi, South Korea

Uterine didelphys with obstructed hemivagina and ipsilateral renal agenesis is a rare entity, sometimes referred to as Herlyn–Werner–Wunderlich (HWW) syndrome. It usually presents after menarche with progressive pelvic pain and a palpable mass due to hemihematocolpos. When the absence of a kidney is found in a premenarchal child, the small size and the tubular shape of the uterus make it almost impossible to evaluate uterine anomalies, so follow-up study should be performed until the end of puberty.
We report a case of HWW syndrome that is detected at the premenarchal stage in a patient with biopsy proven thin glomerular basement membrane disease of contralateral kidney, focusing on follow up study of sonographic, CT and MR findings.

P97

Echogenic kidneys on ultrasound: a pictorial review

Angela Byrne, Douglas Jamieson
BC Children's Hospital, Vancouver, BC, Canada

Background Echogenic kidneys are a relatively common finding in children referred for sonographic imaging. This poster illustrates the differential diagnosis for echogenic renal parenchyma.
Materials and methods We retrospectively reviewed the imaging of patients who had been referred for renal ultrasound and found to have echogenic kidneys. We then sought additional features which might help distinguish these conditions, in particular the use of high resolution linear probes to better evaluate cystic changes and corticomedullary differentiation.
Results Echogenic kidneys are a feature of diverse conditions such as Autosomal recessive polycystic kidney disease, congenital nephrotic syndrome, Zellweger syndrome, Jeune syndrome, medical renal disease, posterior urethral valves and pyelonephritis. All of these are described in this exhibit. In addition, with high resolution ultrasound, accurate determination of cystic changes may be determined.
Conclusion This poster illustrates the many diseases and syndromes associated with the ultrasound appearance of echogenic kidneys and emphasises the value of high resolution linear probe use.

P98

Torsion of a benign tunica vaginalis cyst in an infant

Daphne Katsimba, *Agapi Christopoulou,* Mary Arvaniti, Ilias Torounidis, Christoulos Kaitartzis
General Hospital of Thessaloniki, Thessaloniki, Greece

Background Cysts arising from the tunica vaginalis testis are extremely rare.
Materials and methods We describe a case of torsion of a benign cyst originating from the parietal layer of tunica vaginalis in an 11-month-old infant, who presented with acute scrotal manifestations.
Discussion Ultrasonography (U/S) revealed a cystic mass in the left hemiscrotum, in contact with the medial surface of the testis, oedematous scrotal wall and hydrocoele. Colour Doppler U/S revealed increased blood flow of the testis and tunica vaginalis without evidence of blood flow in the cyst's wall. Following surgical excision, pathology revealed a benign tunica vaginalis cyst.

P99

Herlyn–Werner–Wunderlich syndrome (uterus didelphys, obstructed hemivagina and ipsilateral renal agenesis): experience with a possible cause of pelvic pain in pubertal girls. Sonographic and MR imaging in 13 cases

Cinzia Orazi[1], Maria Chiara Lucchetti[2], Paolo Maria S. Schingo[1], Paola Marchetti[1], Fabio Ferro[2]
1. Diagnostic Imaging Department, Bambino Gesù Pediatric Hospital, Rome, Italy
2. Andrologic & Gynecologic Surgery, Bambino Gesù Pediatric Hospital, Rome, Italy

Background Herlyn–Werner–Wunderlich syndrome (HWW) is characterized by uterus didelphys with obstructed hemivagina and ipsilateral renal agenesis. Increasing pelvic pain occurring after menarche is the usual presenting symptom, associated to palpable pelvic mass.
Objective We highlight the imaging diagnostic clues in this rare condition.
Materials and methods We report US and MR imaging in 13 adolescents with HWW, who came to our observation in the period 2000–2007.
Results Sonography mostly allowed the correct diagnosis, by demonstrating uterovaginal duplication, dilated structures (haematocolpos/haematometros/haematometrocolpos, sometimes even haematosalpinx), periadnexal or peritoneal collections, and absence of the ipsilateral kidney. MRI provided more precise anatomical details as to the uterine morphology, the continuity with each vaginal channel (obstructed/non-obstructed), the aspect and size of the involved fallopian tube. The bloody nature of the contents could be assessed on the basis of the signal behaviour.
Conclusion The diagnosis of HWW is generally made only if the suspicion is raised. Early diagnosis in the pubertal period can allow the necessary surgical therapy (excision/marsupialization of the vaginal

septum, removal of the obstructed/abnormal structures) to relieve pain and prevent further complications, due to prolonged cryptomenorrhea in the obstructed system, such as endometriosis. Because of the coexistence of genital and urinary anomalies due to the close interrelationship during embryogenesis of the Müllerian and Wolffian ducts, as to an earlier diagnosis, it would be advisable to search an obstructed and/or abnormal Müllerian system, whenever a multicystic dysplastic kidney or the absence of a kidney is discovered in a fetus, or girl postnatally.

P100

Oxalosis in primary hyperoxaluria in infancy: report of a case in a 3-month-old baby with renal US and skeletal X-ray follow-up for 3 years

Cinzia Orazi[1], Stefano Picca[2], Fausto Maria Fassari[1], Paolo Maria S. Schingo[1]
1. Diagnostic Imaging Department, Bambino Gesù Pediatric Hospital, Rome, Italy
2. Division of Pediatric Nephrology, Bambino Gesù Pediatric Hospital, Rome, Italy

Background and objective Primary hyperoxaluria is a rare autosomal recessive metabolic disorder due to deficiency of hepatic alanine-glyoxylate-aminotransferase (AGT), resulting in excessive synthesis and urinary excretion of oxalate, and deposition of calcium oxalate in the kidney, bone, myocardium and vessels (systemic oxalosis—SO). Nephrocalcinosis leading to renal failure and bone involvement commonly occur.
Materials and methods We report renal and skeletal changes in a 3-month old girl with SO, treated with haemodialysis from 4 to 36 months of age, until combined liver–kidney transplantation.
Results The diagnosis was suspected on the basis of intense cortico-medullary hyperechogenicity and increased homogeneous radio-opacity of normal sized kidneys. With time kidneys decreased in volume and became more hyperechoic. Skeletal survey showed osteopenia and characteristic metaphyseal transverse dense bands in long bones, presumably caused by oxalate precipitation where cartilage normally calcifies, progressively migrating towards the diaphysis. Multiple pathologic, slowly healing fractures of the limbs occurred at the dense band level. A radio-opaque rim was then observed in flat bones, epiphyseal nuclei and vertebral bodies. Severe hyperparathyroidism developed at 16 months of age. Blurred trabecular pattern, subperiosteal erosions and eventually woolly Pagetoid pattern developed, the spectrum of skeletal changes being related to multiple factors influencing bone metabolism, including crystal deposition in the marrowspaces, granulomatous reaction and renal osteodystrophy. Secondary hyperparathyroidism successfully responded to Ca-mimetic treatment and bone density increased.
Conclusion SO is rarely observed and no reports on infants treated with haemodialysis for more than 2 years are available. Radiology is one of the few biological markers of oxalate accumulation available at this age.

P101

Torsion of inguinal testes: ultrasound findings

Daphne Katsimba, *Christodoulos Kaitartzis*, Ilias Torounidis, Mary Arvaniti, Agapi Christopoulou, Ekaterini Papazisi
General Hospital of Thessaloniki, Thessaloniki, Greece

Background Torsion of an undescended testis is a rare entity with sporadic descriptions, mainly concerning clinical and surgical aspects.
Objective To describe gray-scale and Doppler U/S findings in seven cases of torsed inguinal testes.
Materials and methods We retrospectively reviewed testicular grey-scale and colour and/or power Doppler US sonograms performed in seven boys aged from 3.5 months to 16 years between 2000 and 2007 with surgically confirmed torsion of inguinal testis. All patients presented with a palpable groin mass and a history of ipsilateral cryptorchidism.
Results Undescended inguinal testes were identified in all seven cases. Testicular echo texture was normal in three cases, hypoechoic in two and inhomogeneous in two. Surrounding fluid was noticed in four cases. Colour and/or power Doppler US revealed absence of blood flow in six testes and decreased blood flow in one. Twisted spermatic cord was revealed in three cases.
Conclusions Grey-scale combined with colour and/or power Doppler US is the modality of choice for the diagnosis of inguinal testicular torsion. In cases of normal appearing testes, further exploration of the inguinal canal and identification of a twisted spermatic cord is of high importance.

P102

Cystic trophoblastic tumour: a rare entity in paediatric patients

Shardan Radmanesh, Vesna Kriss, Joseph Pulliam
University of Kentucky Medical Center, Lexington, KY, USA

Background Cystic trophoblastic tumours are a rare form of germ cell tumour with only a few paediatric case reports found in the literature. It is important to distinguish these tumours from other germ cell tumours as they are aggressive and carry a poor prognosis if widely disseminated.
Materials and methods We describe a case report of a 16 year old male who presented with a recurrent retroperitoneal mass following chemotherapy for a previously diagnosed mixed yolk sac germ cell tumour. On physical exam the patient had gynaecomastia and inguinal lymphadenopathy. Lab tests revealed an extremely elevated β-HCG level. MRI of the abdomen demonstrated gynaecomastia as well as a cystic mass involving the retroperitoneum, mediastinum, and hilar area of the chest. A biopsy was preformed which showed syntrophoblastic like cells which, coupled with the elevated β-HCG level, was consistent with trophoblastic tumour.
Discussion Trophoblastic tumours are the rarest of germ cell tumours which are composed of trophoblastic cells such as syncitiotrophoblastic, cytotrophoblastic, and intermediate trophoblastic cells. These cells, being the normal constituents of the placenta, are usually hormonally

active producing, most notably β-HCG. The disease is most prevalent during the third decade of life. Radiographically, these tumours can present as cystic lesions with metastases to the lung, liver, gastrointestinal tract, and brain. The primary tumour and metastases are often hemorrhagic. Elevated levels of human β-HCG and gynaecomastia are sometimes present.
Conclusions Cystic trophoblastic disease should be considered in patients with previously treated germ cell tumours who present with new cystic lesions in imaging.

P103

Sonographic appearance of bilateral abdominoscrotal hydrocele: case report and literature review

Marina Vakaki, Andreas Simopoulos, Eugenia Dagiakidi, Rodanthi Sfakiotaki, Michael Leodis, Anastasia Protopappa, Ilias Karnezis, Chris Koumanidou
P & A Kyriakou Children's Hospital, Athens, Greece

Background Abdominoscrotal hydrocoele is a rare congenital clinical entity. To the best of our knowledge, less than 100 cases have been reported in the literature, and only few of them were bilateral.
Objective To present the sonographic findings of abdominoscrotal hydrocoele, to emphasize the role of sonography in the diagnosis of this uncommon entity, to discuss its embryology and finally, to review the English literature.
Materials and methods A 4-month-old boy presented with bilateral inguinal and scrotal swelling since birth. Sonographic examination of the inguinoscrotal region was performed as an initial diagnostic approach of this clinical problem.
Results Two huge hydrocoeles extending in a hourglass fashion from each hemiscrotum to each side of the abdominal cavity were revealed. Their superior contour was demonstrated adjacent to the lower pole of each kidney. No further imaging investigation was needed. Abdominoscrotal hydrocoeles were surgically corrected. The differential diagnosis and the embryology of this rare condition is presented.
Conclusion Sonography represents the imaging method of choice for the accurate diagnosis of abdominoscrotal hydrocoele. The sonographic appearance is quite impressive. Awareness of the Pediatric Radiologist and knowledge of the embryology and regional anatomy are the prerequisites for the correct diagnosis and avoidance of further unnecessary imaging work-up.

P104

Renal insufficiency in neonates: the role of high-resolution sonography

Marina Vakaki, Eugenia Dagiakidi, Michael Leodis, Andreas Simopoulos, Panagiotis Zodiatis, Niki Lama, Maria Paulou, Chris Koumanidou
P & A Kyriakou Children's Hospital, Athens, Greece

Background A variety of congenital and acquired renal diseases can cause renal insufficiency in the neonatal period. Because of its advantages, mainly portability and non-invasiveness, sonography is the primary imaging method performed for renal evaluation in neonates.
Objective To present the role of high-resolution sonography in the diagnostic approach of renal insufficiency in neonates.
Material and methods The renal sonograms of 1,750 neonates were retrospectively evaluated. High definition modern equipments with high frequency transducers were used. Doppler sonography was performed when needed. The renal size, cortical and medullary echogenicity and echo structure, preservation or loss of corticomedullary differentiation, the presence of cortical/medullary cysts and their dimensions, the presence of hydronephrosis and its characterization were sonographically evaluated.
Results In 102 neonates the sonographic examination demonstrated increased parenchymal echogenicity (renal parenchymal diseases, cortical necrosis). In 41 neonates the presence of cystic disease was sonographically revealed (glomerulocystic, autosomal recessive polycystic renal disease, multicystic dysplastic kidney, cystic renal dysplasia). Fifty-nine cases of obstructive uropathy (ureteropelvic junction obstruction, posterior urethral valves) were sonographically detected. Nineteen cases of renal infection were identified, including 12 cases of renal candidiasis. Finally, 18 cases of renal agenesis were detected.
Conclusion Sonography with the use of high-definition transducers represents the imaging method of choice in the sensitive neonatal period, providing important information about the cause of renal insufficiency. It allows the characterization of underlying pathologic conditions and precise description of renal architecture in the majority of cases. These parameters aid in the establishment of an accurate diagnosis or narrow differential diagnosis.

P105

Multicystic dysplastic kidney: the wide range of sonographic appearances and associated congenital urogenital abnormalities

Marina Vakaki[1], Anna Hountala[1], Eugenia Dagiakidi[1], Sofia Voidila[1], Rodanthi Sfakiotaki[1], Anastasia Protopappa[1], Ilias Karnezis[1], Andreas Simopoulos[1], George Pitsoulakis[2], Chris Koumanidou[1]
1. P & A Kyriakou Children's Hospital, Athens, Greece
2. Agia Sofia Children's Hospital, Athens, Greece

Background Multicystic dysplastic kidney (MCDK) represents a rare, nonhereditary developmental anomaly. Nowadays, with the wide availability of sonographic equipments, it is discovered either antenatally or in infancy as a palpable mass or as an incidental sonographic finding.
Objective To present the whole spectrum of sonographic appearances of MCDK as well as to highlight the various associated congenital urogenital abnormalities.
Materials and methods During a 7-year period 28 children, age 3 days to 11 years, with MCDK were sonographically examined.
Results The abdominal sonographic examination demonstrated in the renal fossa: Multiple cysts of varying size and shape, non-communicat-

ing, randomly distributed, no identifiable renal pelvis and absent or dysplastic renal tissue (n=20), or a solitary cystic mass (n=3), or small peripheral cysts surrounding a large central cyst (hydronephrotic form) (n=1), or one of the above appearances in the upper pole of a duplicated kidney (segmental MCDK) (n=4). Associated ipsilateral genital malformations included: uterus didelphys (one girl), uterus didelphys with hydrocolpos ipsilateral to MCDK (one girl) and Müllerian duct remnant (two boys). Associated contralateral renal abnormalities that were sonographically detected were: ureteropelvic junction obstruction (n=2), a duplicated kidney (n=3), and findings suggestive of vesicoureteral reflux, that was established by voiding cystourethrography (n=6).

Conclusion Awareness of the various sonographic appearances of MCDK is significant. Moreover, familiarity of paediatric radiologists with the associated congenital urogenital malformations, is of outmost importance for the correct sonographic diagnosis and demonstration of the whole spectrum of abnormalities.

P106

Sonography of infantile Tamm–Horsfall proteinuria

Richard Jackson, Vesna Martich Kriss
University of Kentucky, Lexington, KY, USA

Background Uromodulin (Tamm–Horsfall protein) was first purified from urine samples of healthy individuals in 1950 by Drs. Tamm and Horsfall. Since its discovery, Tamm–Horsfall proteinuria has been linked to multiple tubular renal nephropathies. In the neonate, however, Tamm–Horsfall proteinuria is a common phenomena often related to post-natal dehydration.

Results We will present an exhibit on infantile Tamm–Horsfall proteinuria and its various sonographic and clinical manifestations. The subsequent precipitation of Tamm–Horsfall proteins in the neonatal renal collecting system is sonographically visible, manifesting as increased echogenic foci within the central portions of the renal pyramids. Mild and self-limiting, neonatal Tamm–Horsfall proteinuria rarely is clinically significant. However, neonatal acute tubular necrosis (ATN) can occur with extensive echogenic foci filling the medullary pyramids, sometimes with concomitant hydronephrosis as seen on ultrasound. Urine output may precipitously drop. However, clinical reassurance is the order as these infants (once rehydrated) often rapidly resolve the Tamm–Horsfall proteinuria, both clinically and sonographically.

Although considered an exclusively neonatal phenomena seen in the first week or two of life, Tamm–Horsfall proteinuria can rarely be seen in older infants. We present two cases of infants greater than 1 month of age who had classic sonographic and clinical picture of neonatal Tamm–Horsfall proteinuria.

Conclusions Tamm–Horsfall proteinuria is a common neonatal phenomenon that is easily evaluated by ultrasound, both at diagnosis and the expected resolution. Recognition of the classic sonographic findings of Tamm–Horsfall proteinuria can reassure the clinician of the excellent long-term prognosis.

P107

Cystic dysplasia of the testis: two cases and a new association with seminal vesicle dilatation

Edward Hannon, Rosemary Arthur, Mark Powis
Leeds General Infirmary, Leeds, UK

Background Cystic dysplasia of the testis (CDT) is an uncommon congenital abnormality of the testis characterised by the presence of numerous cystic lesions within the rete testis. Most documented cases are associated with renal abnormalities. We present two cases of CDT and a new association.

Case 1: A 21-month-old with ultrasound diagnosed multicystic dysplastic left kidney presented with swelling of the ipsilateral testis. Ultra sound scan (USS) showed multiple small cysts in the testis with a rim of normal tissue. In the presence of normal tumour markers and concurrent renal disease the diagnosis of CDT was made and the patient treated conservatively.

Case 2: A 6-year-old boy presented with testicular swelling. USS revealed multiple small cysts in testis and an absent ipsilateral kidney. It also demonstrated a new association of dilatation of the seminal vesicle. The patient was asymptomatic, tumour markers were normal and the patient was treated conservatively as CDT.

Conclusion CDT is a rare benign condition. The presence of cystic testis with ipsilateral renal disease and normal tumour markers has been used as the diagnostic criterion. We present a new association of dilatation of the seminal vesicle which also be treated conservatively if asymptomatic. This finding supports the idea that CDT and its associated anomalies are the result of a global error in mesonephric development.

P108

Inflammatory pseudotumours of urinary tract in childhood

Manuela De Vivo[1], Vittoria Galeazzi[1], Ascanio Martino[1], Alessio Violo[2], Cinzia Mincarelli[2], Andrea Quagliarini[2], Giancarlo Fabrizzi[1]
1. Ospedali Riuniti Di Ancona—Children Hospital Salesi, Ancona, Italy
2. Universita Politecnica Delle Marche, Ancona, Italy

Background Inflammatory pseudo tumours are semineoplastic lesions consisting of inflammatory and myofibroblastic cells. They may follow minor trauma, surgery or infections, sometimes they may be associated with other neoplasms or immune–autoimmune mechanism. The urinary tract involvement is rare in children, generally with an innocuous course.

Objective Since the first observation they have been described by many different names because of their complexity and variable histological characteristics. As they mimic malignant tumors the radiologist should be familiar with this entity and with the differential diagnosis of soft-tissue neoplasms.

Materials and methods Between June 2005 and September2007 four patients, 8–13 years old, underwent US, MR and/or CT examinations: two of these had dysuria, two non specific symptoms; everyone had a different clinical history and laboratory data.

Results We found two cases of cystitis—in one it had involved the near omentum with thickness increase, a kidney and an adrenal gland mass. After fine-needle biopsy the treatment was the surgical resection for the masses, high-dose steroids with or without chemotherapeutic agents for the cystitis.
Conclusion Inflammatory pseudo tumours may occur in nearly every site in the body with a biological potential highly variable: spontaneous remissions, but also local recurrences and malignant developing have been described. They may be misdiagnosed as rhabdomyosarcoma and other malignancies or, in the other hand, underestimated. The knowledge of this entity is necessary for the choice of treatment.
Reference
Dehner LP (2000) The enigmatic inflammatory pseudotumours: the current state of our understanding, or misunderstanding. J Pathol 192:277–279

P109

Radiologic implantation of subcutaneous venous chest ports in paediatric oncology patients
Sureyya Soyupak, Erol Akgul, Erol Aksungur
Cukurova University, Adana, Turkey

Objective We aimed to analyse retrospectively the outcomes of subcutaneously implanted venous chest ports under fluoroscopic and sonographic guidance in paediatric oncologic patients in radiology department.
Methods and materials Sixty-two paediatric oncologic patients (28 male and 34 female) who underwent venous chest ports placement between 2004–2006 were included in the study. Ages ranged between 7 months and 13 years (mean age: 5.3 years). Procedures were performed by interventional radiologist under IV sedation and local anaesthesia. All ports had single lumen. Port catheter was inserted into the right internal jugular vein in 60 (96.8%), left internal jugular vein in one (1.6%) and right subclavian vein in one (1.6%) patient under sonographic guidance. Catheter tips were placed between brachiocephalic vein and cavoatrial junction under fluoroscopic control. All ports were embedded into a pocket on the chest wall near the clavicle. Indication of port placement was chemotherapy in all patients. Wide-spectrum antibiotic was given to all patients for 7–10 days. Ports were Polysite (Perouse Laboratoires, Ivry-Le-Temple, France) in 57 (92.0%), PAS Port Elite (SIMS Deltec, St Paul, MN, USA) in four (6.4%) and B. Braun Celcite (Melsungen, Germany) in one (1.6%) patients.
Results Technical success was 100%. Total catheter time was 13,292 days (mean 422) and ranged between 9 and 865 days. Nine (14.5%) patients died while ports were still being used. In the follow-up period complications were encountered in six (9.7%) patients. In two patients, ports were extracted because of infection (9th day and 4th month). In another patient, incision of port pocket was resewn because of separation. In two patients, needles could not be inserted into ports because port base was turned upside-down. In these patients ports were rotated to normal position manually. In one patient port malfunction because of catheter thrombosis was relieved with TPA.
Conclusion In paediatric oncologic patients, implantation of subcutaneous venous chest ports preferably should be placed under imaging guidance by an experienced interventional radiologist because of higher technical success and lower complication rates.

P110

Incidence of catheter-related infection associated with peripherally inserted central catheters (PICC) in children: a prospective study
Josee Dubois[1], Francoise Rypens[1], Laurent Garel[1], Jacques Lacroix[2], France Gauvin[2], John Podoba[3]
1. Department of Medical Imaging, Ste-Justine Mother-Child Hospital, Montreal, QC, Canada
2. Intensive Care Unit, Ste-Justine Mother-Child Hospital, Montreal, QC, Canada
3. Consultant in Biostatistics

Objective (1) To determine the incidence of positive culture catheter associated with PICC in children. (2) To characterize the risk factors of catheter infections with PICC.
Materials and methods We conducted a prospective study of consecutive children referred to the department of radiology of a tertiary care academic hospital for PICC insertion. Inclusion criteria were: patients age 0–18 years, weight >2.5 kg, arm location of the PICC. All catheters were removed in the angiography room after careful disinfection of the arm. All catheter distal tips were sent for culture.
Results The study population available for analysis included a total 214 children (101 females, 113 males) with insertion of PICC and adequate follow-up protocol [1]. Sixteen patients had a positive catheter culture (16/214; 7%). In the univariate analysis no significant association was found with fibrin ($P<0.29$), vein thrombosis [1]. ($P<0.37$), infectious disease at presentation ($P<0.42$) and other variables.
Conclusions (1) The incidence rates of PICC-related infection found in this study is low. (2) Most of the catheter infections were unsuspected. (3) The management of febrile paediatric patients with PICC in place (namely the withdrawal of the catheter) should be addressed in the light of this 7% infection rate.
1. Dubois J, Rypens F, Garel L et al (2007) Incidence of deep vein thrombosis related to peripherally inserted central catheters in children and adolescents. CMAJ 177:1185–1190

P111

Pediatric C-spine injury: how to image?
Alexia Egloff, Dorothy Bulas, Gilbert Vezina, Nadja Kadom
Children's National Medical Center, George Washington University School of Medicine, Washington, DC, USA

Background Radiographic evaluation of paediatric cervical spine trauma varies significantly, raising the concern for unnecessary radiation.
Objective Improve the imaging evaluation for cervical spine trauma of paediatric patients.
Materials and methods Retrospective evaluation using previously described NEXUS criteria [1] and Canadian C-spine Rule [2] in a cohort

of paediatric cervical trauma patients over 8 months, referred by the emergency department of our primary paediatric trauma centre for cervical spine imaging.
Results Four hundred forty-seven patients were included in the study. Retrospective correlation of NEXUS criteria with imaging/clinical outcome showed that 5% of patients fell into a low risk category, requiring no imaging, with a sensitivity of 100%; 54% had high risk for injury; and 41% had insufficient documentation to categorize. Only five out of 447 patients had all the Canadian C-spine Rule criteria documented.
Conclusion
1. Significant lack of documentation in the ER department is a current problem.
2. If the NEXUS criteria was used systematically, the amount of studies would have decreased, decreasing the radiation exposure of this population.
3. Larger multi-centre studies are needed to further evaluate the use of these criteria, already proven beneficial in adults, in a paediatric population.
References
1. Viccellio P, Simon H, Pressman BD et al (2001) A prospective multicenter study of cervical spine injury in children. Pediatrics 108:e20
2. Stiell IG, Wells GA, Vandemheen KL et al (2001) The Canadian C-Spine rule for radiography in alert and stable trauma patients. JAMA 286:1841–1848

P112

Preliminary study on MRI diffusion imaging in Perthes disease
Laura Merlini, Vincenzo De Rosa, Cecile Delhumeau, Mehrak Anooshiravani, Sylviane Hanquinet
Geneva University Hospital, Geneva, Switzerland

Objective To compare MRI gadolinium-enhanced and diffusion imaging in Perthes disease to assess which of the two MRI techniques better correlates with the final clinical results (Stulberg scale).
Materials and methods Ten male children with suspected Perthes disease underwent MRI at the time of presentation with the following protocol: coronal T2 and STIR, coronal echo planar DWI, coronal Gd-enhanced dynamic T1 spin-echo, followed by enhanced sagittal T1 planes.
Enhancement pattern of the femoral head, diffusion changes of the latter as well as diffusion imaging findings of the proximal femoral metaphysis were scored. The non ischemic contralateral hip was the control in each child. Kappa (K) coefficient was used to evaluate the concordance between MRI data to clinical outcome evaluated by the Stulberg scale on conventional radiographs (1 and 2: good; 3, 4, 5: poor outcome) at least 6 months after the first examination.
Results Eight patients had good and two patients poor outcome. K coefficient for lateral column enhancement (P=0.7134), and for diffusion changes on the epiphysis (P=0.1692) showed no significant correlation to the prognosis while that of the metaphysis was significant (P=0.0434). Hyperintensity on diffusion of the metaphysis was shown in the two cases with poor outcome and in one case with good outcome.
Conclusion diffusion imaging of the proximal metaphysis seems to be a predictor of poor clinical outcome. This prognostic sign deserves to be further investigated.
Reference
1. Menezes NM, Connolly SA, Shapiro F et al (2007) Early ischemia in growing piglet skeleton: MR diffusion and perfusion imaging. Radiology 242:129–136

P113

Sonographic and MRI findings in four cases of acute pyomyositis in pediatric age
Giovanni Pieroni, Vittoria Galeazzi, Valeria Bolli, Cecilia Lanza, Emanuela De Vivo, Miriam Pasqualini
Azienda Ospedaliera Universitaria Umberto I°, Ancona, Italy

Objective To describe the US and MRI findings of pyomyositis in children.
Materials and methods We identified four cases of primary and secondary pyomyositis (mean age 9.4 years) involving muscular structures of the pelvic region. They were observed during the period March 2006 to November 2007.There were three cases with single-site localization and one case with multisite localization. Included criteria were: a history of acute hip pain or multisite muscular pain, fever, and a history of repeated trauma. All patients were submitted to US and low-field MRI (0.2 T) in an open system.
Results Sonographic findings: muscular structures become thicker, with oedema between the fibres with the possibility to evolve in abscess formation. MRI findings: abnormal muscle signal that appear hyperintense in T2-weighted sequences with increase of thick of adipose tissue; joint effusion; the wall of the abscess could present a low hyperintense signal in T1-weighted sequences. Local regional diffusion of septic focus involving adjacent bone tissue and marrow can be observed in late phases.
Conclusion Pyomyositis is a subtle and late pathology with low incidence in our area. It can be particularly suspected in young athletes with a history of repeated trauma. The role of integrated imaging (US and MRI) is important to establish the diagnosis of pyomyositis and to evaluate its evolution.

P114

Primary pyomyositis in children: a diagnostic challenge
Anna Tietze, Laurence J. Abernethy
Royal Liverpool Children's NHS Trust, Alder Hey, Liverpool, UK

Background Primary pyomyositis is an acute bacterial infection of skeletal muscles which most often involves the large pelvic muscle groups. The usual causative organism is *Staphylococcus aureus*; strains positive for Panton–Valentine Leukocidin cause particularly severe infection. Primary pyomyositis is more common in tropical regions but also occurs in temperate countries.

Objective To illustrate the imaging appearances of children with primary pyomyositis.
Materials and methods Retrospective review of seven cases of primary pyomyositis in children.
Age range: 6 months to 15 years. four were male and three female.
Results Plain radiographs (five patients): normal: two; non-specific soft-tissue swelling: two; scoliosis: one.
Ultrasound (six patients): normal: three; trace of peritoneal fluid: one; swollen soft tissues over the iliac crest: one; hip joint effusion with diffuse swelling of the surrounding soft tissues: one.
Radionuclide bone scan (four patients): normal: one; slightly increased pelvic uptake: three.
CT (one patient): soft tissue swelling around the left obturator internus muscle.
MRI (seven patients): all showed intense muscle oedema; in five cases the obturator internus muscle was involved.
Conclusion Primary pyomyositis is an uncommon but serious disease. Diagnosis may be difficult, particularly if investigation is directed towards osteomyelitis or septic arthritis, as plain radiographs, ultrasound and radio-isotope bone scans are usually non-contributory. MRI is the best modality, demonstrating intense oedema in the affected muscles; there is a particular predilection for the obturator internus muscle.

P115 WITHDRAWN

P116

A pictorial review of childhood haemophiliac arthropathy

Kaseem Ajilogba[1], Michael Ditchfield[2]
1. Royal Hospital for Sick Children, Edinburgh, UK
2. Royal Children's Hospital, Melbourne, VIC, Australia

Background Haemophilia is an X-linked disorder due to a deficiency of factor VIII or IX. The hallmarks are recurrent, spontaneous joint and muscle bleeds leading to disabling arthropathy that can be avoided by prophylactic treatment on the identification of synovial hypertrophy by imaging.
Objective The aim was to review the radiological investigations performed and findings in haemophiliac arthropathy, in a tertiary paediatric centre.
Materials and methods A retrospective review of haemophiliac patients imaged between January 1991 and December 2005 was done. The radiology was analyzed, the frequency of radiography was compared with disease severity and, findings on radiographs and MRI obtained within 4 weeks were compared. Findings are based on the Arnold–Hilgartner (A–H) radiographic scale and Denver MRI scoring scheme.
Results Sixty-three patients (aged 3 months to 18.5 years, mean 8.4 years) were imaged, 77.8% (49/63) plain radiography, 11.1% (7/63) each, CT and ultrasonography. Forty-nine patients had radiography—4% (2/49), 14% (7/49), and 82% (40/49) had mild, moderate and severe disease. The frequency of imaging increases with disease severity. Forty-three percent (21/49) of those who had radiography had MRI—67% (14/21) had both examinations within 4 weeks, of which 7% (1/14) with A–H stage 0 and 43% (6/14) with stage ≥3, had synovial hypertrophy; however, 50% (7/14) stage ≥3 had no synovial hypertrophy, on MRI.
Conclusion Plain film, CT and MRI are important tools in the investigation of haemophiliac arthropathy. MRI is the most useful in identifying synovial hypertrophy leading to early prophylactic treatment.

P117

Diagnostic imaging of benign osteolytic lesions in childhood

Cecilia Lanza, Valeria Bolli, Vittoria Galeazzi, Giovanni Pieroni, Giancarlo Fabrizzi
Azienda Ospedaliero-Universitaria Ospedali Riuniti, Ancona, Italy

Background The differentiation of benign from malignant osteolytic lesions often poses difficulty due to overlap in diagnostic imaging characteristics between malignant and non-malignant lesions.
Objective To investigate the imaging, with regard to CT and MRI features, of osteolytic lesions in childhood.
Materials and methods We retrospectively reviewed 25 patients' records (14 girls and 11 boys; mean age 6.2 years) with uncertain osteolytic lesions on conventional radiography. They performed in eight cases CT, in 22 cases MRI while five patients underwent both. In all patients the surgical and histopathological results were known.
Results Histopathological results demonstrated: nine simple bone cysts, four aneurismal bone cysts (ABC), two chondromas, five fibrous dysplasia, two osteoid osteoma, three osteomyelitis. The benignancy of skeletal lytic lesions was correctly assessed with MR imaging in 71% of the cases. Correlation with plain radiography was extremely important, resulting in correct assessment of 89% of the skeletal lesions particularly for fibrous dysplasia and ABC. CT was useful for defining cortical bone destruction, calcifications, endosteal/periosteal reaction and the assessment of the osteoid osteoma nidus. The combined interpretation of CT and MR images did not significantly improve accuracy.
Conclusions MR and CT imaging features combined with plain radiographic findings, the age of the patient, and other relevant clinical information allow the radiologist to categorize many lesions as benign or malignant.
References
1. Tehranzadeh J, Mnaymneh W, Ghavam C et al (1989) Comparison of CT and MR imaging in musculoskeletal neoplasms. J Comput Assist Tomogr 13:466–472
2. Ma LD, Frassica FJ, Scott WW Jr et al (1995) Differentiation of benign and malignant musculoskeletal tumors: potential pitfalls with MR imaging. Radiographics 15:349–366

P118

Peripheral bone status in children with asthma evaluated by digital X-ray radiogrammetry

Hans-Joachim Mentzel[1], Jochen Mainz[2], Matthias Waginger[1], James F. Beck[2], Werner A. Kaiser[1]

1. Institute of Diagnostic and Interventional Radiology, University of Jena, Jena, Germany
2. Department of Pediatrics, University of Jena, Jena, Germany

Objective Loss of bone mass is a known possible complication in children with asthma. We evaluated the applicability of digital X-ray radiogrammetry (DXR), which estimates cortical bone mineral density (DXR-BMD) for quantification of cortical demineralisation in children with asthma.
Methods and materials Seventeen children (9 F, 8 M; mean age 11.3 years) underwent DXR measurements for calculation of DXR-BMD and metacarpal index (DXR-MCI) using the Pronosco X-posure system (V.2, Sectra Pronosco A/S, Vedbaek, Denmark) on the base of radiographs of the non-dominant left hand. The results were compared to a regional age and gender matched reference data base and correlated to asthma severity and use of inhaled corticosteroids.
Results DXR-BMD was between 0.34 and 0.57 g/cm^2 (median 0.41; SD 0.06) in asthmatic children compared to a range from 0.39 to 0.59 g/cm^2 (median 0.41; SD 0.06) in the reference population. DXR-MCI was between 0.27 and 0.58 in asthmatics compared to a range from 0.33 to 0.46 in controls. The *Z*-scores for DXR-BMD were reduced for more than −1 SD in four asthmatics (23.5%) and the *Z*-score for DXR-MCI was reduced in six patients (35.3%). The correlation between DXR-BMD and the dose of inhaled glucocorticoids for at least 6 months and asthma severity was significant ($P<0.05$).
Conclusion Digital X-ray radiogrammetry performed on radiograms on the non-dominant left hand may be sensitive to assess osteopenia in children with asthma.

P119

Precision control and seasonal variations in quantitative ultrasound of calcaneus, tibia and radius

Hans-Joachim Mentzel, Ralf Reusch, Matthias Waginger, Eric Lopatta, Werner A. Kaiser
Institute of Diagnostic and Interventional Radiology, University of Jena, Jena, Germany

Objective To assess the dependence of quantitative ultrasound (QUS) indices speed of sound (SOS) and broadband ultrasound attenuation (BUA) at different sites on temperature and season we measured these indices monthly, from January to July 2006.
Materials and methods Ten healthy volunteers were included. QUS was performed on calcaneus (Sahara, Hologic), on tibia and on radius (Omnisense 7000P, Sunlight) at four consecutive times after the start, at 0, 20, 40, and 60 min from the start in an examination room. The room temperature was kept constant. Skin temperature was monitored. BUA and SOS were evaluated.
Results There was a significant inverse association between the skin temperature at the calcaneus and SOS at the beginning of the measurements ($R=-0.47$; $P<0.01$); at 60 min correlation was $R=-0.21$ ($P<0.01$). There was no significant correlation between temperature and SOS at the radius ($R=0.17$) and tibia ($R=0.09$). Standard deviation of the parameters BUA and SOS in repeated measurements at the same time was higher on cold days than on warm days.
Conclusion SOS depends inversely on the skin temperature. QUS should measure after 60 min of rest in the examination room. There was no significant seasonal variation in the QUS indices. But, the variation was higher in colder days. The precision was best at the calcaneus.

P120

Quantification of peripheral bone mineral density in children after bone marrow transplantation

Alexander Pfeil[1], Bernd Gruhn[2], Carsten Hädrich[1], Karim Kentouche[2], James F. Beck[2], Hans-Joachim Mentzel[1]
1. Institute of Diagnostic and Interventional Radiology, University of Jena, Jena, Germany
2. Department of Paediatrics, University of Jena, Jena, Germany

Objective Bone loss is a common complication following bone marrow transplantation (BMT) in children and adults caused by the aggressive therapy and immobilisation. The aim of this study was to quantify the loss of peripheral bone mineral density in children after BMT by using Digital X-ray radiogrammetry (DXR) and to compare the data with a local reference cohort.
Materials and methods Thirty-nine children after BMT (19 girls, 20 boys; mean age 12.1 years) underwent an evaluation of Bone mineral Density (BMD) and Metacarpal Index (MCI) by DXR (Pronosco X-posure System V.2, Sectra, Sweden) using digital performed radiographs. The results were compared with a local reference database.
Results DXR-BMD ranged between 0.32–0.64 g/cm^2 in BMT children and between 0.39–0.62 g/cm^2 in healthy children; DXR-MCI (BMT: 0.26–0.58; Reference cohort: 0.34–0.49). The *Z*-Score was reduced with 35.9% (*Z*-Score <−1 SD) and 25.6% (*Z*-Score: 0 to −1SD). Furthermore, the BMT children revealed a mean *Z*-Score of −0.5 SD.
Conclusion DXR seems to be an innovative method for the quantification of peripheral bone loss in children and adolescents after bone marrow transplantation. Further prospective studies are necessary to verify the longitudinal course of bone mineral density in children with bone marrow transplantation.

P121

Primary giant psoas abscess extending to the inguinal canal in a child: US, CT and MR findings

Yasar Bükte, E. Mine Basaran, Asur Uyar, Aslan Bilici
Radiology Department, Faculty of Medicine, Dicle University, Diyarbakir, Turkey

Objective Primary psoas abscess is an uncommon disease [1]. In children, clinical manifestations are often nonspecific leading to diagnostic delay. The presenting signs and symptoms may mimic the frequently seen entities, acute appendicitis and acute hip arthritis [1, 2]. Lower abdominal and inguinal pain, fever, limp, and increased white count are the commonest clinical features. Accurate differential diagnosis is necessary to avoid unnecessary surgery due to a wrong diagnosis [1, 3,].

Case report A 10-year-old girl was admitted to our hospital with the problems of persistent fever, abdominal distension and right hip pain and limp. On physical examination, tenderness on the right abdomen and flexion of the right hip with limitation of the range of motion was noted. Tenderness over the right inguinal area was also elicited. On radiological examinations, ultrasonography showed a smooth large hypoechogenic mass within massive internal echoes in the right retroperitoneal space, it was located between the right kidney and inguinal canal. The CT and MR findings of a giant abscess in the psoas, which extended to the inguinal canal, are reported. The abscess size was 24×12×10 cm. After ultrasound-guided percutaneous drainage and antibiotics therapy, she was discharged 2 weeks later with good condition. Imaging was helpful in revealing the abnormality, in demonstrating its extension and in determining its nature.

Conclusion When a psoas abscess has been diagnosed, surgery and drainage are indicated. One of the preferred approaches is percutaneous drainage under imaging guidance. Convalescence is usually rapid and without late sequelae [1, 3, 4].

References

1. Bresee JS, Edwards MS (1990) Psoas abscess in children. Pediatr Infect Dis J 9:201–206
2. Malhorta R, Singh KD, Bhan S et al (1992) Primary pyogenic abscess of the psoas muscle. J Bone Joint Surg 74:278–228
3. Edgar KA, Schlesinger AE, Royster RM et al (1993) Ilio-psoas abscess in neonates. Pediatr Radiol 23:51–52
4. Lucas AP, Carneiro R, Viegas M et al (1996) Ilio-psoas abscess in the neonate. Eur J Pediatr Surg 7:186–187

P122

Post-traumatic metacarpal synostosis with direct radiography and CT findings

E. Mine Basaran, Yasar Bükte, Asur Uyar, Rojbin Ceylan
Radiology Department, Faculty of Medicine, Dicle University, Diyarbakir, Turkey

Objective Metacarpal synostosis is recognized as a rare congenital anomaly and it usually affects the ring and little fingers and it doesn't seem to be one clinical entity and various aetiologies have been proposed [1]. We aim to present post-traumatic metacarpal synostosis case with the literature.

Case report A 4-year-old boy sustained a crush injury to his right dominant hand caused by the fall of a heavy stone about 2.5 years previously. His right hand had become swollen in the last 5 months. On physical examination there was an immobile painless hard swelling on his right hand volar face between the 2nd and 3rd metacarpals and mild flexion contracture on his right 2nd phalanx. The remainder of the examination was normal. Radiographs and CT showed midshaft fusion between the middle and ring finger metacarpals and callus formation on the first metacarpal. We observed the child approximately for 1 year and not a growth retardation or severe functional limitation has been confirmed.

Conclusion Metacarpal synostosis is a rare congenital anomaly in which fusion occurs at the proximal end of the metacarpals, unlike in our case example a midshaft fusion was determined. Post-traumatic metacarpal synostosis is previously unrecognized; indeed, complications following metacarpal fractures in children are rare, including malrotation, soft-tissue interposition and non-union. Although any significant functional limitation perceived by the patient may warrant referral to a hand surgeon for consideration of surgical correction [1, 2]. Because of this, our case will be watched closely with radiographies in further consultations.

References

1. Buck Gramcko D, Wood VE (1993) The treatment of metacarpal synostosis. J Hand Surg (Am) 18:565–581
2. Horii E, Miura T, Nakamura R et al (1998) Surgical treatment of congenital metacarpal synostosis of the ring and little fingers. J Hand Surg (Br) 23:691–694

P123

Intramuscular echinococcal cyst on the right abdominal wall

Yasar Bükte[1], E. Mine Basaran[1], Adnan Ceviz[2], Aslan Bilici[1]
1. Radiology Department, Faculty of Medicine, Dicle University, Diyarbakir, Turkey
2. Neurosurgery Department, Faculty of Medicine, Dicle University, Diyarbakir, Turkey

Objective The disease caused by *Echinococcus granulosus* is mostly seen in liver [1]. Although the parasite eggs in systemic circulation theoretically may settle anywhere in body, settlement on abdominal wall is extremely rare [2]. In this article we present an intramuscular echinococcal cysts' ultrasonography and 3D images with the use of 64-row multidetector computed tomography (MDCT). We also present radiological images after conventional radiological treatment.

Case report A 10-year-old girl was admitted to our hospital with abdominal pain. Abdominal ultrasound was performed three cysts at right lobe of the liver, one cyst at left lobe of the liver and one intramuscular cystic mass with a diameter of 3.5×2.5×2 cm at right abdominal wall. All cysts had smooth border, thick wall and anechoic. A 64-row multislice computed tomography was performed same cysts in liver and homogeneous cystic mass which had a smooth border, in right internal– external oblique muscle at right abdominal wall. MDCT scan of the thorax was performed a cyst at posterior segment of the lower lobe of the right lung. We made surgery to the lung cyst and percutaneous drainage to the intramuscular cyst.

Conclusion Hydatid disease is an endemic infestation in Mediterranean countries like Turkey. It is most frequently located in the liver and lungs and is occasionally found in other organs [3]. We should be kept in mind echinococcal cyst when we find cyst in different localization of body.

References

1. Saidi F (1976) Surgery of hydatid disease. WB Saunders, Philadelphia, pp 31–32
2. Garcia-Alvarez F, Torcal J, Salinas JC et al (2002) Musculoskeletal hydatid disease: a report of 13 cases. Acta Orthop Scand 73:227–231
3. Çöl C, Çöl M, Lafçi H (2003) Unusual localizations of hydatid disease, Acta Medica Austriaca 30:61–64

P124

Multicentric infantile myofibromatosis in a newborn: a case report

Marzia Mortilla[1], Maria Anna Buccoliero[2], Massimo Basile[1], Monica Antonello[1], Claudio Fonda[1]
1. Pediatric Radiology, Meyer Children's Hospital, Florence, Italy
2. Histopathology, Meyer Children's Hospital, Florence, Italy

Case report We report a case of a newborn (34GW, 3,440 g) who underwent surgical intervention for the presence of three vegetative masses of the mitral valve when she was 1 month old. She came to our Department at the age of 4 months to perform a brain MRI because of an occipital scalp mass. Brain and neck MRI was performed with a 1.5-T scanner (Philips, Eclipse). We detected an occipital scalp mass with a diameter of about 2 cm embracing the skull and meninges with extension towards brain parenchyma. At C5–C7 level in the right paravertebral space other two lesions were detected with mass effect on adjacent muscles and ring enhancement. She underwent neurosurgery for the occipital mass. Histopathology performed on a cutaneous–subcutaneous fragment containing a 7 mm dermal lesion and on a bony fragment with an exophytic lesion of about 18 mm, showed spindle-shaped cells arranged in bundles and fascicles and interspersed in a collagenous stroma. The cells showed eosinophilic cytoplasm and elongated nuclei. Multinucleated cells were detected in the bony lesion. Immunohistochemistry was positive for vimentin and smooth muscle actin. She was followed to the age of 10 months.
Conclusion We described a case of multicentric infantile myofibromatosis in a newborn presenting with cardiac masses and head and neck masses. Few cases have been previously described in the literature and MRI is the method of choice to detect and monitor the masses that these patients present.

P125

Accuracy of skeletal age assessment with Greulich–Pyle method applied to 2,280 children from three different countries

Kathia Chaumoitre[1], Saloua Lamtali[2], Nathalie Colavolpe[1], Abdelatif Baali[2], Gilles Boetsch[3], Olivier Dutour[3], Michel Panuel[1]
1. Hôpital Nord—CHU, Marseille, France
2. Laboratoire d'Ecologie Humaine, Marrakech, Morocco
3. Laboratoire d'Anthropologie Biologique UMR CNRS 6578, Marseille, France

Background The radiological atlas of Greulich and Pyle published in 1959 is still widely used to assess skeletal age.
Objective To assess the accuracy of Greulich–Pyle (GP) method applied to a contemporary population for bone age (BA) determination.
Material and methods Hand-wrist radiographs of 1,372 French children (range 0.4–19.7 years, mean 9.7), 263 Canadian children (range 0–19 years, mean 10.6) and 645 Moroccan children (range 6.6–21 years, mean 14.1 years) were analysed using GP method. All patients had known chronological age (CA) and no chronic disease.
Results Good interobserver and intraobserver reproducibility with this quick method. High correlation BA/CA for the French and the Canadian samples (r>0.93), better than for the Moroccan sample (r=0.77). Age determination was good for the French and the Canadian samples and there was a maturation delay in Moroccan sample especially in boys (about 1 year). Important individual variability (SD 1–1.3 years).
Conclusion GP method is still reliable applied to a contemporary population. The use of this method in a forensic way must deal with individual variability and the bone age estimation must be expressed by a range of values.

P126

Sports injuries associated with rugby in school children

Nagabathula Ramesh, Nabil El Saeity
Midland Regional Hospital, Portlaoise, Ireland

Objective The aim of this poster is to present the various injuries associated with rugby in school children.
Results Rugby is amongst the favourite sports in children attending school. The most common circumstances of injury are when a player is tackled by another player. Often young adults and school children have inadequate protection while playing the games. The injuries range from simple bruising and abrasions to severe dislocations and multiple system traumas. Upper extremity trauma tends to be more common in hurling, while lower extremity fractures are more common with rugby. Orbital and facial are common in both types of sports. The poster aims to present the various fractures and the imaging features.
Conclusion Rugby sport injuries are common and these injuries can pose a challenge to the emergency department physicians and radiologists. Adequate protection should be mandatory to minimize serious injuries.

P127

Pictorial essay: non-traumatic lesions of the tarsals and metatarsals in children

Nagabathula Ramesh, Nabil El Saiety
Midland Regional Hospital, Portlaoise, Ireland

Background Non-traumatic lesions of the tarsals and metatarsals are not uncommon. Various entities including congenital, developmental, infective, benign and malignant tumours involve the tarsals and metatarsals.
Results These entities that will be discussed include, tarsal coalition, osteochondritis dissecans, Kohler's, Sever's and Frieberg's disease, infective pathology including tuberculosis; benign and malignant tumours. We will also be presenting a rare case of giant cell tumour involving the metatarsal.
Conclusion Conventional radiography is the most common imaging modality and in most instances the only radiology investigation required for diagnosis. However, there is an increasing trend to use CT and MRI for further evaluation. Careful analysis of the imaging findings along with clinical history, laboratory studies often helps in deriving at a correct diagnosis in most cases.

P128

Lower limbs bowing, torsion and length discrepancy: when and how to image

Muriel Brun, Pascale Pietrera, Françoise Mallemouche, Agnes Villette
Hopital Pellegrin Enfants CHU, Bordeaux, France

Objective (1) To identify normal variants and to separate those from abnormal conditions in order to avoid unnecessary examinations. (2) To describe imaging modalities useful in children presenting with lower limbs bowing: technical criteria, normal angular measures on plain films and computed tomography and to discuss the few sonographic or MRI examinations. (3) To point the main radiological aspects of each condition.
Materials and methods Imaging modalities are essentially based on plain films of the whole lower limbs in the upper position allowing angular measures and in the supine position for length measures. Osseous structure is analyzed to exclude or to analyse focal lesions. Computed tomography is useful in patella syndrome, lower limb axial torsion and also in some focal osseous lesion. MRI examination is required in focal lesion or epiphysiodesis.
Results Lower limbs bowing is frequent during infancy and childhood, it can result from different conditions including normal variants, congenital abnormalities (femoral bowing or hypoplasia, genu flessum or recurvatum), focal fibrous lesions, epiphysiodesis.
Lower limbs length discrepancy or axial torsion can be due to congenital abnormalities but also to acquired disorders such as epiphysiodesis.
Conclusion Imaging modalities have to be guided by clinical examination and are frequently limited to plain films. CT and MRI are sometimes useful.

P129

Bone mineral content at birth is determined by both birth weight and fetal growth pattern

Marianne Alison, Jacques Beltrand, Sophie Dorgeret, Ramona Nicolescu, Rasa Verkauskiene, Samia Deghmoun, Olivier Sibony, Claire Levy Marchal, Guy Sebag
Hôpital Robert Debré AP-HP, Denis Diderot Faculty of Medicine, University of Paris VII, Paris, France

Background Epidemiological studies have shown that adult peak bone mass is correlated to birth weight, suggesting that fetal growth pattern could affect peak bone mass. Small for gestational age newborns (SGA) have lower BMC at birth, but what about adapted for gestational age newborns (AGA) with fetal growth restriction (FGR)?
Objective The aim of the study was to determine the respective role of birth weight and fetal growth pattern on BMC.
Materials and methods Full term newborns from SGA high-risk pregnancies were included: n=185, M/F: 92/93, 38.9±1.87 weeks of gestation (WG). Estimated fetal weight percentiles were measured monthly from 22 to 36 WG. FGR was defined as a loss by more than 20 percentiles of estimated fetal weight. Newborns with birth weight below 10th percentile were SGA. Total body mineral content was measured at birth, using dual X-ray absorptiometry (DEXA).
Results Newborns were SGA (n=56) or AGA (n=129). Fetal growth restricted newborns (n=111) were either AGA (n=71) or SGA (n=41). BMC was lower in SGA than AGA newborns (70.79±2.19 vs. 92.7±1.46 g, P<0.0001). BMC was lower in FGR group compared to normal growth group (82.16±1.55 vs. 93.9±2.92 g). In multivariate analysis, FGR and lower birth weight were significant and independent predictors of low BMC.
Conclusion BMC at birth is related independently to birth weight and fetal growth pattern.

P130

Rare case of pneumorrachis in a child with blunt neck trauma: CT findings

Mary Arvaniti, *Christodoulos Kaitartzis*, Agapi Christopoulou, Ilias Torounidis, Daphne Katsimba
General Hospital of Thessaloniki, Thessaloniki, Greece

Pneumorrachis is defined as presence of air within the spinal canal. Few cases of pneumorrachis have been described in children and only eight cases with combined cervical and thoracic pneumorrachis have been reported in the literature.
We report a case of an 8-year-old boy with cervical and thoracic pneumorrachis following blunt neck trauma. CT appearances of pneumorrachis and associated extensive subcutaneous emphysema with air dissecting through the soft tissues of the neck and thorax, pneumomediastinum and bilateral pneumothoraces are presented. Pathomechanism of pneumorrachis based upon CT images in our case is also considered. Further management, treatment and outcome of the patient are presented. We also discuss pathogenesis, common co-existing imaging findings and possible clinical significance of this rare pathologic entity.

P131

Ultrasound assessment of clubfoot in infants

Marie-Claude Miron, Guy Grimard, Benoit Morin, Marie-Andree Cantin, Morris Duhaime
CHU Ste-Justine, Montreal, QC, Canada

Background Clubfoot is a relatively common musculoskeletal disorder. It is characterised by equinus and varus of the hindfoot, adduction of the forefoot, supinatus plus or less cavus.
Objective The purpose of this study was to establish the usefulness of US in clinical practice. To determine the value of the different US items analyzed and to compare the talo-calcaneal angle measured by US and plain films.
Material and methods Using a linear high frequency transducer, the US was performed along medial, dorsal, posterior and lateral borders of the foot. The talonavicular relationship was established and quantified from medial and dorsal approaches. Measurement of the distance between the navicular and the medial malleolus was evaluated. The talocalcaneal divergence was assessed in order to correlate with angle

obtained on plain films. The tibio-talo-calcaneal axis in dorsiflexion of the foot was evaluated by a posterior approach. The relationship between the cuboid and the calcaneus was established and quantified with examination of the lateral border of the foot.
Results One hundred ten patients with idiopathic clubfoot were assessed by US (73% male; mean age at first exam 11.5 weeks; 66% bilateral involvement). Patients with neuro-muscular disorders or other syndromes were excluded. Morphological changes of the talonavicular joint, the distance between the medial malleolus and the navicular, and the talocalcaneal relationship are good indicators of the clinical severity. There is good agreement between US and plain films measurement of the talo-calcaneal angle.
Conclusion US is an effective technique to assess and quantify the deformity in clubfoot.

P132

The musculoskeletal manifestations of Panton–Valentine leukocidin *Staph. aureus* sepsis in children: the important role of ultrasound in directing surgical management and the role of MRI in confirming disease extent

Annmarie Jeanes, Sallyanne Gibbs, Joanna Danin, David Hunt, Gareth Tudor-Williams
Imperial NHS Trust, London, UK

Background Panton-Valentine leukocidin is a necrotising toxin secreted by *Staphylococcus aureus*. PVL-positive *S. aureus* osteomyelitis and soft-tissue sepsis have been described and is usually associated with a severe clinical course, and with a higher mortality and morbidity than non-PVL *S. aureus* infection. The musculoskeletal manifestations are usually more severe, than non-PVL *S. aureus*, and are more often associated with local or disseminated soft tissue infection.
Materials and methods We describe the imaging findings in four patients with PVL-*S. aureus* musculoskeletal infection. We highlight the important role of high resolution ultrasound particularly early in the disease course in children with profound septic shock, in the intensive care setting, and later, during convalescence its role in directing surgical drainage. We also describe the musculoskeletal manifestations of this disease using both CT and MRI, highlighting the extent of soft tissue involvement in this group of patients, shown to best advantage with MRI. In addition we describe some of the associated vascular, pulmonary and neurological complications.
Conclusion Early diagnosis and aggressive early surgical intervention is important, both to reduce the length of sepsis, the morbidity and mortality from profound shock and to reduce the long term musculoskeletal complications, which may be profound. Although MRI is the superior imaging modality for the demonstration of the extent of cortical bone, marrow and soft tissue disease, ultrasound and CT both play an important role, both in confirming the focus of infection and aiding surgical planning.

P133

CT-guided percutaneous spinal biopsy in children: diagnostic yield and impact on treatment

Vivian Tang, Saira Haque, Abdu Shabani
Royal Manchester Children's Hospital, Manchester, UK

Objective To assess our biopsy success rate and the diagnostic yield for microbiology and histology. Does the biopsy give information in addition to the imaging findings and as a result change management?
Materials and methods During 2001–2006, 15 children underwent CT-guided spinal biopsy. Clinical notes, radiology, pathology and microbiology results were reviewed. Seven children had CT and 12 children had MR prior to the procedure.
Results One (7%) procedure was unsuccessful. We were unable to obtain core biopsies in 27% and aspirates were obtained. One hundred percent of our samples were adequate. One hundred percent of the four biopsies performed for suspected tumours were diagnostic on histology. Ten samples were sent for microbiology for suspected discitis on imaging. Only 30% were positive for culture. Organisms were cultured from 50% of the aspirate samples. Only one of the three suspected TB discitis showed positive microbiology. Another case was proven to be TB on gastric washings, but the spinal biopsy was negative. Two suspected discitis were diagnosed as Langerhans cell histiocytosis. Seven of the 11 suspected discitis continued on antibiotics. Treatment of three children was changed as a result of the negative microbiology.
Conclusion Our diagnostic yield is comparable to other studies. Diagnostic yield is low for both bacterial and TB infection. Treatment was changed in three children (30%) as a result of the biopsy, but their MR appearances were not classic for discitis. Biopsy should only be performed when imaging is atypical of infection and no evidence of extra-spinal disease in suspected TB.

P134

Paediatric pathology or within the realms of normality: an interactive quiz

Val Gough, *Akash Ganguly*, Lennart Jans, Mohammed Tawil, Caren Landes
Royal Liverpool Children's NHS Trust, Liverpool, UK

Background Paediatric radiological normality can closely resemble pathology. With knowledge and experience the ability to differentiate them becomes second nature. While misinterpreting the imaging can lead to unnecessary investigation.
Objective To give an educational overview of common everyday paediatric radiological normal variants which can easily be mistaken for pathology.
Materials and methods This will take the form of an interactive quiz which shows two images side by side, one of which is pathological, the other an anatomical variant or normality. The reader is then asked to choose which one of the two is normal. The answers are revealed under an adjacent covered slip which will show the reasons why one is normal and the other is not.

Conclusion This interactive poster will reinforce the knowledge of more experienced radiologists, while educating the more junior radiologist of common pitfalls.

P135

Thyroid abnormalities among first-degree relatives of children with congenital hypothyroidism; an ultrasound survey

Atoosa Adibi, Mahin Hashemipour, Mahshid Haghighi
Isfahan University of Medical Sciences, Isfahan, Iran

Background Congenital hypothyroidism (CH) is caused by thyroid dysgenesis and dyshormonogenesis. Evidences suggest the presence of genetic factors in both type of pathogenesis.
Objective We aimed to investigate whether an increased incidence of thyroid abnormalities could be shown by ultrasonography among first-degree relatives of children with CH.
Materials and methods In this case–control study the presence of thyroid abnormalities both developmental and non-developmental were studied among first-degree relatives of CH patients and of healthy children. Assessments include neck ultrasonography and thyroid function tests. Obtained data from parents, siblings and children were compared in case and control groups.
Results In case group 92 patients, 172 parents and 57 siblings and in control group 82 healthy children, 160 parents and 39 siblings were studied. Thyroid developmental abnormalities were more prevalent among parents (3.5% vs. 0%, P=0.03) and siblings (10.5% vs. 0%, P= 0.01) of CH patients than control group. Non-developmental abnormalities were not different significantly among case and control group (17% vs.13%, P=0.3).
Conclusion Thyroid developmental abnormalities were more prevalent among parents and siblings of CH patients than control group, confirming the familial component of this entity.

P136

Thymus and cervical nodes in infants: are they related to breastfeeding?

Maria Raissaki[1], Fani Ladomenou[2], Eleni Drakonaki[1], Emmanouil Galanakis[2], Maria Kalmanti[1], Nicholas Gourtsoyiannis[1]
1. Department of Radiology, University Hospital of Heraklion, University of Crete, Crete, Greece
2. Department of Paediatrics, University Hospital of Heraklion, University of Crete, Crete, Greece

Background Breastfeeding (BF) is known to protect against infantile infections; not much is known on the physiology of this protection.
Objective To investigate whether BF modulates thymic and lymph node function.
Materials and methods The study consisted of 55 infants, 31 male, 24 female, aged 0.51–0.75 years (mean 0.57), 27 of which with exclusive prolonged BF, 14 with partial BF and 14 without any BF. Jugulodigastric lymph nodes and the thymus were ultrasonographically measured and qualitatively assessed. Analysis was preformed by t test and Pearson's correlation. One-tailed Fisher exact probability test, odds ratios (OR) and 95% confidence intervals (95% CI) were calculated. $P<0.05$ was considered statistically significant.
Results No relationship was found between breastfeeding, exclusive or partial, and the thymic index, lymph node size, echogenicity and posterior enhancement. Infants exclusively BF for >20 weeks lacked a visible thymic capsule compared to infants without any BF (OR 4.61, 95% CI 1.22–17.4; P=0.0321). Thymic index was not related to lymph node size, but was less in infants grown up during summer than in infants grown up during winter ($P<0.05$). Jugulodigastric nodes had a greater volume in males than in females ($P<0.05$).
Conclusion The size of the thymus, jugulodigastric nodes and echogenicity in early infancy do not appear to be influenced by breastfeeding however, they are liable to intrinsic and environmental factors.

P137

First and second branchial arch syndromes: multimodality approach

Tarek Laswad, Leonor Alamo, Jean-Yeve Meuwly, Bertrand Jacques, François Gudinchet
University Hospital of Lausanne (CHUV), Lausanne, Switzerland

Background First and second branchial arch syndromes (BAS) manifest as combined deficiencies of tissues and hypoplasias of the face, external ear, middle ear, maxillary and mandibular arches. Various imaging techniques could be used to investigate and follow these lesions.
Objective To evaluate the role of various imaging modalities in the diagnosis and classification of a wide spectrum of BAS and to emphasize the use of multimodality imaging approach for preoperative planning and follow-up.
Materials and methods We studied 23 children, nine girls and 14 boys with a mean age of 15 years. Teleradiograms, orthopantomograms and CT were performed for all patients and MRI in selected patients. The imaging features were compared with surgical, anatomopathological findings, and postoperative follow-up imaging features.
Results Fourteen patients had hemifacial microsomia, four had mandibulofacial dysostosis, two had Goldenhar and two had Pierre–Robin syndrome. Imaging features were well correlated with clinical and surgical findings. Axial CT images allowed more detailed analysis of middle and internal ear structures as well as skull base abnormalities. Axial and 3D CT images depicted associated cerebral and soft tissue anomalies in nine patients. Teleradiograms, orthopantomograms, and CT images were applied as the main planning tools for land mark measurements of maxillofacial surgery.
Conclusion Our results suggest that, multimodality approach should be used: 3DCT and MRI should be used for mapping and grading of different BAS for surgical treatment. Orthopantomograms and Teleradiograms are necessary for the follow-up of postoperative patients.

P138

Neck infection in children and pyriform sinus fistula: the role of sonography

Marina Vakaki[1], George Pitsoulakis[2], Anna Hountala[1], Eugenia Dagiakidi[1], Sofia Voidila[1], Niki Lama[1], Panajiotis Zodiatis[1], Maria Paulou[1], Chris Koumanidou[1]
1. P & A Kyriakou Children's Hospital, Athens, Greece
2. Agia Sofia Children's Hospital, Athens, Greece

Background Pyriform sinus fistula represents a persistent 3rd or 4th pharyngeal pouch, which manifests as a congenital sinus tract originating from the pyriform sinus. It has recently been recognized as the underlying cause of acute suppurative thyroiditis or acute deep neck infection.
Objective To present the sonographic findings of rare left-sided suppurative thyroiditis or acute deep neck infection in children. To familiarize Pediatric Radiologists with them, to emphasize the role of sonography in the diagnosis and association with the underlying cause, directing appropriately further diagnostic investigation and management.
Materials and methods The imaging findings were reviewed in six children, aged 1.5–12 years, with left-sided acute (n=3) or recurrent (n=1) suppurative thyroiditis or perithyroid tissue infection (n=2).
Results In all cases, the sonographic examination of the neck demonstrated a heterogeneous mass with increased peripheral vascularisation and poorly defined margin in the region of the left thyroid lobe. In four cases, a small segment of a fistulous tract posterior to the above mass indicated the presence of a pyriform sinus fistula, which was almost entirely revealed in the sonographic follow-up. In the remaining two cases the fistulous tract was not sonographically depicted. However, due to Pediatric Radiologist's awareness, MRI after the acute phase of infection was requested which detected a pyriform sinus fistula.
Conclusion When suppurative left neck infection in the thyroid/perithyroid tissue is present in a child, Pediatric Radiologist should strongly suspect and search for a left 3rd or 4th pharyngeal pouch remnant with a fistula originating from the ipsilateral pyriform sinus.

P139

Image-guided placement of the Carey–Alzate jejunal tube for long-term feeding in children: the Glasgow experience

Olivia Thomas, Sanjay Maroo
Royal Hospital for Sick Children, Glasgow, UK

Background The management of neurologically impaired children with feeding problems and gastroesophageal reflux is a difficult challenge. Treatment choices include gastrostomy with fundoplication, feeding jejunostomy or prolonged nasojejunal feeds. All these approaches are associated with a high rate of complications. Percutaneously-placed gastrojejunal (GJ) tubes are an alternative means of delivering enteral feeds to children with a variety of diseases. There are several types of GJ tube available.
Objective To evaluate our experience with the Carey–Alzate GJ tube for long-term enteral feeding in children.
Materials and methods A retrospective review of 17 children with failed gastrostomy feeds who have undergone GJ tube placement under image guidance.
Results Seventeen patients underwent 24 tube placements since 2005. The commonest indications were long-term neurological disability and failed fundoplication. The majority of procedures did not require general anaesthesia. The commonest complication was tube dislodgement.
Conclusion The Carey–Alzate GJ tube is a reasonable alternative for long-term enteric feeding in children with existing gastrostomy and failed fundoplication.

P140

Hepatic neoplasms in neonates and childhood: imaging features with pathological review

Jin Wei Kwek, Suat Jin Lu, Sze Yiun Teo, Caroline Ong, Chan Hon Chiu, David A. Stringer
Diagnostic Imaging, KK Women's and Children's Hospital, Singapore, Singapore

Background Hepatic tumours are rare in neonates and childhood but pose a diagnostic challenge.
Objective To present the incidence and imaging features of hepatic neoplasm in neonates and childhood with pathological correlation.
Materials and methods Between Apr 2005 and Oct 2007, all abnormal radiological reports of ultrasound, CT and MRI studies were retrieved from our radiological database of our paediatric patients and reviewed for focal hepatic lesions. A total of 20 cases of neoplasm with pathological correlation were retrieved. Non-neoplastic mimics such as focal fatty change, simple cyst, abscess and focal nodular hyperplasia were also encountered and reviewed.
Results Malignant neoplasm included malignancies of epithelial origins such as hepatoblastoma (9/12) and hepatocellular carcinoma (1/20), a rare case of a yolk sac tumour, a primary lymphoma, as well as a case of lymphoproliferative disease. Benign entities in this group included cavernous haemangioma (4/20) and infantile haemangioendothelioma (1/20). The clinical and imaging findings were reviewed and correlated to pathologic findings. Imaging findings of non-neoplastic mimics such as focal fatty change, simple cyst, abscess and focal nodular hyperplasia are also presented.
Conclusion Focal hepatic lesions are rare and best assessed with ultrasound as a first line modality and MRI as a problem solving modality. Although some hepatic lesions can be characterized based on clinical and imaging features, other lesions may still require invasive procedures like percutaneous biopsy for confirmation.

P141

Ewing sarcoma strikes paediatric rib: common multimodality imaging features of an uncommon neoplasm in children

Alkies Lapas, Julio Mata
Cooper University Hospital/UMDNJ/RWJ Medical School, Camden, NJ, USA

Ewing's sarcoma is the most common malignant chest wall tumour in childhood. It is nonetheless an infrequent cancer, with approximately 225 new cases diagnosed in patients less than 20 years of age per year in North America. About 10% of all cases of Ewing's sarcoma arise from a rib. Initial diagnosis relies primarily on multimodality imaging including radiography, CT, 99m-technetium whole-body radionuclide bone scans, MRI, and 18-FDG-PET. The radiographic appearance of Ewing's in the rib cage is variable. The lesion may be primarily lytic or sclerotic or may represent a mixture of the two. CT is superior to radiography in evaluation of the sclerotic or lytic character of the lesion as well as its spread toward the thoracic cavity. The true craniocaudal and intramuscular extent of the tumour can be evaluated more precisely with MR imaging because of the higher contrast between tumour and soft tissue MR affords. Nuclear imaging reveals skeletal metastases by characterizing technetium pyrophosphate avid lesions. In detecting bone metastases, FDG-PET may be even more sensitive than whole-body scans. The diagnostic information obtained from a multimodality imaging approach can help tailor the treatment protocols prior to instituting definitive therapy.

References

1. Mark B, Heinrich K, Michael P et al (2006) Ewing's sarcoma family of tumors: current management. Pediatric Oncology. 11:503–524
2. Coombs RJ, Bayar EA, Matloub YH et al (1999) Pediatric case of the day. Radiographics. 19:241–244

P142

Hemophagocytic lymphohistiocytosis (HLH) preceded by Kikuchi disease in children

Gye-Yeon Lim, Nak-Kyun Chung
Department of Radiology, The Catholic University of Korea, Seoul, South Korea

Background Kikuchi's disease is a benign, self-limiting acute necrotizing lymphadenitis occurring in young women and children. However, patient with Kikuchi's disease require a systemic survey and follow-up because it may be associated with other disease such as hemophagocytic lymphohistiocytosis (HLH). HLH is often fatal disease in the paediatric population. To our knowledge, there are very few reports suggesting association between the two conditions.
Objective To report the imaging findings and clinical characteristics of five cases of Kikuchi's disease accompanied by HLH in children.
Materials and methods We retrospectively analyzed the clinical characteristics and the imaging (US and CT) findings of five patients who had prolonged fever and cervical lymphadenopathy. Excision biopsy of cervical lymph node in all patients (three male, two female; age range 4–14 years, mean 9 years,) showed necrotizing lymphadenitis and a diagnosis of Kikichi disease was confirmed. Despite the administration of prednisolone therapy the fever did not settle so bone marrow aspiration biopsy was preformed. HLH was proven by bone marrow biopsy at all patients.
Results The duration of lymphadenopathy and fever before diagnosis ranged from 3 days to 3 weeks (mean 9.8 days) in all patients. Associated symptom was rash (2/5) and malaise (1/5). Leukopenia was noted in four patients and two of these had profound leucopenia. The interval between the diagnosis of Kikuchi's disease and diagnosis of HLH ranged from 4 days to 7 days (mean 5.8 days).
All had affected cervical lymph nodes located in the left posterior cervical triangle, and one additionally had affected nodes in the right. One had external iliac and inguinal lymph node. The affected lymph nodes were 0.9–2.5 cm. CT findings of affected lymph node were perinodal infiltrates (4/5), focal low attenuation (2/5), ring-shaped enhancing node (1/5) and homogenous enhancement (2/5).
Conclusion: HLH may be associated with Kikuchi disease in children. Therefore, awareness of these association and systemic survey and follow-up in patients with Kikuchi might be helpful to early recognition and prompt treatment of HLH preceded by Kikuchi disease.

P143

Atypical teratorhabdoid tumours: imaging features in eight children

Maeve McPhillips[1], Hamish Wallace[1], Rod Gibson[2], Colin Smith[2]
1. Royal Hospital for Sick Children, Edinburgh, UK
2. Western General Hospital, Edinburgh, UK

Background A typical teratorhabdoid tumour (ATRT) has been accepted as a separate histological diagnosis for the past decade. It is now something which should be part of the differential diagnosis of brain tumour type, particularly in those under 2 years of age, and with a posterior fossa tumour.
Objective This is a retrospective review of the CT and MR findings in eight cases of atypical teratorhabdoid tumours.
Results The patient group in our institution is atypical in age, our patients range in age from 8 months to 13 years at presentation; in gender, five females and three males; and in site of origin, only one tumour was arising in the posterior fossa, six were supratentorial, and one was metastatic or multifocal at presentation. The radiological differential diagnosis varied with site, and included ependymoma, medulloblastoma/PNET, meningioma, astrocytoma and ganglioglioma. The features which suggested these diagnoses will be demonstrated.

P144

Sacrococcygeal teratoma with malignant degeneration into primitive neuroectodermal tumour with intraspinal extension

Jeffrey Foster
Phoenix Children's Hospital, Phoenix, AZ, USA

Sacrococcygeal teratoma (SCT) infrequently may undergo malignant degeneration, most commonly into leukaemia, carcinoma, and rhabdomyosarcoma.
We present MR and CT imaging of a young child with SCT with localized malignant degeneration into primitive neuro-ectodermal tumour (PNET) showing intraspinal extension of the PNET portion, demonstrating unique imaging characteristics which may allow the diagnosis to be suggested preoperatively.

P145

The effect of cancer treatment including bone marrow transplantation in children with acute leukaemia on the diffusion tensor imaging parameters ADC and FA

Ulrike Löbel[1], Daniel Güllmar[2], Jan Sedlacik[2], Werner A. Kaiser[1], Jürgen R. Reichenbach[2], Hans-Joachim Mentzel[1]
1. Institute of Diagnostic and Interventional Radiology, University of Jena, Jena, Germany
2. Medical Physics Group, University of Jena, Jena, Germany

Objective Diffusion-tensor imaging has proven to be a sufficient method to describe processes or structural changes of the human brain, especially of white matter. This study focuses on the effect of bone marrow transplantation on the brain in children and adolescents by using diffusion tensor imaging (DTI).
Materials and methods We studied the DTI parameters apparent diffusion coefficient (ADC) and fractional anisotropy (FA) in five patients suffering from leukaemia (two females, three males; age range 18 months, 12–18 years) before and 100 days after successful bone marrow transplantation. Data acquisition was done on a 1.5-T MR scanner using a TRSE EPI DTI-sequence (six directions; b=0/1,000 s/mm^2; FOV=240; matrix=128; in-plane resolution 1.8×1.8 mm^2; 19 slices, 5 mm thick). ADC and FA were calculated and 20 ROIs were manually drawn into each data set in white matter regions, internal capsule and the corpus callosum. Wilcoxon signed ranks test was used to evaluate the data. Values below 0.05 differ significantly. Data post bone marrow transplantation was also compared to ADC and FA of a healthy group of 116 controls.
Results The significance values (P) of the Wilcoxon test ranged between 0.25 and 1.0 for ADC. For FA the P-value was 1.0 in each region which means that 100% of any measured differences are coincidental. In comparison to the normative data set all patient parameters lay within the 95% interval.
Conclusion No significant differences in the DTI parameters pre and post bone marrow transplantation and the accordance to our normative data set indicate that the therapy does not lead to a DTI detectable alteration on paediatric brain structure. This may include that nerve fibres and myelin are not permanently damaged due to the therapy of bone marrow transplantation.

P146

Paediatric adrenal malignancy

Monica Coutinho, João Pedro Caldeira, João Paulo Conceição e Silva
Portuguese Cancer Institute, Lisbon, Portugal

Background Apart from neuroblastoma, adrenal tumours are rare in infancy and childhood. Usually presenting as an abdominal mass, both benign and malignant adrenal tumours may have biologic activity, therefore, imaging modalities have a role in lesion characterization.
Objective To illustrate the most important entities and also the rarer ones such as adrenal carcinoma and oncocytoma. The clinical and imaging features are described with emphasis on the main differentials and pitfalls like adrenal haemorrhage and tumours arising from the upper kidney pole.
Materials and methods Retrospective analysis of our institution files from January 2000 until December 2007 revealed 20 adrenal tumours among paediatric patients. Ages ranged from 0 to 14 years (average 3.4 years). Medical records were reviewed. All patients underwent imaging studies (US, CT or MR) and surgery with further histological analysis.
Results Of the 20 patients, 13 presented with abdominal mass, two had hepatomegaly with abnormal liver enzymes, one was jaundiced, one showed tremor and one complained of headache due to arterial hypertension. As expected, neuroblastoma was the most common lesion (n=15). Calcifications and vascular encasement were seen. Two congenital neuroblastomas are reported. Hepatic metastases were found in two cases. Two patients had phaeochromocytoma, one of which with extra-adrenal recurrence. Our series also included ganglioneuroma (n=1), adrenocortical carcinoma (n=1) and adrenal oncocytoma (n=1).
Conclusions Differential diagnosis between adrenal tumours is difficult upon imaging criteria alone. Nevertheless, imaging techniques, particularly MR, are helpful in confirming the origin and the extent of an adrenal lesion.

P147

Lesser known relatives of Wilms' tumour

Amit Maniyar, Abdu Shabani
Department of Radiology, Royal Manchester Children's University Hospital, Manchester, UK

Background Malignant renal masses other than Wilms' tumour do account for less than 1% of childhood cancers and their management varies.
Objective To present a pictorial review of unusual renal malignancies in children including Wilms' tumour.
Results We present the experience of a tertiary paediatric oncology centre over the past 10 years with radiology, histopathology and review of literature. The examples include clear cell sarcoma, synovial cell sarcoma, rhabdoid tumour, renal neuroblastoma, renal cell carcinoma, nephroblastomatosis and bilateral multifocal Wilms' tumour.

P148

Magnetic resonance imaging features of intraspinal extraosseous Ewing sarcoma/primitive neuroectodermal tumour

Ian McCrea, Sanjay Maroo
Royal Hospital for Sick Children, Glasgow, UK

Background Extra osseous Ewing sarcoma/primitive neuroectodermal tumours (PNET) are rare with few cases reported within the spinal canal.
Objective To describe the magnetic resonance imaging characteristics of intraspinal extra osseous Ewing sarcoma/PNET.
Materials and methods The magnetic resonance images from a series of four patients (mean age 9.6 years) with histological proven intraspinal Ewing sarcoma/PNET were reviewed.
Results MR imaging demonstrated an intraspinal extradural mass in all cases. Two located in the lumbar region, one in the sacral region and one in the cervical region. The lumbar sacral tumours were ovoid in shape and the cervical tumour was fusiform. The craniocaudal lengths of the

intraspinal masses ranged from 2.5 to 4.5 cm. All extended through adjacent ipsilateral intervertebral foramen causing enlargement of the neural canal. In two cases this produced a "dumbbell" shaped tumour. All tumours displayed isodense signal to muscle on T1W with one tumour showing central increased signal. On T2W all cases demonstrated isodense signal to muscle with two displaying speckled areas of high signal within the tumour. Post contrast two of the tumours demonstrated peripheral enhancement, one tumour displayed homogenous enhancement and one heterogeneous enhancement.
Conclusions The MR imaging characteristics of extra osseous Ewing sarcoma/PNET tumours are non specific. They are predominantly isodense signal on both T1W and T2W but can contain areas of increased signal. A consistent feature in this series was the extension of tumour through intervertebral foramina causing enlargement of neural canal.

P149

Primary Ewing sarcoma of the spine—twice bitten

Deepak Subedi, Mark Brougham, Graham Wilkinson, Maeve McPhillips, Hamish Wallace, Kaseem Ajilogba
Royal Hospital for Sick Children, Edinburgh, UK

Introduction Primary Ewing sarcoma of the spine accounts for 3–10% of Ewing sarcoma in children. Patients often present with pain, neurological deficits and a palpable mass. The imaging features of vertebral lytic lesions and to a lesser extent paraspinal soft tissue mass are commonly described.
Objective To review the imaging features of and discuss the diagnostic difficulties of spinal Ewing's sarcoma.
Case reports
Case 1: A 13-year-old boy presented with back pain and right leg weakness. Imaging showed an enhancing dumb-bell shaped right paraspinal mass traversing the right L4/5 and L5/S1 neural foramina and no gross vertebral or bony abnormality. Neurofibroma was diagnosed; however, the histopathology showed PNET/Ewing sarcoma.
Case 2: A 15-year-old girl presented with progressive weakness of lower limbs. Imaging demonstrated spinal cord compression from the intraspinal extension of a paraspinal soft tissue mass at the cervicothoracic junction, cortical irregularity of C7 vertebra and flattened T1 vertebra. The most likely cause was thought to be lymphoma, although histiocytosis, metastatic lesion and primary bone tumour were considered. Biopsy revealed Ewing's sarcoma.
Conclusion Primary spinal Ewing sarcoma is uncommon and the imaging findings are not characteristic though may be typical. Primary Ewing sarcoma should be entertained in the differential diagnosis of spinal/paraspinal lesions or abnormality with or without bony abnormality.

P150

Correlation between cerebral magnetic resonance imaging and cerebrospinal fluid investigation in paediatric cancer patients

Birgit Spors, Ianina Scheer, Pablo Hernaiz Driever, Brigitte Stöver
Clinic of Radiology, Department of Pediatric Radiology, Charite, Berlin, Germany

Background Infections of the central nervous system are a common cause of neurological abnormalities in paediatric oncology patients. MRI in combination with cerebrospinal fluid (CSF) investigations may be helpful in differentiating between the manifestation of the tumour underlying disease, complications of the treatment—chemotherapy as well as irradiation and infections.
Objective Diagnostic accuracy of MRI and CSF investigations in order to differentiate neurological deficits of paediatric cancer patients.
Materials and methods Analyzed were MRI and CSF investigation data of 27 paediatric cancer patients with acute neurological symptoms investigated from 1997–2007.
Results Out of 134 MRI and CSF investigations 72 (54%) showed no infectious signs, where as 48 (39%) revealed manifestation of infection. In ten children CSF findings were positive, and MRI results negative. Two patients suggested infection in MRI examinations but CSF findings were negative.
Conclusions Although 39% of our children revealed infection during therapy, in the majority of the children (54%) the neurological deficits could not be explained by infection.

P151

Lens exclusion in paediatric CT head examination: a completed audit cycle demonstrating how individual feedback and re-education measures can make significant improvements

Karen Atkin, Demos Michaelides, Claire Miller
Birmingham Children's Hospital, Birmingham, UK

Background Radiation to the lens of the eye has a deterministic effect. Cataracts are induced above a threshold of 5 Gy in adults. Ideally for CT head examination, the lens of the eye should be excluded from the field whenever possible. In the paediatric population this is especially important as a child is two to four times more sensitive to radiation.
Objective To quantify lens exclusion at our institution and to see if this could be improved.
Materials and methods Retrospective audit of CT head examinations performed between 01.03.07 and 07.05.07 (examinations excluded where lens inclusion was necessary/unavoidable e.g. CT orbits). Lens inclusion, operator, patient age and time of scan (on call/routine) were recorded. Results were presented at the departmental audit meeting. Individual operator feedback/re-education was given at subsequent yearly performance review. Examinations were retrospectively re-audited 6 months later.
Results Initial audit (99 includable examinations)—only 42% of examinations excluded both lenses (40% both, 18% one lens included). There was significant variation between operators. Re-audit (195 includable examinations over 3 months) 6 months later—67% of examinations now excluded both lenses (rising to 75% when results from a single operator who is new to the department are excluded). The younger the child, the more likely the lens is included.
Conclusions Audit and one-to-one individual feedback have significantly improved our rates of lens exclusion, in this especially important patient population.

P152

Diffusion weighted imaging in paediatric body magnetic resonance imaging: potential pitfalls

Rebecca Leung, Jody Maclachlan, Oystein Olsen, Kieran McHugh
Great Ormond Street Hospital, London, UK

Diffusion weighted imaging (DWI) is being increasingly used in body magnetic resonance imaging, particularly in the detection, characterisation and subsequent monitoring of neoplastic disease.
Studies have shown that there is a correlation between cellularity and apparent diffusion coefficient (ADC) values with high cellularity associated with low ADC and low cellularity with high ADC values, but the distinction is not clear cut. The majority of paediatric malignancies have low ADC values. Potential pitfalls, i.e. lesions that are not neoplasms but still show low ADC include abscesses. Neoplasms that are not highly cellular, but still have low ADC, include some spindle cell tumours. Other lesions with a high degree of microstructural order may similarly have low ADC. We will illustrate all these entities. Using these examples we demonstrate the diagnostic difficulty and pitfalls faced in distinguishing neoplastic from non-neoplastic disease.

P153

MRI/RX fusion: step-by-step methodology and examples of a new imaging technique

Tristan Zand, Solène Ferey, Luca Spadola, Laura Merlini, Romain Breguet,
Mehrak Anooshiravani, Sylviane Hanquinet
Hôpital des Enfants Genève, Geneva, Switzerland

Objective Step-by-step explanation and illustration of MRI/RX fusion imaging for routine use by the radiologist. Illustration through several explicit paediatric cases.
Material and methods We chose a limited number of cases (traumatic, neoplastic, or inflammatory pathology) for which the imaging studies included conventional radiographs and an MRI (Siemens 1.5 T). MRI sequences where reconstructed for anatomical correspondence between modalities. Key MRI images where set to a defined colour palette, set to specific windows, and fused using standard fusion algorithms. Image processing was done on generalist image-processing software (Adobe Photoshop) using standard computer equipment connected to a PACS (Apple Macintosh, Osirix). The final images illustrate the possibilities in each of the selected representative cases.
Results By means of the step-by-step method and resulting images, we share our experience in a new and promising technique. Fusion of soft-tissue characteristics as viewed on MRI with fine bone details of conventional radiographs offers a synthetic compound image, but also revalues subtleties of conventional imagery. Our streamlined method enables easy reproduction of the technique by other radiologists with minimal computer knowledge.
Conclusion Our recipe for MRI/RX fusion is accessible to any radiologist. It offers potent synthetic key imaging for diagnostic transmission, but also helps maximize our understanding of all dissociated modalities. It technically bridges the viewing of conventional radiographs to that of thin-slice imaging.

P154

Experience with gadobenate dimeglumine (Gd-BOPTA) for enhanced MRI in children

Cesare Colosimo[1], Mieczyslaw Pasowicz[2], Phillipe Demaerel[3], Pei-yi Gao[4], Paolo Tortori-Donati[5]
1. Catholic University of the Sacred Heart, Rome, Italy
2. Krakow Hospital John Paul II, Krakow, Poland
3. University Hospital K.U. Leuven, Leuven, Belgium
4. Beijing Tian Tan Hospital, Beijing, China
5. Institute G. Gaslini, Genoa, Italy

Objective To summarize safety and efficacy of the higher-relaxivity gadolinium (Gd) agent gadobenate dimeglumine (Gd-BOPTA) in children.
Materials and methods Safety was evaluated in 151 subjects receiving Gd-BOPTA at a dose of 0.1 mmol/kg, 85 of whom participated in a comparison study in which 89 subjects received equimolar gadopentetate dimeglumine (Gd-DTPA). Image quality was evaluated in 70 patients receiving Gd-BOPTA, including 29 children with enhancing lesion compared with 34 children receiving Gd-DTPA. Serial 24 h blood and urine collections were used to determine Gd-BOPTA pharmacokinetics (PK) in 25 healthy children.
Results Eighteen of 151 patients (11.6%) experienced adverse events (AE), most of which were mild. The most commonly reported AE were fever and headache. Modest increases and decreases in vital signs were recorded, but no significant changes in laboratory parameters or ECGs were observed. In the comparison study, AE rates were similar after Gd-BOPTA (11 subjects, 13%) and Gd-DTPA (13 subjects, 14%), $P=0.75$. PK data best fit a two-compartment model, with >90% recovery in urine at 24 h. In children with enhancing lesions, contrast enhancement was considered good to excellent in all subjects. Gd-BOPTA resulted in improved definition of disease extent, lesion border delineation, and visualization of lesion internal morphology. In the comparison study, postdose changes in lesion visualization were significantly greater for Gd-BOPTA than Gd-DTPA at the lesion ($P=0.011$) and patient level ($P=0.008$).
Conclusion Gd-BOPTA is well tolerated, with safety and pharmacokinetics comparable to other Gd agents. Compared to Gd-DTPA, Gd-BOPTA performed significantly better for visualization of CNS tumours in paediatric patients.

P155

Delayed onset of deep venous anomalies as part of Sturge Weber syndrome: case report

Anat Aizer Dannon, Alain Perlow, Dafna Marom
Schneider Children's Medical Center of Israel, Petach Tikvah, Israel

Background Sturge–Weber syndrome is a rare disorder that occurs with a frequency of one in 50,000. The disease is characterized by

facial cutaneous malformations, leptomeningeal angiomatosis, seizures and glaucoma.
Case report We describe a 2-year-old, full-term, female patient who was diagnosed with a port-wine nevus on the left side of her face. Ultrasound and CT scan of the brain after birth were normal. At the age of 2 months MRI demonstrated delay of white matter myelinisation and diffuse enlargement of extraventricular CSF spaces. However, there was no sign of focal cortical dysplasia, leptomeningeal angiomatosis or any other vascular anomaly. At the age of 15 months, follow-up MRI was performed. Her second MRI showed newly developed diffuse bilateral superficial and deep venous anomalies at the periventricular white matter, and deep gray matter. The suprasellar cistern also developed new enlarged, tortuous veins. MR venogram demonstrated absence of the inferior sagittal sinus though there was no evidence of sinus venous thrombosis. MR angiography was normal. The patient suffered from her first generalized 2 weeks from the second MRI. She was discharged on antiepileptic medication.

P156

Position of catheter and tube placement as an indirect indicator of pathology and abnormal anatomy

Rebecca Leung, Jody Maclachlan, Alistair Calder
Great Ormond Street Hospital, London, UK

Radiologists play a crucial role in the evaluation of catheter and tube placement as incorrect positioning can lead to significant complications. The expected anatomical course of such support apparatus is well established. Radiological evaluation of catheter and tube placement in children is thus uniquely able to detect deviations from the normal anatomical course, which may be secondary to pathology, such as the positions of nasogastric tubes and umbilical venous catheters in congenital diaphragmatic hernia, or to the presence of anatomical variations hitherto unknown to the clinician, such as a left sided superior vena cava. A variety of different pathological conditions and anatomical variations where the radio-opaque line or tube acts as a contrast medium are illustrated pictorially. It is important that the radiologist is aware of these potential causes for apparently "malpositioned" catheters in their day to day practice.

P157

Pediatric vascular lesions of the musculoskeletal system: a review of imaging characteristics

Peter C. Young, Shervin Raife, Patrick Getty
Case Western Reserve University Hospitals, Cleveland, OH, USA

Background Vascular lesions of the musculoskeletal system such as haemangiomas are a very common neoplasm and are the most common group of neoplasia in the paediatric population. Accurate diagnosis and differentiation of these lesions is important to insure appropriate management and therapy for the patient. Most vascular lesions are benign, but can cause local symptoms requiring therapy. Also, more rare aggressive vascular tumours of the soft tissues occur.
Objective By reviewing this poster presentation the radiologist will become familiar with imaging characteristics of musculoskeletal vascular lesions in infants and children.
Results Plain film radiography, computed tomography, ultrasound and magnetic resonance imaging all can be used in the diagnosis of vascular neoplasm. Plain film and CT may show the characteristic appearance of phleboliths within the lesion. Ultrasound can show flow within the lesions and may confirm vascular channels. MRI however is the study of choice for the most sensitive evaluation of musculoskeletal haemangiomas and is also best at differentiating the lesions from soft tissue malignancy. MRI can show flow signal changes, tubular vascular channels, and local fatty overgrowth associated with the lesions. It is also the best study for evaluating the extent of the lesion such as extension into adjacent osseous structures.
Conclusion The ability to appropriately diagnose vascular neoplasm in the pediatric age group is important in the management of the patient. Radiology, particularly MRI, is of primary importance in the diagnosis of this common group of lesions.

P158

Pictorial essay: the role of MRI in examination of 109 paediatric vascular malformations

Marcello Napolitano, Irene Borzani, Anna Venegoni, Salvatore Zirpoli, Gianni Vercelio, Fabio Triulzi
V. Buzzi Children's Hospital, Milan, Italy

Background MRI is a good imaging modality to set the correct diagnosis and to determine the extent of vascular malformation that is the first step to plan an appropriate treatment.
Objective To analyze MR appearance of vascular malformations in children.
Materials and methods From December 2004 and November 2007 109 patients (8 months–17 years) underwent 116 MR examinations to study vascular malformations. Sixty-two out of 116 examination were completed with intravenous administration of gadolinium.
Results We analysed MR characteristics, extension and contrast radiographic appearance of each malformation in order to give the right interpretation and classification of each vascular mass. We found 72 low-flow venous vascular malformations (six of which with lymphatic component), 23 lymphangiomas, ten haemangiomas, one Kaposiform hemangioendothelioma, two Klippel–Trenaunay syndrome and one arteriovenous malformation. Body distribution was 39% lower limbs, 30% cervico-facial zone, 19% upper limbs, 7% thorax and 5% abdomen and pelvis.
Conclusions MR is an effective technique to characterize and evaluate body extension in case of vascular malformation even in children, and also allows pre-surgical evaluation and follow-up.