



ECR 2020—current status and trends in genitourinary research

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Urogenital radiology with eight sessions represents an important portion of research sessions at ECR 2020, with three sessions dedicated to prostate imaging, two to kidney and bladder topics, two to female imaging and one to ultrasound (US). Magnetic resonance imaging (MRI) was the dominant modality, but this year, a considerable number of studies were conducted on artificial intelligence (AI) and radiomics, as well as on new ultrasound modalities such as contrast-enhanced ultrasound (CEUS) and sonoelastography. All abstracts are published in the ECR 2020 Book of Abstracts, with sessions and presentation number mentioned in brackets [1].

Like in the previous years, prostate is a large area of research, and prostate MRI is the dominant modality. Studies concentrated on novel MRI applications in diagnosing prostate cancer (PCA), as well as on the role of MRI in the prediction of cancer therapy success. One session is dedicated to deep learning and radiomics, indicating that the cutting-edge of research is the emerging area of AI that is assisting radiologists in dealing with the increasing number and complexity of examinations. What is important is that the study showing reduction of biopsies by 21% when using convolutional neural network (CNN)-based model applied to multiparametric MRI as opposed to the combination of Prostate Imaging-Reporting and Data System Version 2 (PI-RADSv2) and clinical parameters for the risk assessment of clinically significant PCA (RPS 307-2). Another study has shown good diagnostic performance of the combination of multiple radiomics features for the diagnosis of PCA which may help in predicting lesions where aggressive management is warranted (RPS 307-4). Important observation is that there is an added-value of dynamic contrast-enhanced (DCE) in multiparametric prostate

MRI with a region-of-interest-based quantitative evaluation where DCE demonstrates the ability to improve MRI assessment in the peripheral zone but not in the transition zone (RPS 307-7). The study on patients who underwent diffusion-weighted imaging (DWI) and targeted biopsy for index lesions in which calculated DWI was generated for a range of *b* values, using dedicated software, suggests the use of a *b* value of 1600–1900 s/mm² (RPS 1307-6). Regarding prostate imaging and treatment, two studies about ultrasound-guided transperineal laser ablation (TPLA) in the treatment of benign prostatic hyperplasia using US/MRI fusion demonstrated that TPLA is feasible, safe, and cheap treatment of BPH, with good clinical results at 6 and 12 months follow-up (RPS 1107-3). Two studies demonstrated the clinical utility of the PCA radiological estimation of change in sequential evaluation (PRECISE) MRI system in the follow-up of PCA patients on active surveillance (RPS 1107-2, 1107-6) and another group concluded that targeted MRI/US fusion-guided biopsy can supplement systematic transrectal ultrasound-guided biopsy (RSP 1107-10). Feasibility of a second-generation MR-compatible remote-controlled manipulator (RCM) for transrectal focal laser ablation in patients with PCA was evaluated and demonstrated as safe and feasible for performing transrectal MRI-guided focal laser ablation using a MR-compatible RCM (RPS 1107-12).

In the session about new computed tomography (CT) protocols for renal masses and stones, interesting data are shown regarding low-dose imaging. Ultra-low-dose CT was shown to be capable to detect stones with diameter ≥ 3 mm and is the modality of choice for follow-up, due to radiation dose comparable to kidney-urethra-bladder (KUB) radiography (RPS 1407a-2). ResNet-automated detection of kidney stones was introduced utilizing machine learning protocols in image interpretation with excellent capability of algorithm to detect stones (RPS 1407a-12). Perfusion CT and dual-energy CT were shown to have high diagnostic accuracy and capability to distinguish between renal cell carcinoma subtypes, while dual-energy CT involved significantly lower radiation dose (RPS 1407a-7).

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In the sessions dedicated to female imaging, proteomics was studied as a potential to integration with CT-based qualitative and texture features in high-grade serous ovarian cancer (RPS 1007-6). In the study using DWI with ultra-high b value at 3T, the better image quality was obtained and thus improved cervical cancer diagnosis (RPS 1007-10). It was also shown that multiparametric MRI-based radiomics analysis for preoperative assessment of uterine cervical cancer aggressiveness could provide a non-invasive approach in clinical practice (RPS 1007-9). One study on endometriosis has determined that DWI and DCE-MR significantly add to conventional MRI in differentiating benign from malignant endometrial lesion (RPS 1407b-6). It was also demonstrated that MRI is accurate in predicting postoperative complications in endometriosis (RPS 1407b-3). Regarding endometrial cancer (EC), multiple b value DWI-derived parameters were shown to provide additional information for grading EC, which could be helpful in treatment planning and prognosis evaluation (RPS 1407b-7), while three-dimensional turbo-spin-echo amide proton transfer-weighted (3D TSE ATPw) imaging is feasible in type I endometrial carcinomas (RPS 1407b-8). Additionally, clinical radiomics fusion model can improve the performance in characterising T2-hyperintense uterine mesenchymal and mixed tumours, and can outperform experienced radiologists (RPS 1407b-10).

In the session about kidney and bladder issues, new concepts of problem solving are introduced. The French Society of Genitourinary Imaging provided recommendations with aim to standardize MRI examinations based on two questionnaires and current criteria (RPS 1707-12). Prospective single-centre observational study emphasized Vesical Imaging-Reporting and Data System (VI-RADS) as a valuable clinical tool for assessment of bladder cancer grading and invasiveness (RPS 1707-9). VI-RADS was proved as accurate for distinguishing patients with muscle and non-muscle invasive bladder cancer and thus selecting patients which are candidates for repeated transurethral resection procedure (RPS 1707-14). DWI and apparent diffusion coefficient (ADC) was introduced as a novel marker of aggressiveness in non-muscle invasive bladder cancer (RPS 1707-15). Three studies about blood oxygen level-dependent (BOLD)-MRI showed BOLD as a promising tool for differentiation between acute rejection and acute tubular necrosis among patients who underwent renal transplantation. Medullary oxygenation values obtained by BOLD-MRI were also shown as important index for evaluating renal function in chronic kidney disease (RPS 1707 1-3).

Finally, new ultrasound modalities, CEUS and sonoelastography have many potential applications in the genitourinary system. Single-centre study suggested CEUS as an

alternative to define a Bosniak score of complex renal cysts when CE-CT is contraindicated (RPS 607-9). CEUS was found useful for accurate evaluation and differentiation of benign and malignant solid renal masses (RPS 607-4). CEUS was shown to be able to detect vascularity after percutaneous cryoablation of renal tumours (RPS 607-1). In a study about complex adnexal masses, CEUS was superior over conventional US in characterization of masses, having the potential to reduce the number of biopsies and diagnostic laparotomies (RPS 607-3). Cost-effective analysis suggested to use CEUS for characterisation of non-palpable testicular lesions (RPS 607-5). Shear wave elastography (SWE) was proven highly sensitive and specific for the detection of prostatic cancer among patients with elevated PSA and benign hyperplasia, and it could help to avoid unnecessary biopsies in cases of elevated PSA, prostatomegaly and negative SWE (RPS 607-7). Strain elastography has been increasingly used in the assessment of the cervical canal at 12–14 weeks of pregnancy and was able to detect patients with a higher risk of preterm delivery (RPS 607-6).

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Methodology

• Editorial

Reference

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