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Aortic valve replacement with free style stentless bioprosthesis: Our experience

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Objective: Stentless aortic valves were designed to provide a more physiological flow pattern and lower transvalvular gradient, which may have an important bearing on postoperative left ventricular function and remodeling. In this study, we reviewed and analyzed the 10-year clinical results with the Freestyle valve (Medtronic, Inc.) and its hemodynamic performance by serial echocardiography.

Material and Method: Between 2005 and 2015, 72 patients underwent aortic valve replacement with the Freestyle prosthesis (sub coronary and root replacement procedures). Sub coronary implantation was performed in the cases of aortic valve stenosis or regurgitation and complete root replacement technique in aortic valve stenosis or regurgitation with dilated aortic root.

Result: Out of 72 patients, males are 65 (90.2 %) and females are 7 (9.8 %). Mean patient age was 67.3 years. Aortic stenosis in 40 (55.5 %) patients, aortic regurgitation in 10 (13.8 %), combined lesion in 19 (26.3 %), and dilated aortic root in 3 (0.4 %). The operation was performed by subcoronary technique in 69 (95.8 %) patients, and root replacement in 3 (4.2 %). The average bypass time was 51.1 min for subcoronary technique and 122.1 min for root replacement technique. Patients' average follow-up was 24 months and echocardiography was performed preoperatively, at discharge, at 3 to 6 months, and annually thereafter. The 30-day operative mortality rate was 3 (4.1 %), with an overall actuarial survival rate of 69 patients (95.8 %) at 2 years. Among postoperative complications, ten (13.8 %) required temporary pacing and one required permanent pacemaker implantation. Of the three deaths, only two were cardiac related and one was due to cerebrovascular attack. No patient required reoperation on the aortic valve for any reason, including structural degeneration, nonstructural dysfunction, or prosthetic valve endocarditis. Hemodynamically, the mean transvalvular gradient significantly decreased after valve replacement and was reduced further by 39 % by 6 months with a corresponding increase in effective orifice area. Left ventricular mass index fell to 77 % of the preoperative value by 2 years.

Conclusion: The Freestyle stentless valve can be implanted safely in the elderly with excellent midterm clinical results. It has superb hemodynamics in terms of residual transvalvular gradient, effective orifice area, and regression of left ventricular hypertrophy.

Aortic valve repair—our experience

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Objective: Aortic valve (AV) replacement is a standard treatment for AV disease, but in children and young female, there is the need for reconstructive procedure. Despite progress in design and construction of prosthetic valves, long-term results of AV replacement among tissue and

mechanical valve are the same (Dukes, series). Major impetus of AV repair was provided by AV sparing operation success (David and Yacoub procedures). AV repair of aortic insufficiency (AI) is gaining widespread acceptance.

Material and Method: In this series, we are presenting results of ten cases of AV repair in AI from 2011 till date. Out of ten cases, eight were combined procedures and two were the isolated cases. Aortic valve were tricuspid in nine cases and bicuspid in one case. Mean age was 16.2 years (7–63 year), and male-to-female ratio was 1:1. Cuspal prolapse was present in eight cases (type II) and root dilation was present in two cases (type IC). Double valve repair was done in four cases, VSD patch closure was done in four cases, aneurysm of valsalva repair in one case, and two cases were the isolated procedure. Cuspal prolapse (type II) was treated with central leaflet plication in all cases, and root stabilization was done with sub commissural annuloplasty in all cases.

Result: All patients were checked for AI on the operating table and immediate post operative period and AI more 1+ is not acceptable. There was no mortality in this group. Follow-up study is 100 % complete, and mean follow up is up to 18 months. One patient had progressing of AI after 1 year of follow up due to recurrence of rheumatic activity and still being managed medically.

Conclusion: Long-term results are very encouraging as freedom from valve-related complications is 92 % at 10 year follow up (Aicher et al.). Similar report of long-term results are published by Cleveland and Mayo clinics groups. Autologous pericardium leaflet replacement of AV was extended to stenotic lesion also. In conclusion, AV repair is very safe, effective, and reproducible procedure in AI cases especially in children and young female.

Different types of management for ascending aortic dilatation after rheumatic aortic or multivalvular lesions of the heart simple, safe, and effective approaches our centre experience

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Objective: Ascending aortic disease encompasses a range of disease states varying from degenerative, structural, genetic, and valvular origin especially rheumatic valvular disease affecting the population subgroup of the Indian subcontinent. Herein, we present our center experience of various novel techniques and indications of management of ascending aortic dilatation based on the morphology of the diseased aorta.

Material and Method: The study included 162 patients undergoing aortic valve replacement, surgical management of dilated ascending aorta, along with definitive management of other associated valvular disease from the period 01.02.2014 to 01.02.2015. Mechanical heart valve prosthesis were used, based on:

1. The morphologic appearance of ascending aortic dilatation.
2. The thickness and wall structure of the aorta—both assessed intra operatively. The following surgical modalities were employed:

- (a) Multiple plication sutures along the dilated lateral curvature of the ascending aorta.
- (b) Ascending aortic wrapping with woven Dacron tubular graft (24 to 28 mm as per need).
- (c) Free ascending aortic replacement interposition grafting with woven Dacron tubular graft (24 to 28 mm as per need). Concomitant mitral and tricuspid valve replacement/repair were also carried out as per indication.

Result: The mean age of the group was 42.7 years (range 18 to 74 years). Fifty-one (31 %) patients underwent lateral plication, 45 (27 %) underwent free ascending aortic replacement, and 66 (40 %) underwent aortic wrapping. For concomitant valve procedures, 24 (14 %) patients underwent mitral valve repair and tricuspid valve annuloplasty. Nine (5.5 %) patients underwent mitral and tricuspid valve replacement. Sixty (37 %) underwent mitral valve repair. Sixty-nine (42 %) underwent mitral valve replacement. None of the patients required re-operation. There were no infection related complications to the graft or any mortality. The mean pre operative diameter of ascending aorta was 58.2 ± 6.4 mm (range 46 to 84 mm). The post operative diameter was 32.5 ± 8.7 mm (range 24 to 48 mm).

Conclusion: Dilated ascending aorta >5 cm needs to be managed surgically along with treatment of underlying valvular disease. Rheumatic heart disease is a major etiologic factor in the Indian subcontinent. Depending on the morphologic nature of dilation, the various techniques described offer the best possible corrective procedure with optimum results.

Comparison of noninvasive and intraoperative measurement in preoperative assessment of aortic annulus dimensions

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Objective: Precise preoperative assessment of aortic annulus diameter is crucial for valve sizing in patients planned for transcatheter aortic valve replacement. Computed tomographic (CT) and echocardiographic measurements of the aortic annulus may yield different results because of its elliptical shape. This study was undertaken to compare the measurement of aortic annulus intraoperatively with noninvasive methods in patients undergoing aortic valve replacement.

Material and Method: Aortic annulus diameter was measured with cardiac CT and transesophageal echocardiography (TEE) prior to open aortic valve replacement in 30 patients with aortic valve stenosis. In CT, aortic annulus dimensions were measured in coronal plane, sagittal oblique plane, and by planimetry. Both two-dimensional and three-dimensional TEE were used. These were compared with intra-operative measurements done by valve sizers. Pearson analysis was applied to test for degree of correlation.

Result: CT in coronal and sagittal oblique plane tends to overestimate the diameter of aortic annulus when compared with intraoperative measurements (coefficient of relation, $r = 0.798$ and 0.749 , respectively). CT measurements in single oblique plane showed a weaker correlation with intraoperative measurements than 3D TEE and 2D TEE ($r = 0.917$ and 0.898 , respectively). However, CT measurements by planimetry method were most correlating with the intraoperative measurements ($r = 0.951$).

Conclusion: Three-dimensional view non-invasive investigations (CT-based measurement employing calculated average diameter assessment by planimetry and three-dimensional transesophageal echocardiography) showed better correlation with intraoperative measurement of aortic annulus. CT-based aortic annulus measurement by planimetry seems to provide adequate dimensions most similar to operative measurements.

Early outcomes after aortic valve replacement, in 906 patients, older than 70 years of age—The Brazilian Aortic Valve Replacement Study (BRAVARs)

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Objective: Transcatheter aortic valve implantation (TAVI) becomes an established intervention, for management of high-risk patients with aortic stenosis. Despite the fact that the Heart Team is mandatory to decide which type of treatment should be performed in a certain patient, a comparison of results, between techniques, should be done. To stratify patients morbidity and mortality, patients, older than 70 years, who underwent isolated aortic valve replacement (AVR), by conventional bypass technique, were evaluated.

Material and Method: A retrospective cohort study, between Jan/2001 and Dec/2011, in patients who underwent AVR from 9 Brazilian centers, enrolling a total of 906 patients. All the data was collected and stored in one center (RMSA) and analyzed in another (JCL), being this analysis blind.

Result: The mean age was 75.93 ± 4.60 years, being 53.86 % men. The estimated mortality ranged from 5.87 to 40.57 % calculated with EuroScore II (ES) index. The surgery was elective in 96.48 % and biological prostheses were used in 894 patients, due to age and patients choice. The valve diameter most frequently implanted was that of number 23 mm in 42.39 % of the group. The mean cross clamp and bypass time were, respectively, 57.60 ± 19.16 and 72.59 ± 22.85 min. The length of stay at ICU was 4.38 ± 6.27 days and the length of stay in the hospital was 11.02 ± 11.66 days. The hospital mortality, considering 30 days, was 4.63 %, being sepsis and cardiogenic shock the most frequently causes of death. A sub analyses on patients older than 80 years ($n = 206$) with a mean age of 82.66 ± 2.55 years was performed, with no statistical difference from the all group. The OR for variables age, sex, bypass time, and ES were calculated. Risk factor for death, by logistic regression were ES, above 10 %

Conclusion: Conventional AVR, in patients above 70 years of age, is safe with an acceptable risk for the overall group, and the depending variables found were ES and bypass time. These data should be the golden standard for any type of procedure, such as TAVI, and should be taken into account when discussing between Heart Team.

Sutureless aortic valve replacement: early outcomes from a single centre

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Objective: The aim of this study is to evaluate the immediate and early outcomes after the implantation of sutureless Edwards Intuity aortic valve bioprosthesis.

Material and Method: Fifty patients (mean age 80.05 ± 5.3 years, mean logistic Euroscore 9.84 ± 4.84) underwent aortic valve replacement (AVR) with Intuity Elite Sutureless Valve System via full or mini-sternotomy.

Result: The Intuity Elite Sutureless Valve System was successfully implanted in all patients, except one (success rate, 98.2 %). In-hospital mortality was 1.81 % (one patient post-AVR plus coronary surgery). Octogenarians constituted 63.37 % of the cohort, with no mortality in this subgroup. The mean aortic cross clamping time was 53.86 ± 20.33 min, significantly lower for isolated AVR, 42.29 ± 12.6 min, than for AVR plus other concomitant procedures, 65.33 ± 20.43 min, $p > 0.01$, or the aortic

cross-clamping time (52.64 vs. 53.76 min, $p > 0.01$). Mini-sternotomy patients experienced a shorter hospital stay—7.5 vs. 19.3 days.

Conclusion: Aortic valve replacement with Intuity Elite Sutureless Valve System is associated with excellent immediate and early outcomes in high-risk patients and appears to provide satisfactory clinical and hemodynamic results. It is an easily reproducible technique with a very low incidence of implantation failure. Minimally invasive approach can be considered and provides a faster recovery.

Are we under-sizing aortic valve replacements? South Indian scenario

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Objective: A use of small aortic valve prosthesis causes adverse effect post-operatively like LVOT obstruction and persistent transvalvular gradients. This study examines the correct size of prosthetic valve with respect to BSA of the patient undergoing AVR and potential prosthesis patient mismatch on long-term survival.

Material and Method: All patients under went AVR irrespective of age and sex was included in our study group. Associated mitral, tricuspid, or pulmonary valve pathology and AVR with CABG were excluded. Fifty-one patients who underwent AVR in our institution during the period June 2011 to September 2015 are include in our study group.

Result: Out of 51 cases that underwent aortic valve replacement during the study period, 3 patients died (5.88 %) during the course in the hospital post-operatively due to varied reasons. Fifteen patients (29.41 %) with pure aortic regurgitation were on high inotropic support(s) for 4 ± 2 days postoperatively.

Conclusion: AVR is always a challenging procedure in cardiac surgery. It is at most important to avoid coronary orifices while placing the valve and proper sizing to avoid LVOT obstruction and mismatch. Our study has concluded EOA: BSA ratio of $>0.75 \text{ cm}^2/\text{m}^2$ may avoid residual LVOT obstruction and persistent transvalvular gradient.

The expanding indications of unidirectional valved patched to manage patients with advanced pulmonary arterial hypertension

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Objective: Severe pulmonary arterial hypertension is not uncommon in patients with congenital heart diseases, and many of these patients are considered to be inoperable. A novel approach to these patients has been the use of a valved patch to prevent right ventricular decompensation secondary to elevated right-sided pressures. In this paper, we present our experience and expanding indications of this technique.

Material and Method: Between 2006 and 2015, 45 patients underwent surgery for congenital heart disease and pulmonary hypertension using the technique of valved patch. Their preoperative, intraoperative, and postoperative details with details of follow up are analyzed and presented.

Result: The study includes patients of VSD ($n = 29$), TAPVC ($n = 2$), dTGA with VSD ($n = 10$), truncus arteriosus ($n = 1$), and aortopulmonary window with VSD ($n = 3$). The mean age of these patients was 40.8 ± 48.4 months. The mean preoperative PVRI was 10.1 ± 2.2 Wood units. Three patients after VSD closure had right to left shunting in the early postoperative period. Mean follow up was 28 ± 13.7 months. At the most recent follow up, none of the patients had any shunting across the valved

patch and had systemic saturations of above 95 %. Postoperative saturation was above 95 % in all patients with frequent episodes of systemic desaturation due to right to left shunting across the UVP. There were no early or late deaths.

Conclusion: The technique of unidirectional valved patch is a reproducible, easy, and effective technique to manage patients with severe pulmonary hypertension and borderline operability

TCPC—15 years experience at SSSIHMS, Whitefield

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Objective: The aim of this study is to analyze the data spanning one and a half decade of a single institution of various strategies of total cavopulmonary connection.

Material and Method: This is a retrospective study of 52 patients who underwent TCPC from January 2001 to September 2015.

Result: Fifty-two patients underwent TCPC over a span of 15 years at our institute for diagnoses of DORV, non routable VSD and PS (25 %), tricuspid atresia (38 %), DILV/VSD/PS (1.9 %), common A-V valve (1.9 %), hypoplastic TV/RV (11.5 %), single ventricle (13.4 %), TGA/VSD/PS (3.8 %), and tricuspid atresia with supracardiac TAPVC (1.9 %). Prior staging was done in 44.23 % patients of which 43.47 % underwent prior BD Glenn, 47.82 % underwent prior modified Blalock-Taussig shunt, and PA banding in 8.6 %. Average period between MBT and TCPC was 7.4 years and between BD Glenn was 6.2 years. Cath study was done in 27 patients, and the average mean PA pressures at TCPC was 12.4 mmHg. The median age in the lateral tunnel group was 7.5 years and in the extracardiac conduit group was 16 years. Lateral tunnel fenestrated TCPC was done in 28.84 %, ECC off pump fenestrated in 7.69 %, ECC on pump fenestrated in 38.46 %, ECC on pump non fenestrated in 9.6 %, and ECC off pump non fenestrated in 15.38 %. Mortality among staged TCPC was 26.08 % and among single stage FONTAN was 10.34 %. Post TCPC 5 year survival was 68.66 % with intracardiac and 63.21 % with ECC. No significant difference in ICU stay and length of stay between the on and off pump ECC was noticed. PA pressures, prior shunt, A-V valve regurgitation, and ECC were the risk factors for early and late Fontan failure.

Conclusion: Careful case selection is imminent in prevention of fontan failure and early and late mortality.

Cortiatratrium sinister 22 years experience from a single centre

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Objective: Cortiatratrium sinister 22 years Experience from a single centre

Material and Method: A retrospective study of 20 consecutive patients of cortiatratrium was done who underwent surgical correction at our institute between November 1993 and August 2015. There were 9 males (45 %) and 11 females (55 %). Nine patients were less than 10 years of age (children, [$n = 7$], 35 %; adolescent, [$n = 2$], 10 %). Fourteen patients (70 %) had a communication between the right atrium and either the proximal or distal chamber. Sixteen patients (80 %) had atypical cortiatratrium. Median age at presentation was 9 years (range, 1 to 32). Seven patients (35 %) had presented by 5 years of age. All patients ($n = 20$) underwent elective surgery. Median age at operation was 11 years (range, 2 to 32). All (100 %) underwent preoperative transthoracic echocardiography. Seven patients (35 %), all with atypical cortiatratrium, required

cardiac catheterization for diagnosis. Nineteen patients (95 %) were correctly diagnosed before treatment. All patients were treated surgically. The defect was approached through the right atrium in 14 patients (70 %).

Result: No early or late mortalities were reported. Follow-up was 85 %. At a median follow-up of 12 months (range, 2 to 36), all patients including those with atypical cortriatrium were in New York Heart Association function class I. Post-repair survival was 100 % at 5 and 15 years.

Conclusion: Cortriatrium is a rare congenital anomaly. Diagnosis can be done by conventional echocardiography. Magnetic resonance imaging gives excellent anatomical delineation. Surgery offers good early and long-term results for both classic and atypical cortriatrium.

Trans right atrial, transinteratrial septum approach for closing multiple muscular and apical ventricular septal defects

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Objective: Multiple ventricular septal defects (VSD) are difficult to close. In this report, we describe a simple and safe technique of closing multiple muscular and apical VSDs.

Material and Method: Between January 2010 and December 2013, 52 patients with a muscular VSD either in isolation or in association with other congenital heart disease underwent surgery using this technique in which a black silk thread was passed through the suspected VSD opening into the left ventricle and brought out through the mitral valve and the interatrial septum. Sutures were placed around the silk thread to close the VSD.

Result: Out of 52 patients, 34 were male; age ranged from 45 days to 5.5 years. In addition to the large subaortic/large muscular VSD, 3 additional VSD were present in 34 patients, 2 additional VSD were present in 13 patients, and 5 patients had Swiss Cheese septum. The VSD were mid-muscular in 35 patients and were apical in 17 patients. Eleven patients had associated complex lesions. Intraoperative trans-esophageal echocardiograms did not reveal any significant residual shunt in any of these patients. There was no step up on oximetry. There was one hospital death due to sepsis. Follow up was available in 48 patients, and 3 patients were lost to follow up. At follow-up, no patient had a residual VSD.

Conclusion: The biventricular approach through trans right atrial, trans interatrial septum using a thread through the hole method for closing multiple muscular VSD is effective with no persistent residual defects.

Aortopulmonary window: results of repair beyond infancy

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Objective: The aim of this paper is to study the anatomic and hemodynamic data, and results of surgery in patients undergoing surgical repair of aortopulmonary window (APW) beyond 1 year of age in the last decade.

Material and Method: Between July 2005 and July 2015, 21 patients, 1 year of age or older undergoing surgical correction of APW were analyzed. Data studied included details of intraoperative management, postoperative clinical and echocardiography follow-up. Median age at repair was 4 years (range 1 to 12 years). Median weight at repair was 12 kg (range 3.5 to 22 kg). Fourteen patients had type I, five patients had type II, and two patients had type III APW. Six patients had complex APW. Preoperatively, all patients had severe pulmonary arterial hypertension. Cardiac catheterization was performed preoperatively on 12 patients. Mean pulmonary artery pressure and indexed pulmonary vascular resistance index was

65.7 mmHg (range 28 to 91 mmHg and 6.2 units m^2 (range 0.2 to 32 units m^2) respectively). Patch repair of APW was performed using the sandwich method (transwindow) ($n=13$; 62 %), transaortic ($n=4$; 19 %), and transpulmonary artery ($n=1$; 4.7 %) approaches; two patients underwent double ligation ($n=2$; 9.5 %) and one underwent division and suturing ($n=1$; 4.7 %). One patient underwent valved patch closure of APW and one patient underwent valved patch closure of VSD. Duration of follow up ranged from 2 months to 8.1 years (mean = 3.8 years).

Result: There were two in hospital deaths (one due to sepsis and other due to irreversible PAH). All patients were in NYHA Class I at last follow up. Echocardiography revealed normal biventricular function in all patients except two, who had mild to moderate tricuspid regurgitation and residual pulmonary hypertension. Two patients had small residual VSD, and none of them had residual APW shunt. There were no late deaths or reoperation.

Conclusion: Surgery for aortopulmonary window can be safely undertaken in carefully selected patients beyond infancy with acceptable post-operative outcomes.

Assessment of vasoactive inotropic score for prediction of post operative outcomes in cyanotic infants undergoing open heart surgery

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Objective: Prospective clinical assessment of vasoactive inotropic score (VIS) as a tool for predicting post operative outcomes in cyanotic infants after cardiopulmonary bypass surgery.

Material and Method: In this prospective observational study, post operative outcomes were analyzed in 77 cyanotic infants (less than 1 year age) operated between September 2014 and October 2015. Inotropic score (IS) and vasoactive inotropic score (VIS) were calculated for all patients at 1, 24, and 48 h after surgery.

Result: Mean surgical age was 7.16 months (7 days to 12 months) with 85 % infants being male (66/77). Twenty percent of the patients (15/77) had single ventricular physiology and bidirectional Glenn operation was performed in these patients. Based on spearman analysis, maximum VIS score at 24 h was found strongly associated with poor outcome variables such as high peak serum lactate ($R +0.78$, p).

Conclusion: In cyanotic infants undergoing cardiac surgery, higher VIS scores at 24 and 48 h were strongly associated with poor post operative outcome and is a good assessment tool for requirement of resources in post operative care.

Long-term results of ALCAPA repair in the Indian population: The Madras Medical Mission Experience

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Objective: The natural history of patients with anomalous left coronary artery from pulmonary artery (ALCAPA) is poor due to significant left ventricular dysfunction and dilation. Surgery for ALCAPA is associated with remarkable improvement in outcomes. We assessed the operative outcome in the Indian scenario.

Material and Method: A retrospective review of all patients with ALCAPA operated in The Madras Medical Mission from January 2001

to October 2015 was done. Preoperative and postoperative ventricular function, mitral regurgitation, and left ventricular dimensions were assessed by transthoracic echocardiography.

Result: Thirty patients (age range from 1 month to 50 years) underwent surgical repair for ALCAPA. Preop LV EF ranged from 8 to 70 % (14 had severe LV dysfunction and 12 had grade 2 or more MR). Majority of patients underwent direct reimplantation ($n=20$), four had reimplantation with pulmonary artery flap augmentation, four underwent Takeuchi repair, one underwent modified Takeuchi, and one had ligation followed by CABG. There was one operative mortality, no major morbidity, and no late mortality till last follow up (maximum follow up of 12 years). Surgery resulted in remarkable improvement in functional class, LVEF, and mitral regurgitation.

Conclusion: Surgical repair of ALCAPA can be performed even in patients with severe left ventricular dysfunction with excellent short- and long-term results. Our results are comparable to other published results in literature.

Our experiences in surgical outcome of D-transposition of great arteries with ventricular septal defect, pulmonary stenosis

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Objective: Surgical management of D-TGA VSD PS is a challenge, and arterial switch cannot be done because PS will become significant aortic stenosis. Treatment options include initial palliation when indicated then followed by corrective surgery. They are Rastelli procedure, REV, Nikaidoh, and some go for univentricular repair. In this study, we report our experience in managing this surgically challenging subset

Material and Method: Retrospective study was conducted in our institute from 2010 to 2015 who underwent surgical repair for d-TGA VSD PS. Pre operative clinical findings, echo parameters, catheterization data, type of surgery, ICU stay, in hospital mortality, and follow up for a period of 1 year were analyzed.

Result: Between 2010 and 2015, 14 patients ($n=14$) underwent surgery for D-TGA VSD PS. Palliative RMBT was performed in 4 ($n=4$) patients while in follow up among this one underwent bidirectional Glenn shunt. Remaining three patients are in regular follow up for biventricular repair. BDG was performed in four patients (28 %). Biventricular repair was done in seven patients ($n=7$) Rastelli was done in three ($n=3$), and Nikaidoh was performed in four patients ($n=4$). There were no in hospital mortality. Three-month follow up was 100 %. There was no significant LVOT gradient in the biventricular repair group. None required any reinterventions during the follow up period

Conclusion: Even though different surgical options are available for this condition, biventricular repair can be safely performed, should be the standard of care. Aortic root translocation technique of Nikaidoh procedure is a good alternative to Rastelli procedure. Univentricular repair should be reserved only for patients with hypoplastic ventricles. Thorough preoperative work up is necessary to plan the suitable treatment modality.

Ductal stenting implications at subsequent surgeries

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Objective: In the current era, ductal stenting is an increasingly adopted palliative option in complex congenital anomalies to increase/maintain

pulmonary or systemic blood flow. Surgical repair after PDA stenting is not uncommon. This study was performed to analyze the surgical consequences of PDA stent at the time of surgical repair.

Material and Method: Retrospective analysis was done, of the data from all patients with previous ductal stenting, who had undergone surgery between January 2006 and November 2015. Preoperative, intraoperative, and postoperative variables had been reviewed. Intraoperative findings including the status of the branch pulmonary arteries and the need for reinterventions have been analyzed.

Result: Eleven patients underwent surgery in the study period with 9 duct-dependant pulmonary circulation physiology and 2 with duct-dependant systemic circulation physiology. Furthermore, 7/11 were males and 4/11 were females. The mean age is 14.05 ± 9.95 months. One patient had an emergency BT shunt in view of Instent thrombosis, and 1 patient needed an additional balloon dilatation of pulmonary valve after stenting. The median interval between ductal stenting and elective surgical correction was 13.19 ± 8.5 months. Preoperatively, three patients (27.27 %) were with mild ductal stenosis and one patient (9.09 %) with severe Instent restenosis. Intraoperatively, the duct was divided and partially retrieved in five (45.45 %), completely explanted in two (18.18 %), and stent clipped in four (36.36 %). Six patients (66.67 %) needed reconstruction of PA confluence, two (22.2 %) needed LPA reconstruction, and one (9.9 %) had RPA reconstruction. There was one in-hospital death on the 14th postoperative day. The mean follow up duration is 16.538 ± 13 months with 6 (66.67 %) more than 1 year follow up. Four patients (36.36 %) underwent additional interventions, and one patient (9.09 %) had an intervention on branch pulmonary arteries.

Conclusion: Surgical procedures after PDA stenting are increasingly common. PA confluence plasty was required in majority of the patients, while branch PA plasty was needed in 30 % of the patients. Re-interventions on the branch pulmonary arteries were noted in about one third of the patients and further follow-up is ongoing to define the late complications with the branch pulmonary arteries.

Surgical treatment of patent ductus arteriosus in patients operated in the neonatal period

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Objective: The patent ductus arteriosus is a congenital disorder characterized by incomplete closure or non-closure of the ductus arteriosus after birth. Surgical treatment, in the neonatal period, is indicated when the clinical treatment failed or there is contraindication for it. The aim of this study is to identify the morbidity and mortality of neonates submitted to cardiac surgery for correction of patent ductus arteriosus, in a non pediatric unit of cardiovascular surgery.

Material and Method: A retrospective study of 22 neonatal patients, undergoing surgical correction of patent ductus arteriosus, was performed, in a period of 8 years, from December 2007 to June 2015.

Result: Female gender was predominant in 80 %, and the mean gestational age was 27.71 ± 2.95 weeks. The mean birth weight was 1214.32 ± 855.37 g, being the less weight 450 g. The diameter of the ductus arteriosus was in average 2.82 mm ($DP \pm 0.94$). Associated pathologies were present in 80 % of the patients and 64.70 % underwent premedical treatment. There was no operative mortality in this group of patients. Time of hospital stay in these patients was related to gain of weight, being 2 kg the minimum to be discharged. Due to this, the mean hospital stay after the correction of the heart defect was 97 days. Three patients died in ICU due to complications of other congenital malformations, such as neurological and gastrointestinal

Conclusion: The surgery is the recommended treatment after failure of conventional medical treatment. It presents good results and no mortality, related to the cardiac surgery.

Total anomalous pulmonary venous connection primarily presenting beyond first decade of life

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Objective: The aim of this study is to assess the presentation and surgical outcome of total anomalous pulmonary venous connection presenting for the first time after the first decade of life.

Material and Method: Study design: Open prospective study. Fifteen cases of total anomalous pulmonary venous connection were detected from January 2013 to August 2015 and were prospectively followed up for evaluating the surgical outcome. Demographic profile noted. NYHA class and two-dimensional echocardiography were compared pre and post operatively. Surgical complications and results were analyzed.

Result: The mean age of presentation was 23 ± 1.4 years (13–42 years) with 55% being males. All patients had right-sided volume overload with signs and symptoms varying from mild cyanosis to impending failure. Thirteen patients were in NYHA class II and 2 were in NYHA class III. In accordance with Darling's classification, 12 cases were classified as supracardiac type and 3 as cardiac type. Severe pulmonary arterial hypertension was detected in 11 while 4 had moderate pulmonary arterial hypertension. Six patients had significant degree of right ventricular dysfunction. Ten patients underwent complete repair with resultant non-obstructed connections between the left atrium and the pulmonary common veins. The supracardiac variety were operated using retrocardiac approach while the intracardiac ones were approached through right atrium. The remaining six patients did not consent for surgery due to socio-financial reasons. One patient was re-explored for haemorrhage. Follow-up was 30 months (mean 16 months). Two patients required oral medication for arrhythmias. There were no early or late deaths. All operated patients were in NYHA class I. In all operated cases, echocardiography validated normal right and left ventricular function with reduction in pulmonary arterial pressures.

Conclusion: Surgical management of total anomalous pulmonary venous connection is safe in patients naturally surviving beyond childhood at selective high volume centers. Natural history for reasons of late presentation requires review. Operative and post-operative strategy should be individualized.

Is there still a role of central shunt for palliation of complex congenital heart diseases in this modern era: our centre experience

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Objective: Most patients of complex congenital heart diseases are not fit for total correction or if they are fit, the facility for total correction is not available. These large number of patients die without getting any type of treatment. We operated patients with small but confluent pulmonary artery which was not fit for total correction. We did central shunt using appropriate size of Gore-Tex graft ranging 6 to 8 mm based on patient body weight. We choose central shunt because it supplies the blood in both lungs and provides uniform growth of pulmonary trunk. Laying down of shunt during total correction is easy.

Material and Method: We make an S loop of central shunt graft so it does not come below the sternotomy. We did end to side anastomosis using 6/0 and 7/0 Prolene suture. On serial arterial blood gas analysis, there is rise of PO_2 and SPO_2 .

Result: The procedure was performed without cardiopulmonary bypass in 18 cases. Shunt sizes from 6 to 8 mm were employed. After operation, the oxygen saturation increased significantly from 62.2 ± 7.2 to 92.2 ± 3.8 %. Major shunt-related complication included congestive heart failure.

Conclusion: Central shunt increases oxygen saturation with a relatively low incidence of congestive heart failure (CHF). The adequate post-operative survival, low morbidity and mortality, and less technical difficulty of this procedure make it a more desirable treatment for complex cyanotic congenital heart diseases, which are not fit for total correction.

Mitral valve repair in children with congenital mitral valve disease—a single center experience

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Objective: Management of mitral valve diseases in pediatric patients is challenging due to a wide range of presentations and association with concomitant congenital lesions. Clinically significant congenital valve lesions are rare but range from a cleft in the anterior mitral leaflet to complex mitral stenosis of Shone's complex. We evaluated the results of mitral valve repair in patients operated at our center in the last 5 years.

Material and Method: From 2010 onwards, 26 patients (13 male, 13 female) with ages ranging from 4 days to 10 years (mean 3.75 years) and mean weight 11.48 kg (range 5.5 to 20.5 kg) underwent mitral valve repair at our center. All patients had associated anomalies which were repaired concomitantly. Ostium primum ASD repair was the most common associated repairs (ten cases) followed by VSD repair (nine cases), arterial switch, intracardiac repair for tetralogy, and ALCAPA repair (one each). Concomitant tricuspid valve repair was done in three patients. All the patients had moderate to severe mitral incompetence. The surgical techniques for mitral valve repair included closure of cleft in AML (nine cases), cleft closure in PML (seven cases), chordal splitting for fused chordae (one case), commissurotomy for fused commissures (three cases), papillary muscle splitting for fused papillary muscle (two cases), commissural plication (two cases), neochordal construction (four cases), and mitral annuloplasty. Mitral valve replacement was not required in any patient.

Result: There was one hospital death (due to severe PA crises on the third post-operative day). The average ICU stay post-operatively was 5 days, and average hospital stay was 11.69 days. Pre-discharge and follow up echocardiography showed only trivial to mild MR in 20 patients and no MR in remaining. There were no re-operations so far, and all the patients are on regular follow up and NYHA functional class I or II.

Conclusion: Mitral valve repair is feasible and effective modality to manage mitral valve disease associated with congenital heart disease.

Histopathological changes in aorta and pulmonary artery in patients with d-transposition of great arteries undergoing arterial switch operation: a prospective study

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Objective: Following the arterial switch operation, there is a risk of neo-aortic root enlargement, and aortic regurgitation in follow-up. This study is intended to study whether abnormalities in the histopathological finding of the neo-aorta at the time of the arterial switch operation could lead to these complications.

Material and Method: Between January 2015 and November 2015, 50 consecutive patients undergoing the arterial switch operation were included in this prospective cohort study. A sufficient representative sample of tissue obtained from the native pulmonary artery and the native aortic root was fixed in 10 % neutral buffer formalin and sent to the department of pathology. These tissues were conservatively processed and paraffin blocks were made, sections were cut, and stained by H&E, Verhoeff elastic, Van Giessen, Masson's trichrome, elastic tissue, and smooth muscle was systematically accessed, in the native aorta and native pulmonary artery. Simultaneously, a note was made of all the patients pre-operative characteristics, etiology, associated cardiac anomalies, echocardiogram findings, cardiac catheterization data (if performed), intra operative details, histopathological examination of native aorta and native pulmonary artery, comparison with controls with literature, post operative course, follow up, and follow-up echocardiographic data.

Result: Fifty patients had an ASO for TGA between January 2015 and November 2015, and we examined elastic lamellar count of native aorta and native pulmonary artery and compared it with the finding described in the literature. It was found that elastic lamellar counts were similar in both the neo-aorta and the neo-pulmonary artery. Hence histopathologically, they are similar at birth; gradually as the age advances, lamellar count decreases in the neo-pulmonary artery. Hence, early surgery in patients with d-TGA may prevent against neoaortic root dilatation and aortic regurgitation

Conclusion: There were no gross differences between native pulmonary artery and native aorta histopathology, but an inverse relation was found between advancing age and elastic lamellar counts in both structures signifying the need for an early arterial switch to prevent long-term complications.

Polytetrafluoroethylene patch versus autologous pericardial patch for right ventricular outflow tract reconstruction

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Objective: Reconstruction of right ventricular outflow tract (RVOT) during repair of Tetralogy of Fallot (TOF) often requires placement of a transannular patch (TAP). The purpose of the present study was to compare the outcomes following reconstruction of RVOT using polytetrafluoroethylene (PTFE) patch versus autologous glutaraldehyde-fixed pericardial patch.

Material and Method: Fifty-three consecutive patients undergoing TAP repair for TOF in a single institute were randomized into two groups: group I (pericardial patch), group II (PTFE patch), and their postoperative outcomes in terms of postoperative rhythm, duration of mechanical ventilation, mediastinal and pleural drainage, stay in intensive care unit and hospital, were assessed. The preoperative and postoperative gradients across the RVOT, pulmonary insufficiency, and systolic right ventricular function were assessed echocardiographically by an independent cardiology team.

Result: There was one death. There was no difference between the two groups regarding the postoperative duration of mechanical ventilation, intensive care unit, and hospital stay. The requirement of inotropes was less in the PTFE patch group compared to the pericardial patch group (12.80 ± 8.04 vs. 17.30 ± 7.21 , median 10 vs. 20, $P=0.025$). The re-exploration rate in the PTFE group was higher than the other group (6 vs. 1). There was no difference in the RV systolic function between the two groups as assessed by echocardiogram before discharge.

Conclusion: RVOT reconstruction during TOF repair can safely be performed using a PTFE patch with results similar to an autologous patch of glutaraldehyde-treated pericardium. Its results in the mid- and long-term need further evaluation.

Exercise performance of patients after different types of single ventricle palliation

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Objective: Patients with univentricular physiology patients undergo bi-directional Glenn (BDG)/total cavopulmonary connection (TCPC). The optimal timing, need for primary/staged procedure, is a subject of discussion. We performed exercise testing in these patients.

Material and Method: Between January 2012 and June 2015, 117 patients who had undergone either BDG ($n=43$) or TCPC ($n=74$) underwent exercise testing.

Result: Patients with open antegrade pulmonary blood flow had a higher saturation compared to those without it (87.5 ± 5.0 vs. 81.1 ± 4.8 %; $p=0.0001$). Hospital stay (12.9 ± 7.8 vs. 9.4 ± 3.8 days; $p=0.02$) and duration of pleural effusions (9.3 ± 6.3 vs. 6.8 ± 3.1 days, $p=0.04$) was higher in patients undergoing extracardiac TCPC ($n=42$) compared to lateral tunnel TCPC ($n=32$). Fenestrated TCPC ($n=30$) patients had higher exercise capacity in the form of higher metabolic equivalents consumption (6.4 ± 2.3 vs. 5.2 ± 2.0 METS, $p=0.02$) and better postoperative outcome in the form of lesser pleural effusions (7.0 ± 3.2 vs. 9.2 ± 6.2 days, $p=0.05$) and lesser hospital stay (9.5 ± 4.0 vs. 12.7 ± 7.7 days, $p=0.04$) when compared with non-fenestrated TCPC ($n=44$) patients. Extracardiac TCPC ($n=42$) patients demonstrated better exercise capacity in the form of increased duration of exercise (15.0 ± 7.7 vs. 11.2 ± 6.2 min; $p=0.02$), increased SpO₂ at exercise (87.0 ± 8.0 vs. 83.4 ± 7.6 %; $p=0.05$) compared to lateral tunnel TCPC.

Conclusion: We observed no differences in exercise parameters of patients undergoing BDG with or without APBF. Extracardiac TCPC patients had better exercise capacity but longer postoperative hospital stay and pleural effusions compared to lateral tunnel TCPC patients. Fenestrated TCPC patients fared better when compared to non-fenestrated TCPC patients. Overall, patients who underwent TCPC had better exercise capacity than patients who underwent BDG alone.

Atrial switch operation carries acceptable results in older patients in the third world

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Objective: In developing countries, where patients present late, atrial switch operation is still a preferred palliation for d-transposition of great arteries (d-TGA). In this report, we present our experience in patients with d-TGA who were 5 years of age or older.

Material and Method: Twenty-seven patients underwent atrial switch procedure between January 2004 and December 2014. The standard technique consisted of a combination of the Senning and Mustard's repair with the Schumacker's in situ modification for construction of the pulmonary venous baffle.

Result: Median age was 8 years (mean 9.42 ± 4.9 , range 5–26 years). Anatomical variations were Dextrocardia ($n=3$), situs inversus ($n=3$), juxtapedal atrial appendages ($n=4$), and left superior vena cava ($n=6$). Median aortic cross clamp and bypass times were 63 and 105 min, respectively. Median ventilator support duration was 15 h (mean 13.7 ± 4.3 , range 6–24 h). Median intensive care unit stay was 2 days (mean 2.38 ± 0.69 , range 2–4 days). Median hospital stay was 6 days (mean 6.3 ± 1.7 , range 4–12 days). There were no early or late deaths. Median follow up duration was 46 months (mean 55.15 ± 34.71 , range 1–124 months). There were no deaths or re-operations. One patient had mild systemic venous obstruction after 4 years; one underwent embolization of aortopulmonary collaterals after 5 years. Event-free survival at 124 months was 95.2 ± 4.6 %.

Conclusion: The atrial switch operation using the described technique is low-risk, carries acceptable results, and is a valuable alternative to the arterial switch operation after left ventricular retraining or with mechanical circulatory in older patients.

Clinical application of three-dimensional (3D) printing in double outlet right ventricle with remote ventricular septal defect

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Objective: A double outlet right ventricle (DORV) with two good-sized ventricles but with a remote ventricular septal defect (VSD) often presents a therapeutic challenge. Conventional echocardiography in these complex DORVs does not provide the clarity desired to plan a biventricular repair with an intracardiac baffle. A three-dimensional (D) printed heart model was created in each case from CT/MRI-derived data that facilitated better understanding of the intracardiac anatomy. We sort to compare the 3D-printed heart model findings with echocardiography, CT, or cardiac MRI and intraoperative details when available and also to quantify the extra information obtained from the model from the radiologist, cardiologist and surgical perspective.

Material and Method: CT scan or MRI datasets were used to create true size 3D models on a 3D printer. The models were examined for accuracy and additional clarity provided to the surgeon preoperatively. Quantification of the information provided by the 3D-printed heart model was achieved by using a unique scale.

Result: Six datasets of six patients were analyzed to attempt 3D models. Five could be successfully translated into sandstone models. The age and weight of the patients ranged from 7 months to 11 years and 6.7 to 26 kg. The spatial orientation of the heart, the semilunar valves relationship with each other, and the VSD and baffle length and lie were well-appreciated in all models. Three of the five patients underwent successful biventricular repair.

Conclusion: The 3D-printed models scored over conventional imaging in most aspects of the intracardiac anatomy and surface spatial orientation. The models are a useful adjunct in preoperative assessment of complex DORVs. The unique scale helps quantify the advantages and lacunae of the 3D heart models.

Techniques for reduction of supravalvar pulmonary artery stenosis in arterial switch operation: a single centre experience

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Objective: Supravalvar pulmonary artery stenosis (SVPAS) remains a common early and late postoperative complication after arterial switch operation (ASO). We present our techniques and its outcome for reduction of postoperative SVPAS after ASO.

Material and Method: The clinical records of 48 patients who have undergone ASO from March 2013 to November 2015 were retrospectively reviewed. Postoperative echocardiogram and CT-angiogram for assessment of the SVPAS were also analyzed. Surgical techniques employed to minimize the occurrence of SVPAS were the use of large autologous untreated pericardial patch, transection of the native aorta relatively high up especially in TGA with VSD, extensive mobilization of branch-pulmonary arteries, oblique transection of the native pulmonary artery just proximal to its bifurcation, aortopexy and patch enlargement of the pulmonary artery bifurcation, and resection of a ring of the aorta.

Result: A total of 48 patients were obtained for this review. No patient had main neo-pulmonary artery stenosis. A total of eight (16.7%) patients developed significant SVPAS. These were three (6.3%) patients with

significant pulmonary artery bifurcation stenosis and five (10.4%) patients with branch pulmonary artery stenosis.

Conclusion: SVPAS remains a challenge after arterial switch operation. By employing the techniques of large autologous pericardial patch, an oblique transection of the pulmonary artery just proximal to its bifurcation, extensive branch pulmonary artery mobilization, artopexy, patch enlargement of the pulmonary artery bifurcation, and resection of a ring of the native aortic tissue, the incidence of SVPAS could be reduced.

Coronary cameral fistula out surgical experience over a period of 10 years

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Objective: Coronary cameral fistula is a rare cardiac anomaly. Most are asymptomatic and incidental findings on cardiac evaluation. Some are large-producing symptoms requiring surgical correction if not amenable to cardiac intervention. Here, we share our experience with coronary cameral fistulas being treated surgically successfully at our institute.

Material and Method: From Oct 2005 to Sep 2015, six patients underwent surgical correction for coronary cameral fistula. The age of the patients ranged from 3 to 53 years. There were four female and two male patients. The predominant symptom being dyspnea and were in NYHA II ($n=5$) and NYHA IV ($n=1$). Electrocardiogram showed sinus rhythm and volume overload with no ischemic changes in all patients. Chest X ray showed cardiomegaly with plethoric lung fields. 2D Echo showed normal biventricular function ($n=5$) and one with moderate tricuspid regurgitation and biventricular dysfunction. Coronary angiogram done in all patients delineated the fistulas. The fistulous communication was between RCA to RV ($n=1$), LCX to coronary sinus ($n=1$) and RA ($n=1$), LAD to RV ($n=2$), LAD to RA and PA ($n=1$). Associated ASD was seen in one patient. One patient in NYHA IV had LCX fistula communicating with coronary sinus and required medical stabilization before surgery. Surgical correction was done both with CPB ($n=4$) and without CPB ($n=2$). The fistula opening from RCA to RV was closed through RA. The fistula from LCX to coronary sinus corrected by opening the coronary sinus and the one from LCX to RA repaired through RA. The two fistulas arising from LAD to RV was repaired without CPB at cardiac apex. The one fistula arising from LAD to RA and PA was closed through RA and PA along with ASD closure.

Result: There was no early or late mortality. The follow up of the patients ranged from 3 months to 7 years. All patients are in NYHA I except one with moderate LV dysfunction in NYHA II and on optimal medical management.

Conclusion: Coronary cameral fistulas are rare. If they are large and producing symptoms and not amenable to cardiac intervention, they can be treated surgically successfully with or without CPB with good results.

Institutional experience surgical outcome and follow up of patients underwent repair for double chamber right ventricle

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Objective: Double-chambered right ventricle (DCRV) is a rare congenital anomaly. Stenosis of DCRV is progressive, and early surgical intervention is recommended for patients whose symptoms and/or pressure overload of right ventricular (RV) inflow are progressive. The aim of the study is to analyze about the outcome of surgical repair of double-chambered right ventricle in our centre.

Material and Method: Surgical correction consisted of resection of anomalous muscle bundles and correction of associated anomalies through right ventriculotomy, transatrially or through a combination of transatrial and transpulmonary approaches. From 2011 to 2014, 23 patients underwent surgical repair of a double-chamber right ventricle against 1473 patients who had open-heart surgery for congenital heart disease in our centre. Out of 23 patients, 15 were males, and 8 were females, with a mean age of 15.8 years (ranging from 1 to 48 years; 7 patients aged above 33 years). Right ventricular outflow tract pressure gradients were from 51 to 180 mmHg (mean 95 mmHg). Various cardiac anomalies were found to be associated with DCRV. The most common was ventricular septal defect (VSD); 15 patients (65.2 %) had VSD (9 perimembranous, 5 subaortic, 2 muscular), 3 patients associated with tetralogy of fallot. Patients were followed for 6 to 51 months (mean 28 months).

Result: There was no in hospital mortality or late mortality. Out of 23, 20 patients were followed up (3 patients missed out of follow up). The pressure gradient of the right ventricle decreased from 97.65 preoperatively to 11.25 mmHg postoperatively. All 20 patients were in sinus rhythm with 11 patients associated with RBBB (none of them on pacemaker).

Conclusion: In conclusion, surgical outcome obtained with repair of DCRV and related anomalies are favourable, and neither recurrence of DCRV nor fatal arrhythmias/death develops during the follow-up period.

Ebstein's anomaly of tricuspid valve—comparison of surgical repair, outcome, and early and mid term follow up

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Objective: Ebstein's anomaly is a rare congenital valve anomaly of the tricuspid valve. The goal of surgical repair in the setting of adequate two ventricles is bi ventricular circulation. We present our early results in the surgery for Ebstein's.

Material and Method: Retrospective analyses of all patients with Ebstein's anomaly from January 2008 to October 2016 were included. Five patients with a diagnosis of Ebstein and one patient with a diagnosis of ebsteinoid anomaly underwent surgical repair. The diagnosis of ebsteinoid lesion was made intraoperatively based on the finding of delaminated leaflets. Early results of various techniques were analyzed.

Result: Out of six patients, biventricular repair was performed in two patients, one and half ventricular repair (cone reconstruction of tricuspid valve) in two patients, one patient underwent BDG with tricuspid valve annuloplasty, and one with BDG + tricuspid valve replacement. No post operative mortality was found. One patient had failed cone repair which required on table tricuspid valve replacement and had subsequent complete heart block requiring permanent pacemaker implantation

Conclusion: Early results of Ebstein's are promising. Bi ventricular repair should be attempted whenever feasible unless limited by severe right ventricular dysfunction.

Surgical outcomes of left-sided partial anomalous pulmonary venous connection

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Objective: The aim of this study is to analyze the outcomes of patients who underwent repair of left partial anomalous pulmonary venous connection (L-PAPVC) via anastomosing the vertical vein to the left atrial appendage. L-PAPVC is a rare congenital condition, in which part or all of the left pulmonary veins (PVs) drain indirectly into the right atrium. Most of the

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patients are often asymptomatic but if left untreated may lead to severe right ventricular failure and pulmonary vascular disease. In this study, we study the effectiveness and outcome of surgical repair in our centre.

Material and Method: From 2000 to 2015, 13 patients ($n=13$) underwent left-sided PAPVC repair in our institute MMM, with a median age of 11. Patients presenting symptoms, associated anomalies, surgical approaches, clinical, echocardiographic follow up, and re interventions were analyzed

Result: Median age at surgery is 11; concomitant anomalies are present in eight patients. Operation was done using CPB sternotomy approach in nine patients ($n=9$). And off pump posterolateral thoracotomy in four ($n=4$). One year follow up was 100 %. One patient required re intervention for anastomotic gradient. There was no mortality and no anastomotic stenosis in the follow up period.

Conclusion: This is the largest number of L-PAPVC patient in a study in Asian population to our knowledge. Repair can be done via anastomosis of the anomalous vessel to the left atrial (LA) appendage with excellent outcomes. Off pump surgery by thoracotomy approach can be done safely with results equivalent to CPB approach. The rate of anastomotic stenosis at the site of implantation on the LA is very low.

Aortopulmonary window—our experience of fifty-five cases from a single institute over 20 years

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Objective: Aortopulmonary window is a rare, surgically correctable, congenital cardiac anomaly. Various correction techniques have been adapted. Here, by presenting a retrospective study of our experience of aortopulmonary window correction.

Material and Method: From 1994 to 2015, 55 patients including children ($n=49$) and adults ($n=6$) underwent aortopulmonary window surgical repair. The mean age at surgery was 7 years. Male-to-female ratio was 69:31. Associated cardiac anomalies were as follows: Patent ductus arteriosus (seven cases), left superior vena cava (three cases), right aortic arch (two cases), ventricular septal defect (three cases), patent foramen ovale (four cases), supramitral ring (one case), mitral regurgitation (two cases), and interrupted aortic arch (one case). Diagnosis was obtained by echocardiography. Cardiac catheterization was performed in 52 patients. Twenty-four patients had type I (proximal) defect, 28 had type II (distal), and 3 had type III (absent aortopulmonary septation) defect. Three patients had small tubular aortopulmonary window which was ligated off pump with hypotensive anaesthesia, and three had moderate-sized aortopulmonary window which was closed by division and suturing technique using side-biting clamp on either side of aortopulmonary window and cut ends were sutured using polypropylene. Forty-eight patients underwent classical Johansson sandwich technique using Dacron in four patients and Goretex in remaining. One patient had interrupted aortic arch with a large patent ductus arteriosus, in whom intra-aortic baffle was put using Goretex patch to separate the pulmonary artery and aorta. Ascending aorta and arch were augmented with pericardial patch; descending aorta was anastomosed with arch after dividing the patent ductus arteriosus under total circulatory arrest, retrograde cardioplegia, and descending aortic perfusion. Associated anomalies were repaired in all patients.

Result: Hospital mortality was nil. No late deaths occurred. Follow-up was 85.45 % at mean follow-up of 36 ± 12 months, and all patients were asymptomatic.

Conclusion: Aortopulmonary window is a rare congenital anomaly. Diagnosis is achieved by two-dimensional echocardiography. Cardiac catheterization required to decide about operability in cases with severe

pulmonary hypertension. Surgery is indicated as soon as the diagnosis is established, regardless of age at presentation. Associated arch anomalies may require technically challenging approaches and surgical strategy. Early and long-term outcome after surgical repair is good.

Outcomes of Fontan operation in patients with heterotaxy syndrome vs. without it

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Objective: The natural history of unoperated cardiac lesion in heterotaxy syndrome is poor. Historically, the Fontan operation in patients with single ventricle heterotaxy syndrome and atrial isomerism has been associated with high mortality. We compared the results of modified fontan operations for patients with vs. without heterotaxy syndrome

Material and Method: A retrospective single-center study of all patients who underwent fontan operation from Jan 2010 to Nov 2014 was performed. It included all patients with heterotaxy syndrome who had a fontan procedure. There were a total of 54 patients during the study period which includes 10 patients belonging to heterotaxy group

Result: Mean age was 9 years in the heterotaxy group and 12 years in the other group. Mean ICU stay was 4 vs 2.7 days in the two groups, respectively. Ten patients were lost to follow up. There was no significant difference in the postoperative complications including prolonged pleural effusion and post operative arrhythmias between two groups. There was no significant difference between mortality also between two groups.

Conclusion: Fontan operation can be performed in patients with heterotaxy syndrome with survival rates comparable with patients without heterotaxy syndrome. There are several determinants that significantly influence the outcome of fontan operation in patients with heterotaxy syndrome. Therefore, to achieve improved outcomes in patients with heterotaxy syndrome, proper staging of the surgery, appropriate choice of fontan modification, and aggressive treatment of concomitant malformations should be carried out.

Total arterial revascularization in CABG: our center experience

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Objective: Our study is focused on a group of patients receiving aortic total arterial revascularization or pedicle bilateral internal mammary artery with or without radial artery graft for multivessel coronary artery disease and its short- and long-term results, by maintaining normal anatomy and physiology of coronary circulation (means two or more than two inflow according to need).

Material and Method: Study included a group of 54 patients from July 2014 to June 2015. DVD/TV D who undergone total arterial revascularization by bilateral internal mammary artery with or without radial artery. Out of 54 patients, 18 were of DVD, 28 were of TV D, and 8 patients are TV D with Ramus. In which bilateral internal mammary artery + radial artery was used in 36 patients and 10 patients were treated by using bilateral internal mammary artery while left internal mammary artery + radial artery was used in 8 patients.

Result: Patients were analyzed in respect of post operative mortality and morbidity. Post operative MI, CVA, renal compromise, and survival at 1 year.

Conclusion: Total arterial revascularization with the use of both internal mammary artery with or without radial artery by maintaining the normal anatomy and physiology of coronary circulation is an excellent method for myocardial revascularization today.

Multivessel total arterial off pump MIDCAB

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Objective: In the current era of cardiac surgery, minimal invasive coronary artery bypass (MIDCAB) plays an important and challenging role. Also, MIDCAB with bilateral internal thoracic conduits or total arterial grafts is the best option for patients with coronary artery disease who are high risk for sternotomy. We evaluated 108 such selected patients who underwent minimally invasive multivessel total arterial off pump aortic CABG through left anterolateral thoracotomy.

Material and Method: The procedure was performed using 4–8 cm left anterolateral thoracotomy incision. LIMA harvested in every patient, RIMA or radial artery used as second conduit. LIMA-RIMA Y, or LIMA -RADIAL Y was made to accomplish multivessel total arterial bypass grafting. All intraoperative (hemodynamics and requirement of inotropic support, perioperative blood transfusion) and post-operative data (bleeding, wound infection, pain score, ICU stay, duration of mechanical ventilation, arrhythmias, perioperative MI, pleural effusion, need for IABP support, and post operative patient satisfaction index) were collected and evaluated. Post-operative graft patency was checked in every patient by CT coronary angiography before discharge.

Result: Multivessel total arterial CABG was accomplished in all selected individuals. There was no mortality or wound infection. Re-exploration was done in one patient for bleeding. In two patients, saphenous vein was used to graft LAD and LIMA used to graft diagonal as LIMA length was not adequate to graft distal LAD. In one individual, conversion to sternotomy and CPB was required due to unstable hemodynamics. Post-operative CT coronary angiography confirmed patency of all grafts. One patient had blocked radial graft to posterior descending artery. Muscle healing of anterolateral thoracotomy was faster as compared to bone healing of conventional sternotomy incision, and patients were back to normal life earlier.

Conclusion: With conventional immobilization techniques and instruments multivessel, total arterial MIDCAB can be accomplished safely in selected individuals. RIMA can be harvested in long-standing diabetic patients with no concern for sternal wound healing. Muscle healing of anterolateral thoracotomy is faster as compared to bone healing of conventional sternotomy, and patients are back to normal life earlier. Also, MIDCAB can be a salvage procedure for TECAB. So, if we have to do TECABs tomorrow, we have to do MIDCABs today.

Right internal mammary artery as second arterial graft for coronary artery bypass grafting: our experience

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Objective: The aim of this study is to assess the feasibility and effectiveness of RIMA as second arterial graft for CABG.

Material and Method: Over a period of 2 years, from September 2013 to September 2015, 196 patients underwent isolated coronary artery bypass grafting using bilateral internal mammary arteries. RIMA-LIMA Y grafting was performed in 150 patients, with LIMA anastomosed to LAD and RIMA to either diagonal or OM. LIMA was harvested as a semiskeletonised pedicle and RIMA fully skeletonised. In 30 patients with proximal RCA disease, RIMA was anastomosed to distal RCA as in situ pedicled graft. In the remaining 16 patients, RIMA was anastomosed to LAD and LIMA to OM.

Result: Use of RIMA as second arterial graft did not increase operative risk. Operative time was marginally longer compared to CABG with LIMA and venous grafts. Deep sternal wound infection was observed in only one patient.

Conclusion: RIMA as a second arterial conduit did not increase the operative risk including sternal wound complications and had improved postoperative outcomes.

Off pump coronary endarterectomy: our experience

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Objective: Off pump coronary endarterectomy associated with high incidence of postoperative morbidity and mortality. With technical improvement, the role of off pump coronary endarterectomy has been reviewed. In this study, we evaluate our results of off pump coronary endarterectomy and show our strategy for patients with diffuse coronary artery disease.

Material and Method: Out of 8234 CABGs done at our institution from 2005 to 2015, we reviewed 511 patients underwent supplementary off pump coronary endarterectomy. The mean ejection fraction was 41.2 %. Coronary endarterectomy was planned for totally occluded coronary artery.

Result: Out of 511 patients, males are 428 (83.7 %) and females are 83 (16.2 %). Mean patient age was 58.3 years (range 35–81) years. The average number of grafts anastomosed was 3.07. Single-vessel endarterectomy was done in 494 (96.6 %), and double-vessel in 17 (3.4 %). The coronary endarterectomy was performed on only LAD in 37 (7.2 %), LAD + D1 in 3 (0.5 %), only diagonal in 1 (0.1 %), only RCA in 384 (75.1 %), RCA + PDA in 11 (2.1 %), RCA + PLB in 3 (0.5 %), Ramus intermediate in 4 (0.8 %), marginals in 18 (3.5 %), only PDA in 25 (4.9 %), and only PLB in 8 (1.6 %) cases. Endarterectomy was done in 13 (2.5 %) redo-surgeries, and stent endarterectomy was done in 4 (0.8 %) cases. Post operatively, IABP was inserted in 14 (2.7 %) cases, arrhythmias in 72 (14.1 %) cases, post-operative MI in 18 (3.5 %) cases, and mortality in 8 (1.5 %) cases.

Conclusion: We demonstrated that coronary endarterectomy in off pump coronary bypass graft surgery should be used to achieve complete revascularization in patients with diffuse coronary disease with less mortality and morbidity.

Revascularization index as a quality indicator of off-pump coronary artery bypass grafting in a new center

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Objective: A revascularization index of >1 is considered to be the accepted cut off for ensuring completeness of revascularization. A value >1.4 with a conversion rate $<5\%$ is proposed to be a quality indicator.

Material and Method: The data on 59 consecutive patients who underwent off pump coronary artery bypass grafting was collected prospectively using STS data sheet (version 2.81). The study was performed at the Heart Center, Rajagiri Hospital, Kochi, Kerala, INDIA. Revascularization index was calculated as a ratio of distal anastomosis performed intraoperatively to the targets identified preoperatively and documented in the database.

Result: Forty percentage of the study group were admitted with acute myocardial infarctions and were taken up for surgery during the same admission. Left ventricular dysfunction was present in 35.59 % of the study group. There were two unplanned conversions to on pump beating heart grafting (conversion rate = 3.39 %). The total number of distal anastomosis performed was 225 with a mean graft number of 3.95 per

case. Mean revascularization index for the off-pump group ($n=57$) was 1.44. Six out of 57 patients had coronary endarterectomy done.

Conclusion: Due consideration to the revascularization index can ensure the completeness and quality in off pump CABG. This is achievable even in the setting of acute myocardial infarction and LV dysfunction.

Use of radial artery in patients of severe left ventricular dysfunction: a single centre experience

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Objective: Concern has been raised about use of the radial artery for coronary artery bypass grafting (CABG) in patients with severe left ventricular dysfunction (LVD) owing to the apprehension of severe radial vasospasm caused by post-operative vasopressor use. This may also be linked to an overall unstable immediate post-operative course. We present our experience with use of radial artery in patients undergoing CABG with severe LVD.

Material and Method: We evaluated the operative and post-operative data from the case files of 103 patients undergoing off pump CABG (OPCAB) at our centre. Parameters evaluated included post-operative ICU stay, duration of ventilation, need for vasopressors, post-operative renal dysfunction, and incidence of complications like renal, neurologic, and infective.

Result: Patients had a mean LVEF of 29.5 %. Radial artery was grafted to a mean of 1.3 vessels of a mean of 4 total grafts. Mean duration of ventilation and ICU stay were 7.8 h and 3.4 days, respectively. Mean duration of vasopressor infusion was 49 h and mean hospital stay was 5.1 days. Two patients developed mediastinitis of which one required reoperation with omentoplasty, the other being treated with vacuum-assisted closure followed by simple wound suturing. Significant post-operative renal dysfunction was seen in six patients, none of whom required dialysis. There was no incidence of stroke, and four patients required readmission; two for mediastinitis, and one each for pneumonitis and low cardiac output syndrome, respectively.

Conclusion: Based on this experience, we advocate the use of radial artery as a conduit whenever indicated even in patients with severe LV dysfunction.

Clinical profile, surgical strategies, and outcomes of coronary artery bypass grafting in children: our experience

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Objective: Reports of coronary artery bypass grafting (CABG) in children have been uncommon. Indications for the same include Kawasaki disease, congenital lesions, post arterial switch, and other iatrogenic obstructions. Familial hypercholesterolemia is a rare cause of coronary insufficiency in children requiring CABG. In the last decade, in our institute, we came across five children with symptoms of myocardial ischemia, commonly due to Kawasaki disease (four out of five cases). In these patients, we have attempted to study the clinical, laboratory and imaging features, surgical strategies, and outcomes of CABG.

Material and Method: From 2006 to 2015, 5 consecutive children have undergone CABG at NH Rabindranath Tagore International Institute of Cardiac Sciences, Kolkata, the indications being recent onset myocardial infarction in a case of Kawasaki disease, triple vessel disease in a case of familial hypercholesterolemia, and aneurysmal coronary arteries, with/without significant stenosis.

Result: Kawasaki disease-related coronary aneurysms was found to be the commonest etiology requiring CABG in children, with a male-to-female

ratio of 3:2. The age of the patients was between 8 and 14 years, with a median age of 11 years. Their body weight varied from 19 to 90 kg; two of them being obese for age. The height ranged from 110 to 163 cm, with a mean of 145.2 cm. One child had familial hypercholesterolemia. Angiography was the most important diagnostic tool in all patients. All patients were symptomatic at presentation. The commonest coronary artery affected was the LAD and proximal lesions were more common. All of them underwent off pump CABG. One patient had an emergency CABG. LITA, RITA, and SVG were the conduits used. Problems encountered included clinical diagnosis and choice of conduit. Harvesting of conduit and grafting was difficult, given the smaller and thinner vessels encountered and the presence of peripheral edema. All five patients were discharged home in a stable condition. Post-operative hospital stay was uneventful. They are being followed up at our institute; the follow up data ranging from 5 months to 9 years and 10 months.

Conclusion: CABG can be safely performed in symptomatic children with good short and midterm outcomes.

Ticagrelor versus clopidogrel in post CABG patients

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Objective: The aim of this paper is to study the benefit of ticagrelor over clopidogrel in post CABG patients.

Material and Method: A comparative study was done in our hospital between two groups of post CABG patients where one group was prescribed aspirin (150 OD) + ticagrelor (90 BD) and the other group was prescribed aspirin (150 OD) + clopidogrel (75 OD). The patients were analyzed for the side effects and benefits of both the drugs.

Result: It was found that patients receiving ticagrelor had higher incidence of bleeding like hematuria, GI bleeding, nasal bleeding compared to those on clopidogrel where as both were equally potent in its anti platelet therapy.

Conclusion: Ticagrelor has been shown to be clinically superior to clopidogrel when given to post CABG patients, resulting in significantly lower rates of myocardial infarction and vascular death. However, ticagrelor is indicated to be administered with aspirin, and the clinical benefits of ticagrelor may be less when daily dosages of aspirin exceed 100 mg. Bleeding is the most common adverse effect with ticagrelor, although it occurs at rates higher than that seen for clopidogrel. Unlike clopidogrel, there are no known pharmacogenomic concerns with ticagrelor, and emerging data suggest ticagrelor to be effective in patients resistant to clopidogrel, although more study is needed on this topic. While preliminary data suggest ticagrelor to be cost effective when compared with generic clopidogrel, the acquisition cost of ticagrelor is not insignificant, and this will likely be an issue for many health care organizations. Currently, ticagrelor is well positioned to assume an active role in the treatment of coronary artery disease due to an impressive efficacy profile and reasonable safety. Its ultimate role in therapy will continue to evolve as studies on this drug continue and more information hopefully becomes available on its use in clopidogrel nonresponders and relative safety and efficacy.

Occurrence of atrial fibrillation in the postoperative period of coronary artery bypass grafting

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Objective: Atrial fibrillation (AFib) is the most common complication in cardiovascular surgery, regarding immediate and late post-operative

period. The aim of this retrospective study was to evaluate the incidence of AFib, clinical characteristics of the patients, and to identify risk factors for developing this arrhythmia, as well as the independent predictors related with coronary artery bypass grafting (CABG).

Material and Method: A retrospective study analyzed 123 patients, from January 2010 to December 2011, in a cardiovascular unit. The data analyzed was age, gender, body mass index (BMI), total number of grafts, number of arterial grafts, cardiopulmonary bypass time, cardiac arrest time, heart rhythm preoperative, at the ICU and at hospital discharge, duration of mechanical ventilation, length of stay in the intensive care unit (ICU), and hospital medications used during hospitalization and at discharge. Data were stored in an Excel database and were analyzed by a logistic regression model.

Result: The mean age of the patients was 62.65 + 9.84 (40–84) years, 97 (78.8 %) were male and the mean BMI was 28.28 kg/m². As for coronary artery bypass graft surgery, the mean time of CPB was 65.63 + 19.67 min. The average length of stay in the ICU was 3.14 + 1.86 days, and hospital stay was 9.57 + 5.03 days. The incidence of AFib was observed in 33 patients (26.84 %), 2.44 % preoperatively, 19.51 % in the immediate postoperative period, 13.82 % in the ICU, and 4.88 % at discharge. In a multivariate analysis, the female sex, age, and the invasive mechanical ventilation in the ICU were identified as independent risk factor for AFib, in the immediate postoperative period, The presence of AFib in the ICU and/or in the immediate postoperative period was a risk factor for the use an antiarrhythmic drug, excepting beta-blockers.

Conclusion: This study was able to identify age, female sex, and invasive mechanical ventilation as independent risk factors for AFib and that the presence of AFib in the immediate postoperative period was a risk factor for late hospital discharge with the use of any antiarrhythmic drugs.

Histological analysis of saphenous veins surgically harvested with or without electrocautery

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Objective: The use of electrocauterization in the harvesting of the saphenous vein, to be used as grafts in coronary artery bypass grafting (CABG), is a common practice in almost all units of cardiovascular surgery. The aim of this study is to evaluate if the use of electrocauterization in the harvesting of the saphenous vein has a deleterious effect in the histological aspect of the vein, and if it correlates to the clinical result.

Material and Method: Twenty-four patients underwent CABG and in 12 of them, electrocautery was used (group 1) to harvest the saphenous vein, and in another 12 it was not (group 2). Vein segments were sent for analysis after fixed in 10 % formalin for 24 h. These segments were vertically cut, and two fragments were removed for histological analysis. They were stained with hematoxylin and eosin according to the normal protocol. All samples were analyzed by a blinded observer, which looked for morphological changes, especially acute ones in the endothelium, muscle tunics, and adventitia. The acute changes investigated were necrosis, degeneration, inflammation, thrombosis, structural rupture signs, and the presence of hemorrhage. The mid-term results of the grafts were observed clinical.

Result: In both the groups, there was no change in the endothelium or limiting membrane. In three cases (25 %) of group 1, there was the appearance of pyknotic nuclei, likely exaggerated by cauterization. In one case (8.33 %), group 2 had a recent hemorrhage adventitia. The blind observer only managed to identify a use case cautery one sample, in group 1, apart from those who had pyknotic nuclei..

Conclusion: Despite the small sample, collected, it was possible to identify four cases where cauterization was used for the dissection of the saphenous vein. There was no correlation of the same with the clinical course of patients.

Coronary guidelines and syntax score—are they being correctly applied, by a heart team?

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Objective: The 2014 ESC/EACTS Guidelines on myocardial revascularization define the SYNTAX Score as a risk stratification model for the planning the type of treatment. The SYNTAX score was developed to grade the anatomical complexity of coronary lesions in patients with left main or three-vessel disease. The objective is to assess whether the guidelines, based on SYNTAX Score, are being followed in a cardiovascular unit in the south of Brazil, in which the decision is made by a Heart Team

Material and Method: A retrospective blind study was conducted evaluating 395 coronary angiographies, from January 2013 to August 2014. The insertion criteria were the angiography of all patients under investigation for coronary disease. The exclusion criteria were the angiographies of patients that already had any type of percutaneous transluminal angioplasty (PCI) or coronary artery bypass grafting (CABG). The angiographies were evaluated and classified according the SS, in group A (score <22), B (score 23–32), and C (score >32). An independent blind observer checked the type of treatment performed and the percentage of each of those three groups.

Result: The coronary angiographies, of the 395 patients, were analyzed and showed an average SS of 9.95 ± 10.45 . The table below shows the population of each group: SAMPLE ANALYSIS. Patients mean SS SD CL 95 %—group A 346, 2.83, 3.23, 7.24 ± 0.71 ; group B 31, 11.28, 1.12, 25.06 ± 2.39 ; group C 18, 22.75, 7.89, 38.05 ± 3.13 . From the 395 patients assigned to the study, 121 patients underwent PCI and 42 CABG. The remainder 232 underwent medical treatment. All patients undergoing CABG were in the C group and part of B; of patients undergoing PCI, 7 (5.79 %) belonged to group B and 114 to group A (94.21 %).

Conclusion: The guidelines have been followed, in a unit in which a Heart Team decides what type of treatment should be considered, because the patients underwent the recommended treatment, based on the SYNTAX Score.

To study the effect of remote ischaemic preconditioning in myocardial preservation during coronary artery bypass grafting

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Objective: The aim of this paper is to study the effect of remote ischaemic preconditioning on myocardial injury and short-term outcomes after elective CABG in patients irrespective of surgical myocardial preservation technique by assessing the level of Trop-T in post-op period and on other organs like the kidney by serially assessing the level of S. Creatinine in post-op period.

Material and Method: The study was conducted at the Department of Cardiothoracic Surgery, Government Medical College, Kottayam, Kerala as a randomized controlled study, where we studied the effect of remote ischaemic preconditioning induced by transient limb ischaemia on peri-operative myocardial and remote organ injury in patients. All patients undergoing CABG in the month of July 2015 who fulfilled the criteria were considered for the study. RIPC was induced by transient limb ischaemia in patients who volunteered for the study by inflating a standard 9 in blood pressure cuff to 200 mmHg on the upper arm for 5 min for three cycles, each separated by a reperfusion period of 5 min during which time the cuff was kept deflated. Pre-tested structured questionnaire was used for the study. Blood samples for the measurement of serum cTnT were taken pre-operatively, and at 6, 24, and 72 h following surgery. Blood samples for the measurement of serum creatinine was taken pre-

operatively and post-op, from second to seventh day following surgery, and elevation in trend was assessed.

Result: We had a total of 96 cases of CABG of which 25 underwent remote ischaemic preconditioning. Seventy-one patients were kept as control. Of the 25 cases, 21 had minor nonsignificant increase in Trop-T values and also irregular fluctuation in S creatinine values. On the other hand, the patients in control group were found to have consistently higher levels of Trop-T in post op periods.

Conclusion: This study proves that ischaemic pre-conditioning has some role in myocardial preservation but cannot be said to be significant.

Revisiting of transmyocardial laser revascularization in patients with diffuse coronary artery disease

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Objective: Transmyocardial laser revascularization (TMLR) is an adjunct therapeutic option offered to the patients with disabling angina despite maximal medical therapy and patients not amenable for complete coronary revascularization. This report describes five patients with 15–20 years follow up after TMLR.

Material and Method: From December 1994 to September 2001, 300 patients have undergone TMR in our institution of which 112 include isolated TMR and the remaining had combined with CABG. All patients had diffusely diseased coronaries. We reviewed five patients revisited for follow up. Among them, one patient had isolated TMR who had a prior CABG done, and the rest had TMR as an adjunctive procedure to CABG. The median age at the time of surgery is 54 ± 2.8 years. Furthermore, 8–12 transmyocardial channels were created using the CO₂ laser device. A myocardial perfusion scan was performed at the follow up to assess the perfusion status of the left ventricle.

Result: Two patients remained asymptomatic at the end of 15 and 16 years post procedure with patent grafts. Two patients developed class II–III angina on exertion 16 years post procedure—one due to the development of distal left main disease in the native coronaries, was advised for primary coronary intervention. The second patient had developed severe left ventricular dysfunction and underwent intracoronary stem cell therapy. One patient with isolated TMR with prior CABG remained angina-free for 18 years and presented with class III angina on exertion in view of the occluded vein graft to OM and PDA. Percutaneous angioplasty was performed onto the vein graft to PDA but was found to develop in-stent restenosis within 1 month. Subsequent attempts of percutaneous interventions failed, and optimal medical management was offered to the patient. He has NYHA class II dyspnea and was advised for off pump surgical revascularization of RCA.

Conclusion: Preserved left ventricular function and the functional benefits observed even after 15–20 years indicate that TMR is viable and useful option in patients with diffusely diseased coronary arteries undergoing revascularization.

High Syntax score in coronary artery bypass grafting—can it predict significant carotid disease?

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Objective: The association between coronary artery disease and carotid disease is well established. However, the correlation between the severity of the coronary artery disease and concomitant significant carotid disease

(>50 % stenosis by carotid Doppler) has not been documented. Routine carotid Doppler examination for all patients undergoing CABG is not cost effective considering the high prevalence of non-significant carotid disease. This study aims to examine whether Syntax score can reliably predict significant concomitant carotid disease in patients undergoing CABG and thus improve the specificity and cost effectiveness of carotid Doppler study during pre-operative work up.

Material and Method: Data including the Syntax score and bilateral carotid doppler report was collected prospectively as per the STS data collection form (version 2.81) for 60 consecutive patients undergoing first time coronary artery bypass graft with or without concomitant procedures at Rajagiri Hospital, Kochi, Kerala, India. Both on and off pump cases were included in the study. Chi-square test was used to test the significance.

Result: Out of the 60 patients studied, 31 patients were of high (≥ 33), 22 of intermediate (≥ 22 – 32), and 7 of low (< 22) Syntax score risk group. Eight patients had significant carotid disease while 39 patients had non-significant carotid disease. Among the 8 patients with significant carotid disease, 7 had.

Conclusion: High Syntax score (≥ 33) can predict significant carotid artery disease in patients undergoing CABG and thus guide the judicious use of carotid doppler in the pre-operative work up. Syntax score may also be a predictor of peripheral vasculopathy.

Outcomes of off pump coronary artery bypass grafting in non-dialysis-dependent patients with stage 2 and stage 3 chronic kidney disease

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Objective: Increasing numbers of patients with non-dialysis-dependent chronic kidney disease (CKD) are presenting for coronary artery bypass grafting (CABG). While outcome data for dialysis-dependent patients undergoing CABG is available, outcome data of CABG, off pump cases, in mild renal impairment, is sparse. The aim of this study therefore was to assess the outcomes of off pump CABG (OPCABG) in non-dialysis-dependent patients with stage 2 and stage 3 CKD.

Material and Method: A total of 315 patients with non-dialysis-dependent stage 2 and stage 3 CKD undergoing OPCABG were recruited in this prospective observational study. Pre-operative risk factors and intra-operative variables were recorded. Post-operative outcome measures included measurement of glomerular filtration rate (GFR) using the Modification of Diet in Renal Disease (MDRD) equation. Clinical outcome measures included post-operative morbidity and mortality. Role of diabetes as an incremental risk factor for adverse outcome was also assessed.

Result: The study population was predominantly male, 293 out of 315 (93 %). Then, 156 (49.5 %) of the patients were diabetic. Of the 315 patients, 114 (36 %) were in stage 2 and 201 (64 %) in stage 3 chronic kidney disease (CKD). Need for post-operative dialysis was seen only in 4 (1.2 %) of the patients. There were no neurological events. Haemodynamic compromise was seen in 17 (5.3 %) patients and new onset arrhythmias in 70 (22.22 %). Mean post-operative stay was 9.2 days. Twenty (6.3 %) patients were re-explored for bleeding, and the mean number of blood transfusion was 0.36 units. The overall mortality was 6 (1.9 %). Diabetes mellitus was not found to be an incremental risk factor for mortality in the study population odds ratio 6.32; 95 % confidence interval (0.74–50.21). There was a nonsignificant variation of GFR in the post-operative period. A pre-operative GFR of 55.85 ± 9.26 ml/min changed to 58.39 ± 14.96 ml/min on the first post-operative day and 58.39 ± 13.96 ml/min at the time of discharge.

Conclusion: OPCABG can be safely performed in patients with mild renal impairment. The overall risk of mortality and need for post-operative dialysis in our study group was similar to patients with normal renal function. Diabetes was not found to be an independent risk factor for mortality.

CABG in the young (<40 years) PCI vs. CABG—choice of revascularization strategy

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Objective: The aim of this study is to analyze our early outcomes with patients undergoing CABG or PCI within their first four decades of life and formulate a revascularization strategy aimed at complete revascularization and long-term freedom from repeat revascularization.

Material and Method: Between January 2010 and June 2015, 74 patients below the age of 40 years underwent CABG and 469 patients underwent PTCA for CAD in our hospital. We retrospectively analyzed the perioperative/peri-procedural data and evaluated the outcome of these patients

Result: In the CABG series, male-to-female ratio was 3.6:1, and the median age of male and female patients undergoing CABG was 37 and 34 years, respectively. Off pump, 70 (94.5 %) of which 11 (15.7 %) were total arterial revascularization procedures and on pump 4 (5.4 %) The coronary arteries involvement in the CABG series were LMCAD 16.21 %, TVD 22.9 %, DVD 6.7 %, SVD 17.57 % out of which four where post PTCA with ISR. Lmcad (43 %) was the predominant culprit lesion in females. Three emergency CABGs for unstable angina were done and no in hospital and early mortalities were noted. In the average follow up of 2.24 years, freedom from redo revascularization in the CABG series was 95.9 % and no MACCE were noted. In the PCI series ($n=469$), male-to-female ratio was 9.1:1. Single-vessel PTCA was done in 463 patients and multi-vessel PTCA in 6 patients. Emergency primary PTCA was done in 11 patients (2.3 %). No in hospital or 30 day MACCE noted. Early mortality was 0.6 %; three in hospital mortalities were noted out of which two were emergency PCI post MI cases and one case with low EF and had post procedure ventricular fibrillation. Forty-nine patients (10.44 %) needed redo revascularization after an average post primary procedure period of 31.8 months. In the average follow up of 3.18 years, freedom from repeat revascularization was 89.55 % and freedom from MI was 96.8 %. No incidences of stroke were noted.

Conclusion: Overall, early outcome in the CABG group is excellent with no mortality and should be considered the choice of revascularization despite PTCA offering less pain, shorter hospital stay, and shorter time required to resume activity.

Bilateral internal thoracic arteries are enough for total coronary revascularization

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Objective: Current evidence suggests that arterial grafting improves freedom from cardiac events after coronary artery bypass graft surgery. It has been shown that bilateral internal thoracic arteries (BITAs) grafts provide improved outcome compared with left internal thoracic artery (LITA) graft. Total arterial myocardial revascularization with composite grafts proved to enhance the long-term benefits of coronary surgery. We assessed the hypothesis that total arterial revascularization may improve clinical outcome even in diabetic, female, elderly, and other high-risk patients

Material and Method: At our centre from January 2010 to January 2015, we performed 5842 CABG. Patient who got at least one arterial graft were included in this study (3514, 60.15 %). Study population was divided into

three groups. Group A has 190 patients (3.25 %) in which only BITA were used. Group B includes 191 patients (3.26 %) in which two arterial grafts were used along with third graft (RA/RGEA/SVG). Group C has 3133 patients (53.63 %) in which LITA along with 2 or more venous grafts were used. We excluded patients (1) who underwent emergency CABG, and (2) patients with total venous grafts.

Result: Groups had comparable risk profiles. Group in which BITA alone was used had lower recurrence of angina, less cardiac events, and decreased cardiac mortality. Multivariate analysis identified use of BITA as a protective factor resulting in less recurrence of angina. We also found that (1) there is no difference statistically in mortality in all three groups. (2) Group A has the lowest neurological complications. (3) Hospital, ICU stay, and deep wound infections between all three groups showed no statistically significant differences.

Conclusion: Total arterial myocardial revascularization improved clinical outcome of patients undergoing coronary surgery in the diabetic, elderly, and other high-risk patients. Composite grafting plays a crucial role in total arterial revascularization because it eliminates the need for proximal anastomosis to the aorta and conserves extra lengths of an arterial graft for additional grafting.

Changing trends in clinical scenario of CABG in Indian women

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Objective: Ischemic heart disease in women is identified less often and at a more advanced stage than men. In recent years, more women are diagnosed with CAD and more of them undergo revascularization procedures across the world. This report analyses the clinical and perioperative parameters of CABG in women during 1998 to 2002 (Gr I) and compared with years 2010 to 2014 (Gr II).

Material and Method: All the female patients who underwent isolated CABG have been included in the study. The clinical and perioperative parameters including age, weight, BSA, diabetes, hypertension, angiographic findings, number of grafts, CPB time, duration of ventilation, hospital stay, and wound status were collected and reviewed. There were 293 patients in group I and 395 patients in group II. A retrospective analysis was done using Fischer's and Chi-square method

Result: The mean age of group II patients (62.8 ± 9.3 years) was higher than group I patients (57.9 ± 8.6 years). The mean number of grafts in both the groups is similar—2.8. There was no difference in hypertension between the groups but there were more diabetics in group II (67.59 %). Furthermore, 18.8 % of group 1 had left main disease and 20.75 % were in group 2 ($p > 0.05$). Moreover, 2.7 % of group 1 patients had previous PCI compared to 4.8 % from group II ($p > 0.05$). Group 1 included 26 % with severe left ventricular dysfunction while 31.89 % from group II. Then, 13.3 % in group I required endarterectomy while 4.3 % in group 2.

Conclusion: Conforming with the world trend, the number of women undergoing CABG is increasing. The patients are older, more with diabetes with decrease in the requirement of IABP. The mortality is showing a decreasing trend in recent years. Our results imply that women undergoing CABG in modern surgical era fare better than those who underwent CABG in earlier years.

Myocardial revascularization in elderly patients—a clinical study

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Objective: More elderly patients are referred for cardiac surgery nowadays due to increase in the average life expectancy. Development in

myocardial protection, extracorporeal circulation, and anesthetic management have led to reduced morbidity and mortality rates in elderly patients undergoing myocardial revascularization. In this review, preoperative risk factors and the postoperative outcome of elderly patients undergoing myocardial revascularization were analyzed, and future perspectives for the treatment of elderly patients with cardiac surgery are discussed.

Material and Method: Patients aged above 70 years who have undergone surgery from 2012 to 2015 are included in this study. Preoperative left ventricular function, associated mitral regurgitation, NYHA class, co morbid illness, intraoperative coronary artery status, inotropic supports required, post operative complications, duration of ICU stay, and hospital stay were studied.

Result: Left ventricular dysfunction, comorbid illness, and coronary artery status have significant impact on the postoperative outcome. But overall, the results are comparable to that of younger patients.

Conclusion: Due to technical and medical improvements, myocardial revascularization is feasible even in elderly patients with careful patient selection, perfect surgical techniques, excellent myocardial protection, and perfect anesthesiological management.

Coronary artery bypass grafting in low ejection fraction patients: our series

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Objective: The objective of our study is to evaluate coronary artery disease patients with low ejection fraction (35 %) who underwent coronary artery bypass grafting.

Material and Method: This study was conducted for 2 years from October 2012 to October 2014. The study included all patients with coronary artery disease with a low ejection fraction who underwent coronary artery bypass grafting with the preoperative use of levosimendan or dobutamine. Two patients were put on IABP. Forty-seven patients were male and 4 were female. The age of patients was 57.2 ± 8.29 . LIMA was harvested in 25 patients and saphenous vein grafts were used in all the patients.

Result: In our study, 49 patients were discharged from the hospital and followed up after 3 months and 1 year. All have shown an improvement in ejection fraction. Two patients have expired in the post operative period with the main factors being comorbid conditions with severe left ventricular dysfunction.

Conclusion: In our study, we found that patients with low ejection fraction coronary artery disease can be managed effectively with preoperative use of levosimendan or dobutamine without the use of IABP with good results in coronary artery bypass grafting.

Off pump coronary artery bypass in critical left main disease: safe or unsafe—our centre experience

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Objective: This study is aimed to review the results of off pump coronary artery bypass grafting (OPCAB) in patients with severe or critical left main coronary artery disease (LMCA).

Material and Method: The retrospective and prospective study was conducted on the patients with isolated coronary artery disease patients having critical or significant left main coronary artery disease undergoing

OPCAB. Since year 2012 to 2014, 150 patients underwent OPCAB for LMCA disease. Patients with LMCA stenosis of more than 75 % were kept on intra aortic balloon pump (IABP) support night before surgery. All patients were operated via conventional sternotomy. Octopus coronary stabilizer was used in every patient. Left internal mammary artery (LIMA) was used in every patient along with saphenous vein graft and radial artery if required.

Result: In all patients, LIMA was used to graft left anterior descending artery. Average graft in LMCA disease only without right coronary disease was 3.2. In patients with RCA disease also, average graft used was 4.1. There was no conversion to emergency on pump. No operative mortality occurred. Three patients were re-explored for post operative bleeding.

Conclusion: OPCAB is a safe method of revascularization in patients with severe or critical LMCA disease. Pre operative use of IABP in LMCA disease >75 % has facilitated OPCAB in maintaining the hemodynamic of the patients stable

Management of diffusely diseased coronary arteries—coronary reconstruction remodelling

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Objective: The aim of this paper is to study the outcomes in patients with diffusely diseased coronary arteries, who underwent long segment bypass surgery.

Material and Method: From February 2015 to October 2015, 35 patients with diffusely diseased coronaries underwent coronary artery bypass graft surgery (CABG) with these techniques at our centre. Twenty-two patients underwent LAD modification (length of anastomosis ranges between 2 and 4 cm), whereas 13 patients underwent LAD reconstruction (length of anastomosis >4 cm). The preoperative mean ejection fraction was 42 %. Sixteen patients were operated off pump and the rest were on pump. The surgical technique includes a long segment arteriotomy followed by fashioning of left internal thoracic artery (LITA) or saphenous vein conduits. A complex procedure involving the combination of remodelling with endarterectomy was also performed in one patient.

Result: The ICU recovery of all the patients was uneventful. All were weaned of inotropic supports by third postoperative day. Mean duration of ventilation was 8.6 h. None of the patients had postoperative ECG changes, arrhythmias, renal impairment, or re-explorations. One death was recorded, cause was cerebrovascular accident (CVA) on the seventh postoperative day. All patients are on follow-up. None had any new ECG changes nor cardiac symptoms.

Conclusion: All diffuse disease coronary diseases, who are usually deferred surgery and those who are advised for medical management, can be submitted for CABG with long segment coronary remodelling or reconstruction.

A comparison of left ventricular function in patients undergoing beating heart bypass surgery using mixed versus pure venous conduits

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Objective: The aims of this study are to compare the left ventricular function in patients who have undergone beating heart bypass surgery using mixed (internal mammary artery and venous conduits) versus pure venous conduits, and to compare the incidence of postoperative complications including patient mortality in both the groups.

Material and Method: Type of the study: observational study. Sample size and sampling method: It is a hospital-based study. All patients attending HIMS for bypass surgery during study period were considered as sample. On the basis of previous year, departmental data around 40 new patients were included in the study. Inclusion criteria: Patients diagnosed with coronary artery disease requiring surgical myocardial revascularization with fair left ventricular function. Exclusion criteria: Patient who have undergone prior surgical myocardial revascularization, patients with significant impairment of left ventricular function (EF <30 %), patients with pre existing valvular disease, patients operated using cardiopulmonary bypass machine, pre operative use of intra aortic balloon pump.

Result: Improvement in left ventricular function was more in patients with pure venous conduits. Post operative complications were more in patients with mixed conduits. Duration of hospital stay was more in patients with pure venous conduits. Mortality were comparable in both the groups.

Conclusion: Patients with venous conduits have better outcome than in patients with mixed conduits.

OPCAB coronary endarterectomy in diffuse coronary artery disease

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Objective: Diffuse coronary artery disease, intramyocardial coronaries, and hemodynamically unstable patients are considered as poor candidates for OPCAB. With patience and experience, first of these two conditions can be successfully managed with off pump technique. We herein report our series of off pump coronary endarterectomy for diffuse CAD, performed in 1 year duration.

Material and Method: All the patients who underwent off pump coronary endarterectomy between 1st Nov 2014 and 31st Oct 2015, have been included. The clinical and perioperative parameters have been collected and reviewed. The data was analyzed using the Fischer's and Chi-square method.

Result: Two hundred thirteen patients underwent OPCAB during the study period, of which 15 patients required coronary endarterectomy of at least one vessel. The mean age was 59.87 ± 10.38 years (range 42–75 years). It included 12 males (80 %) and 3 females (20 %). Thirteen patients were with diabetes mellitus, 9 with hypertension, 2 with chronic kidney disease, and 2 were with previous CVA. The mean left ventricular ejection fraction was 50.2 ± 11.98 %, and four patients had severe left ventricular dysfunction. The mean number of grafts was 3.8. It included eight patients with RCA endarterectomy, three with OM, three with diagonal, and one with LAD endarterectomy. The average duration of inotrope and ventilator supports were 46.5 and 14.4 h, respectively. Three patients underwent re-explorations, one patient with IABP support, and two patients had postoperative arrhythmia, which could be reverted. No other postoperative complications were encountered in any of these patients. We had no mortality in these patients and the mean ICU and hospital stays were 2.4 and 8.2 days, respectively.

Conclusion: OPCAB endarterectomy is a viable and safe option in patients with diffuse coronary artery disease.

Ventricular assist devices: a new lease of life

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Objective: LVAD therapy is an established treatment modality for patients with advanced heart failure. Continuous-flow rotary LVADs represent an innovative design with potential for small size and greater reliability by simplification of the pumping mechanism. Heart failure is the

final common pathway for many chronic heart diseases. For selected patients who are too ill to wait for a heart donor or who are not eligible for a heart transplant ventricular assist devices (VADs) offer life-saving therapy.

Material and Method: We at Max started putting ventricular assist device in Feb. 2015. In the last 9 months, we have put six LVADs in five patients. Out of six patients, five were Heart Mate II and one was Heart Ware. All patients were male. Three patients had dilated cardiomyopathy and two had ischemic cardiomyopathy.

Result: Average ICU stay was 5 days and hospital stay was 14 days. One patient had frequent ventricular arrhythmias requiring intensive pharmacotherapy. One had thrombosis of device on post operative day 3 which required exchange of the device. All are on follow up and have been doing fine.

Conclusion: A LVAD provides effective hemodynamic support in patients with end-stage heart failure with improved functional status and quality of life. LVAD is the only alternative that offers a ray of hope to thousands of patients whose hearts are too weak to survive and those waiting for a heart transplant. Improvements in device design, along with advances in surgical and medical management, have allowed VAD patients to return home, to work, and to their communities, with excellent quality of life.

Midterm experience of adult ECMO in India

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Objective: Extracorporeal membrane oxygenation (ECMO) is a rescue therapy for critically ill patients with reversible cardio-respiratory pathology and those who have probability of death around 80 % despite maximal conventional treatment. The positive results of the recent trials have stimulated our interest to use ECMO for life-threatening conditions due to cardiorespiratory failure. Here, we describe our experience at a tertiary care center in India.

Material and Method: We established an adult ECMO program for cardio-respiratory support in April 2013. In the last 2.5 years, we supported 35 patients on ECMO and it was only considered once the conventional therapy deemed failing. A retrospective analysis of our patient data was performed to collect information regarding patient demographics, indication for ECMO, type of ECMO, and outcomes.

Result: A total of 35 patients received ECMO between April 2013 and October 2015. The mean age was 36.4 year (range 18–57 years), 20 male, and 13 female. Out of 35 patients, 4 were veno arterial (VA) and 30 were veno venous (VV) ECMO. In VA ECMO, the first patient had intractable arrhythmias and the second had acute viral myocarditis leading to refractory cardiogenic shock; one was post cardiectomy and one was myocardial depression post sepsis. Out of 31 patients of VV ECMO, 10 had viral pneumonia, 6 bacterial pneumonia, and 3 with fulminant fungal infection leading to ARDS, 1 had pulmonary hemorrhage due to Wegener's granulomatosis, and 11 were swine flu-related ARDS. ECMO was instituted by peripheral cannulation in all patients. Average support time was 13 days (range 2 to 44 days). Twenty-three patients (65.7 %) were successfully separated from ECMO and 22 (63 %) survived to hospital discharge. Four patients had major complications including pump failure and bleeding, oxygenator failure, and air in the circuit. One underwent lobectomy for multiple bronchopleural fistulae in right lung.

Conclusion: ECMO is salvage therapy in patients with life-threatening refractory circulatory shock or severe ARDS. This therapy has the potential to save lives if applied in time and in appropriate clinical settings.

Use of decellularized bovine pericardium for surgical ventricular remodeling—a single centre experience

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Objective: Left ventricular aneurysm is a well-known sequelae after myocardial infarction. Western countries have a reported incidence of 10–35 %. Surgical ventricular reconstruction (SVR) procedure have been evolved as a preventive modality from thrombo-embolic complications. Bovine pericardium is upcoming preferred prosthesis in view of its proven high biological compatibility. This study was conducted to assess the functional capacity and analyze the survival benefit of the this technique of ventricular remodeling with the usage of bovine pericardial patch.

Material and Method: Forty (35 male + 5 female) patients had undergone surgical ventricular reconstruction (SVR) using decellularized bovine pericardium (patented 76/CHE/2006-Dated 17/01/2006; USA patented US20120029655A1dated08/04/2009) forms the basis for the study, between March 2004 and November 2015. A retrospective study was conducted. Preoperative, intra operative and postoperative variables have been reviewed and outcome was analyzed using 2D echocardiography, MRI, PET scan.

Result: The study patients underwent LV re-construction at a mean age of 58.5 ± 14.7 years (range 38–72 years). Fifty percent of the patients were in NYHA CI III, and 12.5 % had NYHA CI IV symptoms. The mean pre-operative ejection fraction was 36 ± 11 %, and nearly three fourths (72.5 %) of our patients had severe LV dysfunction (1 year) follow up and average increase in ejection fraction was 5 ± 1 %. Symptom class improved in 30 %.

Conclusion: SVR can be performed with good early outcome. Concomitant myocardial revascularization further benefits with improved symptomatic status and long-term survival as evidenced by 2D echocardiography, MRI, and selected case PET scan.

Stem cell therapy—future of cardiac remodeling? A single institute experience

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Objective: Stem cells address a great therapeutic approach, as they are known to differentiate into various tissue lineages, including osteocytes, chondrocytes, cardiomyocytes, and even into neurons. Stem cells have a tremendous ability to home to sites of injury, fuse with injured cells, inhibit cardiomyocyte apoptosis, replace dead cardiomyocytes, as well as secrete paracrine factors to regulate the regeneration response, fibrosis, and neovascularization post myocardial infarction. The conventional treatment of ischemic heart failure does not correct the underlying cause raising the need for strategies aimed at regeneration and repair of scarred myocardium. At the opposite end of the spectrum, cardiac transplantation provides radical therapy. Therefore, cellular cardiomyoplasty has emerged as a possible means of regenerating damaged myocardium.

Material and Method: One hundred twelve patients suffering from ischemic/dilated cardiomyopathy were subjected for collection of granulocyte colony factor (G-CSF) induced peripheral blood derived CD34⁺ endothelial progenitor cells (EPCs) or bone marrow-derived mononuclear cells (MNCs). The bone marrow collected using aseptic precautions is processed. The isolated MNCs (buffy coat) were subjected to flow cytometry, analyzed for the presence of CD34⁺, CD45⁺, viability, endotoxin analysis, and pre and post microbial sterility check. The route of cell

delivery was transcatheter (85) during cardiac catheterization or epicardial/intramyocardial (27) injection during surgery. The patients were injected with total cell yield approximately $6-8 \times 10^8$ cells/ml of 98.5 % viability.

Result: One hundred twelve (4 months to 85 year old) patients (94 males (83.9 %), 18 females (16.1 %)), mean age 45.8 years, received stem cell from November 2006 to November 2015. Twenty-three patients (34 %) were available for follow up at 1 year as most patients are foreigners. Among the 19 patients who were alive at the end of 1 year, 10 patients (52.6 %) had at least 5 % increase in the ejection fraction, 16 patients (84.2 %) had at least one NYHA class improvement from baseline and had significant improvement in the functional status as well as in 6-min walk test.

Conclusion: Stem cells therapy is an attractive alternative to aggressive treatment including cardiac transplantation. However, it takes longer time for effectiveness. In this series, improvement in EF (5–7 %) is seen over a period of 1 year. Periodical PET-SCAN might be of tremendous use to prove efficacy.

IABP as bridge to definitive therapy in cardiac ICU—a single centre experience

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Objective: Background: Intra aortic balloon pump (IABP) is widely used to provide circulatory support for patients with hemodynamic instability due to various cardiac disorders. It improves systemic hemodynamics, augments coronary flow, reduces myocardial oxygen demand, and can sustain coronary patency. Indication for using IABP are in cardiogenic shock secondary to acute myocardial infarction (AMI), ST-segment elevation-acute coronary syndrome without shock, and also in high-risk percutaneous coronary intervention (PCI) or surgical revascularization. Objective: The aim of this study was to evaluate the outcome patient who had IABP for different indications in the cardiac ICU.

Material and Method: This is a retrospective study which includes all patients for whom IABP was inserted in cardiac ICU at our institution during the period from November 2007 to October 2014. The clinical details of all patients were reviewed from patient records.

Result: A total of 107 patients were included in the study. The mean age was 51.4 years (ranging from 28 to 89 years), 87 patients (81.3 %) were males, and 20 patients (18.6 %) were females; 66 patients (61.6 %) were diabetic, 58 patients (54.2 %) were hypertensive. All patients had NYHA class III to IV symptoms of dyspnea/ chest pain with features of cardiogenic shock; 59 patients (55.1 %) had anterior wall myocardial infarction, 31 patients (28.9 %) had inferior or posterior wall myocardial infarction; 6 patients (5.6 %) had critical left main coronary artery disease; 1 patient (0.93 %) had acute myocarditis, 1 patient had (0.93 %) non ischemic dilated cardiomyopathy, 2 patients (1.8 %) had Post MI-VSR. In all patients, IABP was inserted though femoral approach. Average IABP duration was 49.73 h. All cause 30 day mortality was 42 patients (39.2 %). Out of which 3 patients (2.8 %) died after IABP removal; 66 patients (61.6 %) had underwent PCI, 19 patients (17.7 %) had undergone CABG, and 3 patients had peripheral vascular occlusion on the IABP inserted lower limb requiring medical or surgical treatment.

Conclusion: The use of intra aortic balloon counterpulsation reduces 30-day mortality in patients with cardiogenic shock/ACS without cardiogenic shock, complicating acute myocardial infarction for whom an early revascularization strategy was planned.

Minimally invasive cardiac surgery (MICS): our experience at PGIMS Rohtak

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Objective: Minimally invasive cardiac surgery program was started in January 2010 at PGIMS Rohtak. We have operated 70 patients till October 2015. We present our techniques and experience of different cardiac operations through minimally invasive approach.

Material and Method: We have done mitral valve repair, mitral valve replacement, ASD closure, VSD closure, and aortic valve replacement through minimally invasive approach. Mitral valve surgery, ASD closure, and VSD closure were done through limited right anterolateral thoracotomy with femoral artery cannulation. Aortic valve replacement was done through upper partial sternotomy.

Result: The mean age of study group is 45 ± 11 years. Thirty-six mitral valve repair, 7 mitral valve replacement, 20 ASD closure, 4 AVR, and 3 VSD closure were done through MICS approach. Twenty-five atrial fibrillation surgery was done through MICS but these were done as concomitant procedure. There is only one mortality in this group.

Conclusion: Cardiac surgery through MICS is as safe as mid-sternotomy approach with equivalent functional and surgical outcomes. It is associated with lesser morbidity and lesser resource utilization with better post-operative quality of life. There are excellent cosmetic results especially in young unmarried females

Our initial experience of minimally invasive cardiac surgery

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Objective: Minimally invasive approach is the need of the hour in today's era. There are concerns regarding its applicability given the small stature of our population. We have started this program and are applying it for doing various procedures. We would like to share our experience.

Material and Method: Its a retrospective analysis of 16 cases operated between Feb 2014 and Aug 2015. Age ranged from 15 to 53 years. There were 6 ASD, 8 MVR, and 2 CABGs. TEE was used in all cases. Femoral artery and vein cannulation was used. SVC was cannulated percutaneously in ASD. Right 1–2 in mini thoracotomy was used. CABG was done off pump via left mini thoracotomy. We started our program by first doing direct closure of ASDs, then patch closure of ASD thereafter graduating to doing MVR and then CABG. We first used conventional techniques for cardioplegia but latter on changed to Del Nido to reduce cross-clamp time.

Result: More female patients were forthcoming for minimally invasive approach in ratio of 5:3. Initially, our CPB time was more but we could reduce it less than 2 h by using double-lumen endotracheal tube, Del Nido cardioplegia, and continuous carbon dioxide insufflation in chest cavity. By standardization of steps, we could reduce the drainage from approx 500 to about 150 ml and hence reduce the blood transfusion need from 4 units in first six cases to just 1–2 units in last ten cases. Patients were extubated in 2–3 h. There was early mobilization and discharge. Unfortunately, four of our patients had neuralgic pain at the operated site. One case had groin seroma at the cannulation site. There was no stroke or death.

Conclusion: Minimally invasive cardiac surgery is doable in our patients. It should be learnt to meet the challenges of advancement in cardiology. It is possible to do ASD closures, mitral/tricuspid valve repair or replacement, aortic valve replacement, and CABG via this approach. It is better to be selective in case selection at the beginning and as team gets used to it then graduate to combined cases.

Minimally invasive cardiac surgery: simplification techniques we have adopted

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Objective: Minimally invasive cardiac surgery (MICS) has become popular and being practiced in India. Experience and simplifications in the setup as well as techniques will make it to be adopted at many more centres.

Material and Method: We analyzed 152 cases of MICS performed at our center from 2012 to 2015. These cases include 42 CABG, 50 ASD repair, 48 mitral valve replacement, and 12 aortic valve replacements. Out of total 152, mini-sternotomy was performed in 21 cases and 131 had sternal sparing incision (mini-thoracotomy). During this experience, we did different modifications to simplify the procedure. These include positioning of the patient, anaesthesia, intubation, cannulation, exposure, etc. Use of standard endotracheal tube rather than double lumen tube, avoiding jugular venous cannula for SVC, and better venous drainage techniques were few of the modifications.

Result: We will present all these simplification techniques we have adopted for MICS. It has reduced the operation, bypass, and cross-clamp times in addition to increasing the safety of the procedure.

Conclusion: Simplifying the set-up and surgical technique for MICS made the procedures more users friendly, easier, adaptable, and reproducible. The simplified technique we have adopted will be discussed in detail. These will help and encourage many more centres to adopt MICS procedures.

Conventional sternotomy versus lower hemisternotomy without transverse cut in mitral valve surgeries: a comparative study

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Objective: Retrospective comparative study of patients undergoing mitral valve surgeries with a lower hemisternotomy (without transverse cut) with patients undergoing regular full sternotomies.

Material and Method: A retrospective analysis of patients' records over a period of 30 months (January 2013 to May 2015) was done. A total of 211 patients undergoing hemisternotomy for mitral valve diseases were analyzed for comparison with an equal number of control patients. These patients underwent lower hemisternotomy without a transverse cut. Patients with previous surgeries were excluded from the study. Data collected was analyzed with respect to the incision to bypass time, cross-clamp time, blood loss, and requirement for transfusion of blood/blood products. Need for re-exploration, mortality, and hospital stay post surgery was also compared between the two groups.

Result: There was no significant difference in the incision to bypass time between the two groups (mean 29.55 vs. 30.57 min). However, blood loss was less ($p < 0.05$) in patients undergoing hemisternotomy. There was also a significant decrease in the need for transfusion of blood/blood products.

Conclusion: Lower hemisternotomy without a transverse cut provides adequate exposure for nearly all type of mitral valve surgeries, be it for repair or replacement. Cannulation and exposure of the valve requires expertise; however, a short learning curve will give the required experience. Considering the advantages, and the decreased pain intensity, this can be used in most, if not all, mitral surgeries.

Early experience with minimal invasive cardiac surgery program

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Objective: Over the past decade, minimal invasive cardiac surgery (MICS) has grown in popularity. MICS is favoured by surgeons and patients for reduced post operative pain, faster healing, shorter ICU/hospital stay, and cosmesis. A new learning curve for surgeons and fear of the unknown has limited the number of surgeries performed. We have started MICS program at our centre.

Material and Method: Between June 2015 and November 2015 (6 months), seven patients underwent MICS, namely MICS ASD closure ($n=5$) and MICS MVR (replacement) ($n=2$). In all the patients, MICS was performed via antero-lateral thoracotomy with incision of 10–14 cm in right sub-mammary groove. CPB was established with femoral artery and direct bi-caval cannulation. Aortic root antegrade cardioplegia was delivered. We do not have special MICS instruments apart from Chitwood aortic clamp and used routine open cardiac surgery instruments available.

Result: There was no peri-operative mortality and no conversions to sternotomy were required. The mean age was 28 ± 6 years with three males and four females. The average cross-clamp time for MI ASD closure was 18.2 min and for MI MVR was 52.10 min. Mediastinal drains were removed on first POD with average drainage of 170 ± 20 ml. ICU stay was around 24 h and hospital stay was 4 days. The last two cases of MI ASD closure were extubated in operation theatre only. There were no wound infections.

Conclusion: MICS is safe and feasible, with rapid post-operative recovery. The cosmesis is excellent with hardly visible scar in females. There is no additional cost to the patient, rather shorter hospital stay and early return to work helps to better the economics. Although, we have just started MICS program and number of cases done are less, we are very excited with our early results and look forward to expand our horizon in MICS.

Del Nido cardioplegia in adult cardiac surgery practice—our experience

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Objective: Cardioplegic arrest during cardiac surgeries provides a safe and reproducible method to induce and maintain electromechanical quiescence. Various different type of cardioplegia like crystalloid, blood, or substrate-enriched solution were used in adult surgery with good results. Majority of the cardioplegic solutions need to be repeated at short intervals and are dextrose-based solutions. Del Nido cardioplegia has been used in pediatric practice for more than two decades. But use in adult surgeries is a new area at present, and no prospective data exist for such uses, and only few small retrospective reports are available

Material and Method: From Jan 2015, we started using Del Nido plegia in our adult practice and completed 63 cases using this cardioplegia system. Valvular surgeries were in 48 cases, coronary surgery with associated procedure in 5 cases, congenital cardiac surgeries in 4 cases, and aortic surgeries in 6 cases. Single dose of Del Nido cardioplegia contains 26 meq/l of KCL, 13 ml of 1 % lidocaine, 3.2 g/l of 20 % mannitol, 2 g of $MgSO_4$, and 13 meq/l of $NaHCO_3$ and 1000 ml of plasmalyte a solution. It is delivered in 1:4 dilution with oxygenated blood. Dosing was done as 20 ml/kg with maximum up to 1.2 l and used as single dose in 61 cases. Repeat dose of 10 ml/kg was delivered in two cases only after 120 min of cross clamp where electrical activity was appearing. Details of preparation of solution and modification of blood cardioplegia will be presented.

Result: In all patients, heart picked up beating spontaneously except two patients. Being single dose cardioplegia system, ease of doing surgery was also enhanced. Fluid overload was less and lower need of inotropic support was observed in immediate postoperative phase.

Conclusion: In conclusion, single dose of Del Nido cardioplegia is very safe and reproducible cardioplegia system. We have extended the use in all adult patients needing cardioplegic arrest.

Cardiac surgery in octogenarians: our experience

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Objective: With the advancements in medical facilities, average lifespan of human being increased in India, and with improvements in surgical techniques and postoperative care have resulted in increasing cardiac operations in the octogenarian group. The aim is to analyze our experience of cardiac surgery on octogenarians and beyond concerning postoperative morbidities and mortality.

Material and Method: One hundred eighty one octogenarians who underwent open heart surgery in our hospital between 2005 and 2015 were reviewed. Data included baseline preoperative status, intraoperative and perioperative course, and immediate outcomes. Preoperative spirometry and perioperative and postoperative analgesia was emphasized particularly in octogenarian group.

Result: The mean age was 84.22 years. One hundred sixty (88.39 %) patients were males and 21 (11.6 %) were females. The mean EF was 42 %. Risk factors include smoking in 54 (29.83 %), DM in 112 (61.8 %), hypertension in 94 (51.9 %), obesity in 47 (25.9 %), COPD in 18 (9.9 %), renal insufficiency in 21 (11.6 %), pulmonary hypertension in 3 (1.6 %), and cerebrovascular disease in 47 (25.9 %) patients. Perioperatively cryoanalgesia was given in 80 (44.1 %) and epidural analgesia in 101 (55.9 %) patients. Complications are renal impairment in 14 (7.73 %), arrhythmias in 20 (11.04 %), re-exploration 14 (7.7 %), prolonged ventilation in 17 (14.9 %), gastrointestinal bleeding in 5 (2.7 %), wound infection in 18 (9.9 %), and cerebrovascular accident in 5 (2.76 %). Hospital mortality was 16 (8.8 %) patients. Surgeries performed are OFF PUMP CABG 140 (77.3 %), PUMP SUPPORTED 8 (0.4 %), CABG + MVR 9 (4.1 %), CABG + AVR 15 (8.28 %), and AVR 10 (5.5 %).

Conclusion: Cardiac surgery can be performed safely with acceptable hospital morbidity and mortality in octogenarians and beyond. Early referral, proper selection of patient, and preparation for surgery are mandatory to improve immediate postoperative survival.

When should the intra-aortic balloon be used in patients submitted to cardiac surgery?

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Faculdade Assis Gurgacz

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Objective: Controversies have arisen on what is the best time to insert the intra-aortic balloon pump (IABP), in patients to be submitted to cardiovascular surgery. The aim of this study was to analyze the results of the use of IABP in patients undergoing cardiac surgery, in a single study, and to evaluate which is the best time for insertion.

Material and Method: This study analyzes the outcomes of 60 patients, who underwent cardiac surgery, and in which IABP were used, at the Institute of Cardiovascular Surgery of West Paraná (ICCOP) between February 1998 and September 2013. The patients were divided into four groups according to the time of insertion of the IABP: group A (three

patients)—preoperative period, group B (37 patients)—after anesthesia in the operating room, group C (five patients)—intraoperative after cardiopulmonary bypass (CPB), and group D (15 patients)—postoperative. The groups were compared, using a logistic regression, relating aortic clamping time, CPB, hospitalization time, length of stay in the intensive care unit (ICU), mechanical ventilation, and mortality.

Result: The statistical analysis of these characteristics found that no single factor was considered significant as a mortality risk. With respect to the time of insertion of the IABP, it was shown that group B had lower mortality.

Conclusion: Insertion of intra-aortic balloon after anesthesia, in the operating room, showed beneficial results in relation to the number of deaths compared to the other groups.

Is the use of cell saver system in cardiac surgery cost/effective and neurologically safe?

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Objective: The use of cell saver (CS) in cardiac surgery is proposed to reduce the use of units of packed red blood cells stored (URBC), which increases morbidity and mortality, and causes inflammatory reactions. The objective of this study is to evaluate whether the use of CS decreases the use URBC, is cost/effective, had any role in neurological events, and was beneficial to the patient.

Material and Method: In a prospective study, between November 2009 and October 2014, 200 consecutive patients who underwent cardiovascular surgery with CPB, hemodilution, and hemofiltration were enrolled. Patients were divided into groups 1 (no CS) and 2 (CS). The criteria for the replacement of RBC were hemodynamic instability and hemoglobin (Hb) <7–8 g/dl. Demographic data, as well Hb and hematocrit, mediastinal drainage, number of URBC and CPB, ICU and hospital time, were analyzed. The neurological status was evaluated after the patient woke up from anesthesia and at hospital discharge. Statistical analysis was performed to see if there was difference between which variable in both groups.

Result: In groups 1 and 2, the average age was 69.2 and 67.1 years, predominantly male, the logistic EuroSCORE of 11.2 and 10.5, and mortality of 2 and 3 %, unrelated to these study. Group 2 had a higher incidence of reoperations (14 versus 8 %), but the number of UCH used (6.6 versus 1.1) and length of hospital stay (11.1 versus 6.8) was lower. Univariate and multivariate analyses were performed, which showed no statistically significant values, except in the use of UCH. The relationship between the CS and the cost of RBC was cost/effective and length of stay was shorter. There were no neurological events in the survival groups in both groups in the ICU or at hospital discharge. No patient died being the neurological factor the main event.

Conclusion: The use of CS decreases the number of RBC used, is cost/effective, and has shown benefits for patients. There was no difference between the two groups for neurological events.

Preclinical testing of an indigenous novel chitosan-based hemostatic sponge in swine femoral artery model

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Objective: Hemostatic dressings and sponges play an important role in the management of vascular bleeding. The objective of this study is to compare the efficacy of an indigenously developed novel chitosan-based hemostatic sponge in controlling bleeding in a swine femoral artery.

Material and Method: The study was conducted at Frontier Mediville, Elavoor, Chennai. Two groups of four pigs about 50 kg each were used for the study. Group 1 (test group) was assigned to test the novel indigenous chitosan-based hemostatic sponge. Group 2 (control group) was used to test the efficacy of plain gauze in arresting the bleeding. The swine were pre-medicated, intubated, and after sterile preparation, the femoral artery was exposed in the femoral region and the adductor canal. An incision about 3 mm in diameter was made in the femoral artery, and the wound was allowed to bleed for 20 s before the test material was applied on the femoral artery, with a sponge pad on top of it. Compression was exerted for a period of 4 min. The sponge was then removed, leaving the test material on the femoral artery. After a period of 15 min, the test material was removed. Blood loss and control of bleeding were noted at different time points for the various groups.

Result: The mean blood loss was found to be about 300 ml in the chitosan sponge group. The mean blood loss in the gauze group was 950 ml with ongoing bleeding at the end of the study. At the end of 5 min, the test sponge achieved hemostasis at the femoral injury site while the control group did not show cessation of bleeding. Removal of the test material at the end of 15 min led to renewed bleeding in two pigs in the test group.

Conclusion: Chitosan is prepared for the shells of crustaceans and has been extensively studied including its hemostatic property. This study found the novel indigenous hemostatic sponge based on chitosan to be efficacious in arresting important vascular bleeding

Is adding controlled reperfusion to Del Nido cardioplegia useful?

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Objective: Is adding controlled reperfusion to DelNido cardioplegia useful?

Material and Method: A prospective randomized trial was conducted on 78 consecutive adult patients who underwent cardiac surgery with predicted aortic cross-clamp time of more than 40 min in a tertiary care teaching hospital. Patient undergoing coronary revascularization procedures were excluded. Patients were administered Del Nido cardioplegia (20 ml/kg body weight) and heart was topically cooled. Systemic temperature was maintained at 32 °C. Retrograde cardioplegia catheter was placed. Half of the sample was randomized to receive reperfusion with tepid blood at end of procedure (rate 350 ml/min, maintaining a pressure less than 40 mmHg). Coronary sinus blood was sampled at 2, 5, and 10 min post aortic cross-clamp removal and checked for lactate levels, SO_2 , and pO_2 . A reference arterial blood gases sample was drawn at 5 min after aortic cross-clamp removal. Blood CK-MB was estimated at 8-h intervals for 24 h post surgery. Appropriate statistical tests were used for analysis.

Result: There was no mortality till date of data submission in either arm of study. The controlled reperfusion group had lower coronary sinus pO_2 and SO_2 at 2 min post aortic cross-clamp removal vis-a-vis Del Nido cardioplegia alone (pO_2 41.0 mmHg versus 50.33 mmHg; $p=0.043$) (SO_2 67.44 versus 78.10 %; $p=0.011$) using two-sample *t* test for unequal variances. Mean coronary sinus pO_2 and SO_2 at 2, 5, and 10 min were similar (pO_2 33.61 mmHg versus 36.80 mmHg; $p=0.132$) (SO_2 58.79 mmHg versus 61.84 mmHg; $p=0.075$) using ANOVA two-factor without replication. Mean coronary sinus lactate at 2, 5, and 10 min was 3.09 mmol/l in controlled reperfusion arm and 3.06 mmol/l in Del Nido cardioplegia alone arm ($p=0.655$). Mean CK-MB was 86.44 U/l in controlled reperfusion group and 81.71 U/l in Del Nido cardioplegia alone group ($p=0.672$).

Conclusion: Controlled reperfusion is not harmful with Del Nido cardioplegia. Two-minute coronary sinus pO_2 and SO_2 are significantly higher in group without controlled reperfusion. It may be attributed to early ‘no reflow’ phenomenon. However, the difference is attenuated with time and ceases to remain significant. Controlled reperfusion following Del Nido cardioplegia appears to have a beneficial role in myocardial protection.

Prevention of acute renal failure post cardiac surgery under cardiopulmonary bypass using preoperative infusion of sodium bicarbonate: a prospective randomized controlled trial

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Objective: Acute renal dysfunction is a common and serious postoperative complication of cardiopulmonary bypass. Theoretically, alkalinisation can protect acute kidney injury post cardiopulmonary bypass.

Material and Method: In a prospective randomized controlled trial, we enrolled 200 adult patients undergoing open heart surgery with the use of cardiopulmonary bypass (CPB). One hundred patients received 150 ml of 7.5 % sodium bicarbonate (SBIC) mixed to 750 ml of 5 % dextrose, infused at 1 ml/kg/h through a dedicated intravenous line for 6 h prior to the initiation of CPB, and 100 patients (control group) received 0.9 % sodium chloride given at same rate and volume. Post-operative serum creatinine, urine output, increase in serum creatinine value, and several other parameters were evaluated. The primary endpoint was the proportion of patients developing acute kidney injury.

Result: Renal replacement therapy (RRT) was initiated in 8.2 % of patients in the control group and 7.2 % of patients in the SBIC group. Time to initiate RRT was 29.0 (19.0 to 39.0) hours in the control group and 35.5 (24.5 to 49.0) hours in the SBIC group (*P* value not significant).

Conclusion: In our study, urinary alkalinisation using sodium bicarbonate infusion was not found to reduce the incidence of acute kidney injury following open heart surgery; however, less number (7.2 %) of the patients in SBIC group required RRT than 8.2 % patients of the control group. There was no differences in direct or indirect measures of morbidity and mortality in both groups. However, a larger sample and a multi-centre trial may yield different outcome.

Cardiac surgery in SAARC region: the current trends and future focus

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Objective: South Asian Association of Regional Cooperation (SAARC) is an economic and geopolitical organization of the eight countries of the region. Collectively, they cover an area of 4,334,215 km² or 2.96 % of the face of the world. These countries host approximately 23.4 % of world population today. Cardiac surgical facilities currently exist in six of these countries. Objectives of this study are to figure out the present situation of cardiac surgery in this region, sort out the problems, and focus on future development perspectives.

Material and Method: The national organizations of different nations and renowned individual surgeons had been contacted for the available information from their database. Cardiac product manufacturing companies also maintain their own database. This information was matched with that provided by the industry. In addition, the secondary sources like journals, records, and archives were thoroughly searched. Internet search engines have been extensively used along with personal effort of individual investigators. The database of the cardiac anesthetists associations was found to be very useful source in some cases. All the data collected were compiled and analyzed.

Result: All SAARC countries are regularly performing cardiac operations except Bhutan and the Maldives. The total number of cardiac operations performed annually in these 6 SAARC countries is estimated around 200,000 with almost three-fourths being in India, the dominant nation. The number of qualified cardiac surgeons is around 1000. Although India has the highest number of operative procedures, when

the population is taken into consideration, Sri Lanka has the best figures per million inhabitants. Despite numerical inferiority, the quality of cardiac surgery in the SAARC region is comparable with that of the developed world.

Conclusion: Cardiac surgery is a well-established discipline in the SAARC region. But the annual number of 200,000 is not adequate when compared with the other parts of the world. The USA alone, with one-fifth of SAARC population, performs more than half a million cases per year. Proper planning, innovative thinking, capacity building, cost cutting, and mutual cooperation all are of utmost importance to meet the future demand of cardiac surgery for the SAARC population.

Cardiac surgery without blood transfusion: a 7-year single centre experience in Jehovah's Witness

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Objective: Jehovah's Witness a section of Christian faith are well known for their refusal to use blood and blood products. Cardiac surgery seems to be risky especially where use of blood and blood products are usual. This study reviews our strategies and experience in conducting routine and complex cardiac surgeries in this sect of people.

Material and Method: Over 7 years from 2008 to 2015, 19 patients underwent open heart procedures including CABG, valve replacements, and aortic root replacements. We retrospectively studied the demographic data, perioperative management, blood conservation strategies, and clinical outcomes in such patients.

Result: The mean age was 50 ± 15 years with 13 men and 6 women. Operative procedures included isolated coronary artery bypass grafting (CABG) ($n=13$), isolated valve replacement/repair ($n=2$), valve replacement and CABG ($n=2$), ASD closure and ascending aorta replacement ($n=1$), and redo MVR + ascending aorta replacement ($n=1$). The mean preoperative haemoglobin was 13.0 ± 1.0 and 10 ± 2 in immediate postoperative period. Strategies involved were preoperative erythropoietin, meticulous anaesthetic management with pressors, acute normovolemic hemodilution, perfect hemostasis, retrograde priming, use of cell saver, and targeted pharmacotherapy with tranexamic acid and aprotinin. On follow up at 3 weeks post surgery, the haemoglobin was 12 ± 2 and there was no change in left ventricular function.

Conclusion: Our experience shows that complex open heart operations can be performed without blood transfusion if proper blood conservation strategies are applied. In a broader sense, 'bloodless' cardiac operations can be performed in all patients.

Risk stratification in open heart surgery—role of EuroSCORE II

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Objective: The aim of this study is to evaluate EuroSCORE II for the risk stratification in adult patients undergoing cardiac surgery at our centre.

Material and Method: This is a retrospective data analysis of consecutive 884 adult patients undergoing cardiac surgery from January 2010 to August 2015. All the patients were operated at a single tertiary care centre and by a single cardiac surgeon. EuroSCORE II was calculated for each patient. The calibration of the scoring system was assessed using the Hosmer Lemeshow test, and the discriminative capacity was estimated with area under receiver operating characteristic curves.

Result: The all-cause in-hospital mortality was 1.47%. Predicted mortality with the EuroSCORE II was 3.6 ± 1.42 %. Using the Hosmer Lemeshow test, chi-square value of 5.12 ($p=0.07$) was obtained, indicating satisfactory model fit. The calculated area under the receiver operating characteristic curve was 0.789 (asymptotic 95% confidence interval, lower bound 0.665 and upper bound 0.912), indicating very good discriminatory power.

Conclusion: EuroSCORE II has satisfactory calibration and discriminative power to predict mortality in adult patients undergoing cardiac surgery at our centre.

Cardiac surgeon report card and database 2015 and its importance and utility

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Objective: Clinical outcome data is very important for individual cardiac surgeon and the surgical unit he is working in. Present era demands transparency and keeping it in mind many countries have made it mandatory to publish their data. There was a long positive debate for a database, but no one actually presented their own database. This is an effort to compile the database.

Material and Method: We are compiling data of our patients with approximately 30 variables for the last 4 years. Now, we are presenting our data of patients operated between January and October 2015. During this period, we operated 110 patients of CABG and 24 were other patients who required CPB.

Result: All CABG were done off pump, except a single patient who required CPB before grafting. Male-to-female ratio was 93:17. Average age was 62.14 ± 8.2 years with median of 61 years. Twenty-seven had left main disease, 59 were diabetic, 80 had recent MI, and 63 were hypertensive. Eighty-one patients were in ACS-9 in UA, 62 NSTEMI, and 10 had STEMI. Eight patients had prior PCI. In CABG group, total Euroscore I/II were 719.64/577.97 against actual mortality of four patients. One more patient expired after discharge but within 30 days. Total PRBC requirement in CABG group was 54 units (0.52 units/patient). Seventy-six patients (69%) were discharged without any PRBC infusion. Mean Hb was 12.47 ± 1.89 g % with median of 12.75 g %. In CABG group, 8 patients were operated in emergency and 11 were operated in critical preoperative state. In patients requiring CPB Euro score I/II: 140.19/96.19, actual mortality of one patient. Average age was 50.35 ± 14.79 (50 years), and average hemoglobin was 12.96 ± 1.70 median of 13.0. Total PRBC requirement was 27 units (1.17 units/patient). Twelve patients were operated without any PRBC infusion (50%). There was no reopening. Mediastinitis and sternal dehiscence occurred in three patients and all survived.

Conclusion: Cardiac surgeon's report card can be used for self evaluation, assessing a particular trend, determining impact of new technique or instrument, better learning, and to some extent in gaining confidence. Furthermore, it can be used as true marketing tool as in western world.

Our experience of surgical management of post MI VSD—early surgery is the best

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Objective: VSD after acute myocardial infarction is associated with poor prognosis. Surgical intervention is mandated in majority of such cases. We reviewed our outcome vis-à-vis contemporary results.

Material and Method: We retrospectively analyzed the hospital records of 16 patients who underwent surgery for post MI VSD in our institute between 2008 till 15 Nov 2015. Twelve were males and mean age was 68 years. IABP was used in all cases.

Result: Half of the 16 patients required concomitant CABG. There were small residual shunts in four patients. The patient had extension of VSD and required re-operation. There were two in-hospital deaths, and one had stroke on 5th POD. The deaths were in the patients who had presented to us from periphery in low hemodynamics with poor KFT.

Conclusion: Surgical closure of the mechanical defect after MI is the only option. No doubt it has high risk but early surgery gives the best result.

Submitral left ventricular aneurysm—our experience over 10 years

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Objective: Submitral left ventricular aneurysm (SLVA) is a rare cardiac anomaly which occurs most commonly among the black population. Here, we share our experience of five cases that were treated surgically successfully at our institute.

Material and Method: From June 2006 to May 2015, five patients of submitral left ventricular aneurysm were treated at our institute. Age ranged from 23 to 30 years. There were four males and one female. Three patients had moderate mitral regurgitation and two patients had severe mitral regurgitation. One patient had aneurysm with multiple necks. Diagnosis was made by echocardiography and was confirmed by angiography in all cases. Cardiac MRI was done in the last case. In four cases, aneurysm was excised and annulus was resuspended with interrupted sutures and in one case, mitral valve was repaired with annuloplasty ring.

Result: All patients were discharged in stable condition. There was no early or late mortality. Follow up of the patients ranged from 3 months to 7 years. Early follow up showed moderate mitral regurgitation in one case and on optimal medical treatment and residual aneurysm cavity in one case. One case in which annuloplasty ring was used had no mitral regurgitation or residual aneurysm cavity.

Conclusion: Submitral left ventricular aneurysm is a rare cardiac lesion. Diagnosis can be done by echocardiography. Cardiac MRI gives better delineation of the SLVA. Surgery is the treatment of choice and careful closure of all the necks of aneurysm and use of mitral annuloplasty ring is preferable which can reduce the recurrence of postoperative mitral regurgitation or residual aneurysm cavity.

Strategies to manage bloodless heart operations in Jehovah Witness: our experience

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Objective: The aim of this study is to show the feasibility of bloodless surgeries in complex open heart surgeries using the data from heart surgeries performed on Jehovah's Witness patients.

Material and Method: This study is a single-centre retrospective analysis of 12 patients who underwent bloodless surgery from 2010 to 2015. The age ranged between 1 and 48 years and body surface area ranged between 3 and 80 kg. Various surgeries performed were TOF correction, VSD closure, AV canal repair, Bentall procedure, valve replacement with endocardectomy, and redo case of completion Fontan. All acyanotic patients required preoperative intravenous (IV) iron and erythropoietin therapy. All procedures were performed using conventional CPB at 32 °C with cardioplegic arrest of the heart. Synthetic hemostatics used were bone wax and surgical. Albumin, which is considered as secondary blood product, was used as a plasma expander in all cases, and a specific consent for this was obtained

Result: Mean CPB-time was 162 ± 46.35 min; mean cross-clamp time was 115 ± 41.78 min. Intraoperative blood loss was 181 ± 98.42 ml. One patient was re-explored for cardiac tamponade. One patient developed (completion Fontan) hemothorax following aspiration of pleural effusion, which was managed conservatively. All patients survived.

Conclusion: Strategies such as pre-operative optimization of haemoglobin, effective intraoperative fluid management, and meticulous hemostasis allows bloodless surgery in Jehovahs Witness patients. Considering the ills of blood transfusion, this study illustrates that bloodless surgery is practical and should be pursued even in patients who are not Jehovahs Witness.

Role of primary thoracoplasty in cases of recurrent hemoptysis

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Objective: Recurrent hemoptysis is one of the most common symptom in patients presenting in a thoracic surgical outpatient department. Many of these patients present with bilateral disease or with severe reductions in their pulmonary function ruling out lung resection surgeries in them. Primary thoracoplasty with or without added apicolysis is a viable option in such patients, completely absolving hemoptysis or making the subsequent episodes very minimal. We present a series of 50 cases that underwent primary thoracoplasty with or without apicolysis for recurrent hemoptysis in our institute.

Material and Method: A series of 50 patients presenting with hemoptysis with bilateral disease or reduced pulmonary functions not suitable for lung resection were selected. Pre-operative CT scan and a bronchoscopy were done showing either a higher burden of disease on one side or active bleeding from one side. Primary thoracoplasty was done in these patients. Minimum follow-up was for 6 months.

Result: Out of 50 patients, 33 had no hemoptysis in follow up. Thirteen patients had recurrent hemoptysis which was of very less amount not requiring admission. Four patients continued to have hemoptysis of substantial amount requiring repeated hospital admissions.

Conclusion: Primary thoracoplasty is a viable option in patients with recurrent hemoptysis not suitable for lung resection surgeries reducing the incidence of life-threatening hemoptysis and improving the quality of life.

Utility of Thopaz in patients of tubercular pyothorax undergoing decortication

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Objective: Usually after thoracic surgery, we need chest tube drainage systems to aid in lung expansion. Negative thoracic suction is very much needed after certain surgeries, especially after decortications in tubercular lung. However, creation of negative suction using wall suction has its limitations like it limits mobility of patient, is unpredictable, and at times hazardous. The aim of this study is to evaluate utility of Thopaz (a negative suction thoracic drainage system) with traditional chest tube drainage systems after surgical decortication in terms of removal of chest tube (days), length of hospital stay, and post-operative complications.

Material and Method: It is an observational retrospective study carried out in department of Cardiothoracic surgery, JNMC, AMU, Aligarh which included patients of tubercular pyothorax who underwent open decortication. All our patients were taking Anti tubercular therapy. We excluded patients of MDR tuberculosis and those with significant comorbid diseases. Our control group (group I) included 20 patients operated

between may 2013 to April 2014 in whom traditional chest tube drainage system was used and study group comprised of 20 patients operated between may 2014- June 2015 in whom Thopaz was used (group II).

Result: Both the groups were comparable in age and gender distribution. There was no operative mortality in either group. The intercostal tube drain was removed in group I in 14.1 days (range 5–33) while in group II, it took 8.3 days (4–23) which was statistically significant ($p < .05$).

Conclusion: Thopaz significantly decreases duration of ICTD insertion and hospital stay in patients of tubercular pyothorax and thus decreases morbidity and hospital costs.

Combined intra and extra pericardial approach of hilum for a complex pneumonectomy: our centre experience

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Objective: Pneumonectomy involving a chronically diseased lung is usually associated with difficulty as to adequate dissection and exposure of hilum. Ligation of hilar structures in a potentially inflamed environment is fraught with the risk of poor healing and blow out. Hence, a combined intra and extra pericardial approach is employed in cases of complex pneumonectomy.

Material and Method: Approach is via lateral thoracotomy via the fifth intercostal space. After opening the pleura, the underlying lung is dissected off the anterior chest wall till pericardium is reached, which is opened in front of the phrenic nerve longitudinally so that all hilar structures are visualized. Now, the pulmonary artery is approached first, isolated, and mobilized. This is followed by double transfixation and division. The procedure is similarly repeated for the superior and inferior pulmonary veins. Now, the lung is attached only at the level of bronchus. It is dissected off the remaining pleural cavity. After the lung is completely free, the bronchus is approached and sleeve resection is done. The stump is covered with thymic flap/intercostals muscle flap or mediastinal pleura as per need. The pericardial defect is carefully closed with continuous Prolene suture. Care is taken to preserve the phrenic nerve.

Result: Thirty-one patients including 27 males and 4 females have undergone this procedure. Twenty-three pneumonectomies on the right and 8 pneumonectomies on the left were done. All the patients had chronically diseased lungs with post tubercular sequelae. All the patients had normal post-operative recovery; the only complication being surgical site wound infection in four patients.

Conclusion: Dissection in a case of chronically diseased lung is difficult due to wide spread inflammation. Intra pericardial approach to the hilar structures where there is a relatively aseptic plane and comparatively healthy tissue. The vascular structures and bronchus can be easily isolated, mobilized, doubly transfixed, and suture ligated. Aim is to reach the pericardium, first complete the intra pericardial isolation, mobilization, double transfixation, and division ligation of vessels followed by completing the extra pericardial dissection of lung with sleeve resection of the bronchus in the end. The bronchial stump should be reinforced and pericardium should be closed.

Surgical results in carcinoma esophagus at GMC Jammu

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Objective: The aim of this study is to know the mode, pattern of presentation, common site/type, and the results of various surgical procedures in carcinoma esophagus.

Material and Method: The study was conducted in the Department of Cardiovascular and Thoracic Surgery. Besides history, and clinical

examination, all the patients had endoscopic and histopathologic evidence of carcinoma esophagus. Only patients having lesions beyond 25 cm from incisors were included in the study. Preoperative contrast-enhanced computed tomography (CECT) was done in all. Except patients with distant metastasis, others were planned for esophagogastrectomy. Esophagogastric junction was approached by laparotomy, and in patients with extensive disease and dysphagia only feeding, jejunostomy was done. Transhiatal esophagogastrectomy with gastroesophageal anastomosis was the common procedure performed, and all patients with resection had feeding jejunostomy. Morbidity and mortality was recorded, surviving patients were attached to radiation oncology department, and patients were followed up in outpatient department.

Result: A total of 76 patients were included in the study, majority males and in sixth to seventh decade of life. Dysphagia was the presenting symptom, and features of esophageal pathology on endoscopy and evidence of carcinoma esophagus at histopathology was documented. Eighty percent of the patients had transhiatal esophagectomy; in 20 %, only feeding jejunostomy could be done, in one the procedure had to be abandoned, and one with esophagectomy had benign pathology. Re-exploration for bleeding and tracheal injury was needed on eight and one occasions, respectively. In three patients feeding jejunostomy had to be done at multiple times, two of whom were alive at 2 years. Anastomotic leak followed by anastomotic stenosis were the problems encountered. All surviving patients were attached to the department of radiation oncology for possible radio chemotherapy. Mortality was 11.84 %. Quality of life improved in the resected and surviving group.

Conclusion: Quick suspicion, specific investigation, early and precise surgical intervention in combination with multimodality treatment gives good results

VATS hybrid techniques to improve the learning curve for VATS

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Objective: Video-assisted thoracoscopic surgeries (VATS) have been gaining importance as the gold standard technique for various thoracic resections. The perceived complexity of the technique, inadequate instrumentation and training, and concern regarding the potential compromise of surgical and oncologic principles have been a barrier to adopt the VATS technique. This article presents the use of videoscope along with mini thoracotomy to perform technically difficult VATS surgeries and improve the learning curve for performing VATS.

Material and Method: A series of 1043 VATS procedures were performed between 2011 and 2015. Out of which 103 cases were performed as a hybrid technique where mini thoracotomy was made along with videotelescope at the thoracoscopic port. The advantages of this dual access were ease in instrumentation, visualization, lighting, retraction, and hand-eye coordination. In addition, this technique allows immediate access under direct vision for urgent control of bleeding, which can be difficult using a conventional thoracoscopic approach.

Result: Out of 103 cases, 74 were males and 29 were females with the mean age of 54 years (ranging from 22 to 82). The cases performed were anatomical anomaly, severe dense adhesions, identifications of very small/deep-seated malignant lesions for biopsy, lobectomy, decortication, pneumonectomy, sleeve resections for carcinoid, and bronchoplasty. The mean operative time was 92 min. There were no conversions to conventional thoracotomy. Mean hospital stay was 3–4 days. Chest tube duration was 2–3 days. There was no mortality. The results were favourably compared to conventional VATS procedures and showed a feasibility of the hybrid technique.

Conclusion: The results suggest that every open thoracic surgery should have a thoracoscopic port for better visualization of anatomy, technique, and hand-eye coordination which will further enhance the learning curve for VATS

Advantages of robotic approach for plication of diaphragm for eventration

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Objective: Diaphragm plication surgery is performed for symptoms of dyspnea, which results from mediastinal shift, atelectasis, and ventilation/perfusion dyssynchrony in lungs that occur because of an eventrated diaphragm. We describe our experience with robotic thoroscopic plication for the treatment of diaphragmatic paralysis

Material and Method: Diaphragm plication surgery is performed for symptoms of dyspnea, which results from mediastinal shift, atelectasis, and ventilation/perfusion dyssynchrony in lungs that occur because of an eventrated diaphragm. We describe our experience with robotic thoroscopic plication for the treatment of diaphragmatic paralysis

Result: Six of seven patients successfully underwent robotic plication. One patient had to be converted open as it was difficult to achieve single lung ventilation. Mean operating time was 203 min. No major complications occurred during surgery or the postoperative period. All patients were discharged after PODay 3. At 12 months follow up, no recurrence was observed

Conclusion: Advantages of thoroscopic plication compared to open thoracotomy are ease of endoplication of diaphragm, less postoperative pain, and shorter hospital stay, yet technical difficulties due to limited workspace and by the ribcage and the elevated hemidiaphragm have been a major drawback in using the robotic approach for this disorder

Use of hybrid techniques to improve the learning curve for VATS

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Objective: Video-assisted thoroscopic surgeries (VATS) have been gaining importance as the gold standard technique for various thoracic resections. The perceived complexity of the technique, inadequate instrumentation and training, and concern regarding the potential compromise of surgical and oncologic principles has been a barrier to adopt the VATS technique. This article presents the use of videoscope along with mini thoracotomy to perform technically difficult VATS surgeries and improve the learning curve for performing VATS

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Result: Out of 103 cases, 74 were males and 29 were females with the mean age of 54 years (ranging from 22 to 82). The cases performed were anatomical anomaly, severe dense adhesions, identifications of very small/deep-seated malignant lesions for biopsy, lobectomy, decortication, pneumonectomy, sleeve resections for carcinoid, and bronchoplasty. The average operative time was 108 min. There were no conversions to conventional thoracotomy. Mean hospital stay was 3–4 days. Chest tube duration was 2–3 days. There was no mortality. The results were favourably compared to conventional VATS procedures and showed a feasibility of the hybrid technique.

Lung transplant and outcomes: a single-center experience

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Objective: Indications for lung transplant have widened over the years, with selection criteria becoming less restrictive. Unfortunately, a wider donor pool has limited application of this treatment, but this is being addressed through donor management protocols, refinement of the technique of lung preservation, and development of ex vivo perfusion system to recondition suboptimal donor lungs. Bronchiolitis obliterans, infection, and primary organ dysfunction are major impediments to long-term survival. Here, we analyze our early and midterm experience with single and double lung transplant.

Material and Method: Between December 2011 and November 2015, 21 patients (13 male, 8 female; mean age 42.3 years; range 19–68 years) with end-stage pulmonary diseases underwent single lung transplants ($n=16$) and double lung transplants ($n=5$) at our institution. Preoperative patient demographic data are presented. Recipients were selected according to the guidelines outlined by the International Society for Heart and Lung Transplant. Organs were allocated to recipients based on blood group, size match, and patient status. Donor lungs were preserved with ice-cold low-potassium Dextran (50 mL/kg, Perfadex, Vitrolife, Sweden) mixed with buffer solution tromethamine (THAM), prostaglandin E1 (500 μ g), and calcium gluconate (10 %). A bolus of prostaglandin E1 (500 μ g) is administered directly into the pulmonary artery just before antegrade pulmonary artery flush.

Result: Twenty-one recipients (13 male [61.9 %] and 8 female [38.1 %]) underwent 26 lung transplants. There was no peri-operative mortality. Seven patients (33.3 %) died within 30 days of surgery, five patient died due to multi-organ failure as a result of sepsis, one patient died due to re perfusion injury, and other patient died of rejection. The overall 1- and 5-year survivals for recipients were 66.7 and 55.4 %. Recipients body mass index, age, and use of cardiopulmonary bypass had no significant effect on the length of mechanical ventilation, length of stay in the intensive care unit, and advantage on recipient survival. At 1 year after surgery, a significant improvement was observed in pulmonary function.

Conclusion: Our single-centre experience in lung transplant confirms satisfactory results. Limitations of this study include having a small number of patients.

Video-assisted thoroscopic surgery of sliding hiatus hernia—a single institute experience

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Objective: Sliding hiatus hernia is associated with laxity of the phrenoesophageal membrane and the cardia of the stomach herniates. Sliding hiatus hernia is diagnosed by barium swallow radiography, endoscopy, or manometry. The gastroesophageal junction becomes incompetent and esophageal acid clearance is compromised in patients with hiatal hernia, which facilitates the development of gastro-esophageal reflux disease (GERD). Majority of these hiatus hernia patients present with GERD. Because GERD may lead to several complications, surgery should be considered in patients with refractory symptoms and in patients with complications, such as recurrent bleeding, ulcerations, or strictures. We have performed video-assisted thoroscopic fundoplication in seven patients with symptomatic hiatus hernia which has been described here.

Material and Method: From March, 2015 to September, 2015, a total of seven patients were operated in the Department of Cardiovascular and Thoracic Surgery, NRS Medical College & Hospital, Kolkata, West Bengal, India.

Result: We had a total of seven patients (3 males, 4 females; age range 28–63 years). Video-assisted thoracoscopic fundoplication was done in all cases through three port technique. Port size ranged from 5 mm to 7 cm. Hernia size was moderate (2–5 cm). Duration of surgery was from 90 to 120 min. All these cases had smooth postoperative recovery. Feeding could be started within 48 h. **Conclusion:** Thoracoscopic technique using three ports and 10-mm camera was found to be effective and reproducible with minimum morbidity. All patients had significant improvements of symptoms. No recurrence noted till 9 months follow-up (maximum). Long-term study is required to see the effectiveness of the procedure in the long run.

Mediastinal tumors—single centre experience over 7 years

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Objective: The aim of this study is to do a retrospective observational study of the various types of mediastinal tumors operated in a single centre over a period of 7 years (2008–2015).

Material and Method: Retrospective analysis of all patients who were operated for mediastinal tumours between 2008 and 2015 was done. Clinical presentations, diagnostic workup, management, complications, and their outcome were recorded.

Result: Of the 78 patients, 44 were male and 34 were female. Average age of these patients was 38 (range: 21 to 60). Most common clinical feature was chest pain and dyspnea (1). Anterior mediastinal tumors were most common (1,2), with thymoma being most common in anterior mediastinal tumors (1,2). Posterolateral thoracotomy was done in most of the patients. However, few required median sternotomy. Complete excision was achieved in 60 and debulking done in 18 patients. Complications were seen in 13 patients, hemorrhage being the most common complication. Average post operative stay was 10 days and 7 of the patients succumbed (early and late).

Conclusion: Mediastinal tumors are more common than observed. They are often large and pose difficult surgical problem. A complete excision should be the aim; however, if not complete excision at least a debulking of these tumors should be attempted to alleviate the patients symptoms and give chance for adjuvant therapy. Downstaging of some tumors with neoadjuvant chemoradiotherapy may be given for attempting complete excision in malignant tumors.

Tracheal reconstruction: our experience

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Objective: Tracheal stenosis a potentially life-threatening condition. Prolonged intubation and improper management of endotracheal tube has been a major factor. Segmental resection and end-to-end anastomosis or resection with staged repair using Montgomery tube are the methods employed in reconstruction.

Material and Method: A retrospective analysis of 38 patients with post intubation tracheal and post-traumatic stenosis treated surgically from January 2008 to September 2015 was done.

Result: Of 38 patients, the male-to-female ratio was 22:16; 14 patients had long segment stenosis, and the rest had short segment stenosis. Twenty-six patients underwent primary end to end anastomosis; 12 patients underwent resection anastomosis with Montgomery tube. Dissection was done on anterior and posterior aspect and anastomosis was done with 3–0 Vicryl interrupted sutures. Eight patients who had undergone Montgomery tube placement underwent removal after 1 year and reanastomosis. All patients were preferably extubated on table and managed in critical care ICU. Fiber

optic bronchoscopy was done at various stages of surgery and post op period for assessment and toileting. Four patients required post-operative ventilation with careful adjustment of PEEP and ventilator parameters. Restenosis occurred in four patients, two underwent re-surgery and recovered, two patients are waiting with Montgomery tube.

Conclusion: Tracheal reconstruction is the only available modality for post intubation tracheal stenosis. Resection and end-to-end anastomosis with 3–0 Vicryl sutures has been standardized. Outcome is excellent.

Colon as replacement for esophagus in cases of corrosive stricture esophagus 5 year experience of tertiary care centres

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Objective: Ingestion of corrosive substances either accidentally by children and alcoholics or intentionally for purpose of suicide is a common form of poisoning, especially in Eastern India. Management of this problem is, however, more complex and demands careful evaluation and reconstruction. Surgery is a well-established treatment for corrosive strictures and involves either resection or bypass of the damaged esophagus and replacement by a conduit. Surgical management of the corrosive stricture esophagus and to study the outcome of colonic transposition as conduit for esophageal replacement.

Material and Method: Following acid ingestion, patients who had stricture esophagus, documented by clinical feature of dysphagia and barium study, were admitted for evaluation. Nutritional status of these patients was checked. Patients who did not respond to initial intervention (esophageal dilation, feeding jejunostomy, gastrojejunostomy) were planned and taken up for esophageal replacement surgery. Postoperative outcome was evaluated in terms of resolution of dysphagia, weight gain, quality of life, complications, and mortality.

Result: Out of 57 patients treated for stricture esophagus, M:F 30:27, 25 urban community, 32 rural community. Age group was 6–60 years (average 26 year). Forty five were due to acid ingestion and 12 were suffering from alkali ingestion. Out of 57 cases, 18 of them underwent colon interposition graft. Colonic interposition was reserved for long segment stricture esophagus with small contracted stomach or where only cervical esophagus is dilatable or stricture lower end of esophagus with dilated stomach (where cervical esophagus is dilatable up to 30 Fr dilator). Three patients had post-operative pneumonia and three had abdominal wound dehiscence which were managed conservatively. Total mortality was found to be 5 (anastomotic leak and sepsis). At 6 month follow-up, there was improvement in dysphagia and substantial weight gain.

Conclusion: We conclude that with proper case selection, this procedure, if properly performed, gives good results. It improves quality of life to some extent. However, long-term outcome of acid stricture ingestion, in general, still needs remarkable improvement.

Mitral valve disease with chronic atrial fibrillation treated by mitral valve repair/replacement along with modified COX-Maze III procedure: our centre experience

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Objective: Chronic atrial fibrillation (AF) in the setting of diseased mitral valve is distressing to both the clinician and patient. Valve repair/replacement alone may not be sufficient to reduce AF completely. We

studied the effectiveness of modified COX-maze III procedures with radiofrequency (RF) in conjunction with valve repair/replacement surgery for effective treatment of chronic AF.

Material and Method: Patient with rheumatic mitral valve disease with established chronic AF underwent mitral valve repair without ring (open mitral valvotomy, removal of LA clot if present, and chordal splitting) or replacement (TTK Chitra Mechanical or SJM bileaflet mechanical valve) with complete anatomic preservation combined with modified COX Maze III RF ablation along standard incision lines.

Result: All 18 patients had normal post op recovery. Post operatively, all patients were started on antiarrhythmic agent (Amiodarone 200 mg bd or tds) and anticoagulation. In all 18 patients, sinus rhythm was restored and sustained over follow up of 3 months. However, three patients at 6 months follow up had reverted to intermittent AF. All patients are on regular follow up.

Conclusion: The modified COX Maze III procedure in conjunction with mitral valve repair/replacement is a safe and effective method in treatment of chronic AF. RF ablation has the advantage of blocking all accessory pathways as it causes complete thickness wall scarring (due to endocardial and epicardial approach) without the need to apply surgical incisions.

Valve surgery—a decade of experience in Apollo Hospitals Dhaka

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Objective: Surgical treatment for heart valve disease has good, long-term outcome.

Material and Method: This retrospective study was done in Apollo Hospitals Dhaka from 10th July 2005 to 11th October 2015. A total of 391 valve cases were operated. There were 261 males and 130 females. Mitral valve replacement was 222, aortic valve replacement was 107, double valve replacement was 17, and mitral valve repair was in 18 cases. Aortic valve repair was done in 7 cases, and De Vega annuloplasty for tricuspid regurgitation was done in 21 cases. Root enlargement was done in 15 cases, Nicks procedure was needed in 14 cases, and Nicks procedure with Konno-Rastan aortoventriculoplasty was done in 1 case of an 11-year-old boy. Bentall procedure was 12 cases. CABG with mitral valve procedure in 83 cases, CABG with aortic valve replacement was done in 17 cases. CABG with double valve replacement was done in 4 cases. Left ventricular aneurysm with CABG with mitral valve replacement in 9 cases and left ventricular aneurysm with CABG with mitral valve repair in 6 cases. Redo double valve replacement was done in 4 cases, redo CABG with aortic valve replacement was done in 2 cases. Native valve endocarditis was in mitral valve 12 cases, aortic valve 8 cases, both mechanical valves were replaced in 45-year-old lady for prosthetic valve endocarditis. Mitral valve kissing vegetation ulcer was in 1 case, ventricular septal defect with vegetation in pulmonary valve with perforation in leaflet of pulmonary valve was surgically treated in 1 case. Aortic valve replacement with patent ductus arteriosus closure was done in a 45-year-old lady.

Result: Overall mortality was 2.81 %. Mitral valve replacement mortality was 0.9 %, Double valve replacement 5.88 %, CABG with mitral valve procedure 3.61 %. Five percent of patients were lost from our routine follow up. Other patients are doing well in our continuous last 10 years follow up. Cause of mortality was bleeding, thromboembolism, and congestive heart failure.

Conclusion: Surgical treatment though challenging in some cases, but it is the only way to hope of life with long-term survival benefit.

Factors influencing outcome of valve replacement, with special reference to double valve replacement

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Objective: Importance of left ventricular function, and other factors which help in predicting surgical outcome after valve surgery, with review of literature.

Material and Method: The study was conducted in the Department of Cardiovascular and Thoracic Surgery in a teaching institute. All the patients undergoing DVR were divided in to two groups, those with preoperative ejection fraction (EF) 45 or more were placed as group, and those with EF of less than 45 were placed as group. EF of more than 45 was taken as an indicator of good left ventricular function. To correlate the EF, as indicator of left ventricular function, with hemodynamic parameter in postoperative period, the need for inotropic, vasodilator, ventilatory, and circulatory assist device were also assessed in patients of both the groups.

Result: Thirty-eight patients were in group A, 60 % of the patients had rheumatic heart disease, and 3 % had undergone closed mitral valvotomy (CMV) initially. Mean age of patients in group A was 28 years, and in group B 34 years; male patients were more in both the groups, duration of symptoms and NYHA functional class was more in group B patients. Predominant valvular lesions was insufficiency of aortic/mitral valve in 77.1 % of patients. After surgery, patients in group B required more inotropic and ventilatory support; they had low cardiac index, higher pulmonary capillary wedge pressure, and low systemic arterial pressure. Patient in group A had improved immediate post operative cardiac parameters, early weaning of ventilatory support, lesser need for inotropic support, ventilator assistance, better long-term clinical improvement, improved NYHA functional class, and decreased morbidity and mortality. Operative mortality 15 % was more in group B. After surgery, all the survivors improved by at least one functional class.

Conclusion: Regurgitant lesions fare worse than patients receiving DVR of any other combination; surgical intervention should be done before irreversible left ventricular dysfunction. Left ventricular function was the single most important predictor of good post operative outcome. Patients with better left ventricular function have quick post operative recovery, short hospital stay, improvement in functional class, and excellent long-term results.

Double valve replacement along with double annular enlargement through aorta in narrow aortic and mitral annulus: our centre experience

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Objective: In cases of narrow aortic and mitral valve annulus of rheumatic etiology, we performed aortic and mitral annular enlargement followed by mitral valve replacement (MVR) and aortic valve replacement (AVR) of adequate sizes as per respective body surface area (BSA) of patient.

Material and Method: Patients with dominant stenotic lesions of mitral/aortic valve with narrow annulus (cut off value <1.5 cm with normal BSA for aortic annulus and <1.7 cm with normal BSA for mitral annulus) and small LA were included. Surgical technique after initiation of CPB, aorta transected completely, and aortic valve excised. Aortic annular incision given in the middle of non coronary cusp extending up to mitra.

Result: Five patients (three males, two females) underwent this surgery with good results. Significant improvement in symptoms (from NYHA class III–IV to class I–II) and mean gradient across aortic and mitral valve noted. For mitral valve, mean gradient was 2.3 ± 0.2 range 2.1 to 2.7. Mean gradient for aortic valve was 8.1 ± 1.1 range 7 to 9.5. Two patients underwent free ascending aorta replacement. One patient had LBBB but did not require pacemaker. The use of co-seal provides excellent hemostasis.

Conclusion: We recommend transaortic double annular enlargement along with double valve replacement as a feasible approach in patients with severe aortic and mitral annular stenosis. Another advantage is the avoidance of a second atrial incision.

Advantages and safety of trans-septal approach for mitral valve surgery

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Objective: The aim of this study is to evaluate the advantages and safety of trans-septal approach for mitral valve surgery in reoperations, with small left atriums and combined mitral and tricuspid valve procedures (with or without aortic valve procedures)

Material and Method: From January 2007 to December 2015, a total of 704 patients who underwent mitral valve surgery of which 48 patients were redo mitral surgeries, 35 were combined mitral and tricuspid surgery, 18 patients had associated aortic valve replacement, and 42 patients with small left atriums underwent mitral valve surgery through trans-septal incision, were studied retrospectively. Their ages ranged from 22 to 69 years. The surgical indication was mitral restenosis in 29 patients, mitral stenosis in 66 patients, and 90 were mitral regurgitation, and 90 patients had multi valvular procedure. All patients were more than NYHA functional class III symptoms.

Result: In all patients, this approach provided excellent exposure. The cardiopulmonary bypass time ranged from 60 to 155 min (mean 114 min). Mitral valve was replaced in 42 patients with redo mitral surgery. Mitral valve replacement and tricuspid valve repair was done in 29 patients, and tricuspid valve was replaced in 6 patients. Eighteen patients had concomitant aortic valve replacement. Three patients died because of cardiogenic shock; 38 patients had post operative atrial fibrillation of which 35 had preoperative atrial fibrillation. The mean hospital stay was 12.6 days. Thirteen patients had temporary atrial conduction disturbances which completely resolved within 10 days with temporary pacing. Three patients required permanent pacemaker implantation.

Conclusion: The transseptal approach offers an excellent exposure of the entire mitral valve both in primary isolated or combined mitral surgery particularly in re-do surgery where the primary standard vertical left atriotomy is impeded or the conventional approach gives only limited access. Temporary atrial dysrhythmia is not crucial and is easily controlled by short-term single- or dual-chamber pacing.

Is it time to rethink about the mechanical valve prosthesis in Indian patients?

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Objective: Mechanical and tissue valve prosthesis have been in use for many years. They have their own pros and cons, problems associated with anticoagulation. The preference of the prosthesis varies from centre to centre and the date of operation.

Material and Method: We retrospectively analyzed consecutive 400 patients who underwent valve replacement from January 2002 to December 2014. The valve replacement was performed as an isolated

or concomitant procedure. The follow up could be done on 91 % patients. All the patients were assessed clinically and by echocardiography. Ten patients underwent reoperation for a choked mechanical prosthesis where as none of the tissue prosthesis required reoperation.

Result: There was a high incidence of mechanical valve dysfunction and anticoagulation related complications (bleeding as well as thrombo-embolic).

Conclusion: We performed a systematic and statistical analysis of all the valve patients, both alive and dead. It revealed a long-term survival benefit, better reoperation free period, and reduced anticoagulation-related complications with a bioprosthetic valve.

Double valve replacement using bioprosthetic valve—10 years single center experience

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Objective: Background: The rationale for development of biological valves was to reduce the risk of serious complications related to the mechanical heart valves (thrombosis, embolism, bleeding complications due to anticoagulation therapy). Also, bioprosthetic valve implantation is recommended in patients with contraindication for oral anticoagulants.

Objective: The aim of this study was to evaluate the early outcome and factors influencing the outcome of patient who undergone double valve replacement with bioprosthetic valve.

Material and Method: This is a retrospective study which includes all patients who underwent double valve replacement with bioprosthetic valve at our institution during the period from 2004 to 2014. The clinical details of all patients were reviewed from patient records.

Result: A total of 31 patients were included in the study. The mean age was 53.09 years (11 to 70 years), 21 patients (67.7 %) were male and 10 patients (32.2 %) were female; 29 patients (93.5 %) had rheumatic pathology of aortic and mitral valve, 1 patient had MV prolapse with severe MR and moderate AR, and 1 patient, an 11-year-old male, had infective endocarditis of aortic and mitral valve. All patients had NYHA Class III–IV dyspnea on exertion; 26 patients (83.8 %) had atrial fibrillation, 3 patients (9.6 %) had thrombo-embolic signs, and 4 patients (12.9 %) had features pulmonary edema. All patients undergone DVR using bioprosthetic valve (St. Jude Medical mechanical/CE porcine bioprosthetic/Medtronic Hancock-II valve). Two patients (6.2 %) had re-exploration. Three patients (9.6 %) had multiple blood product transfusion; average mechanical ventilation duration 13.4 h. Average ICU stay was 2.3 days. Average hospital stay is 9.2 days. All cause 30 day mortality was one (3.1 %). During follow up, two patients had developed neurological complication and died, while two patients developed thromboembolic complications managed medically. Two patients (6.45 %) had required redo surgery of which one patient (3.22 %) had infective endocarditis and other patient had structural valve degeneration and underwent redo-DVR.

Conclusion: Avoidance of anticoagulation-related complication is the major indication for choosing bioprosthetic valve over mechanical valve.

Surgery for rheumatic heart disease in a regional Australian centre: not an uncommon procedure!

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Objective: Rheumatic fever (RF) is a significant health burden in regional Australia. Some of these patients develop rheumatic heart

disease (RHD). North-Eastern Australia has a high incidence of RHD; populated by remotely located indigenous communities with limited follow up. We reviewed last 6 years of surgical experience from our institution.

Material and Method: A retrospective review of the clinical data obtained from the national database was carried out. All patients with rheumatic heart disease (RHD) requiring valve surgery at the institution with or without concomitant procedures were included.

Result: Of 1116 patients presenting with RF or RHD between January 2008 and April 2014, 113 patients required cardiac surgery. Of these, 67 % patients were indigenous. The mean age was 47 years (range 13–83). Mitral valve procedures totalled 94 (30 bioprosthetic valves, 59 mechanical valves, and 5 repairs). Aortic valve procedures totalled 58 (25 bioprosthetic and 33 mechanical); tricuspid valve repairs totalled 27 (15 with annuloplasty rings). Infective endocarditis was present in 5 patients. Redo cardiac surgery was performed in 17.7 % patients. Thirty-day mortality was 2.7 % (3 patients). All deaths were in patients with mitral valve disease. Bleeding was responsible for two deaths, and one patient died from cardiogenic shock.

Conclusion: RHD requiring surgical treatment is common in North-Eastern Australia. Thirty-day results of cardiac surgery in our experience are satisfactory. A higher number of patients have had bioprosthetic valve implantation. There is a less likelihood of valve repair in our population. Advanced nature of disease, complex socioeconomic issues, and lack of adequate follow up play an important role in surgical decision making.

Role of leaflet augmentation with pericardium in rheumatic mitral valve repair—our experience

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Objective: Mitral regurgitation in rheumatic disease presents the difficult subset for mitral valve repair because of leaflet retraction due to fibrosis of leaflet and subvalvular apparatus. Role of leaflet augmentation with pericardium is very useful technique. We are presenting midterm results of leaflet augmentation in rheumatic mitral valve repair with glutaraldehyde preserved autologous pericardium

Material and Method: From 2009 to till date, 26 patients underwent mitral valve repair with leaflet augmentation of posterior or anterior leaflet. All patient had predominant mitral regurgitation or mixed lesion severely calcified or predominant mitral stenosis were not included in the study. All repair are supported with annuloplasty, and patient are followed up from 3 to 5 years

Result: Age of the patient ranging from 8 to 42 years (mean age 16.2 years). Male and female ratio was 1:4. Most of the patients were in NYHA class III (19/26). Predominant mitral regurgitation was present in 23 patients, posterior leaflet retraction seen in 24 patients, and 2 patients had anterior leaflet pathology. Posterior leaflet augmentation was done in 24 cases and anterior leaflet augmentation in 2 cases. All repairs were supported by annuloplasty. Associated procedure includes commissurotomy, secondary chordal resection, and Goretex neochordal reconstruction, tricuspid annuloplasty, or aortic valve repair. Mean aortic cross clamp was 72.4 min (62–128 min). Mean CPB time was 89.6 min (76–176 min). During follow up, two patients had moderate mitral regurgitation which were followed medically. Echo evaluation showed good leaflet movements with good coaptation in majority of patients without sign of deterioration.

Conclusion: Leaflet augmentation with autologous pericardium is a useful adjunct to compensate leaflet and chordal retraction. With low incidence of adverse outcomes in follow up phase. It offers the definitive advantage for repair in this subset of patients. In conclusion, leaflet augmentation is simple and reproducible method of valve repair in rheumatic pathology with good midterm results

Surgery for tricuspid valve regurgitation in mitral valve disease of all etiologies—our experience

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Objective: It is established that secondary tricuspid regurgitation following mitral valve disease carries significant morbidity and mortality. We evaluated the results of tricuspid repair in patients with tricuspid regurgitation in patients with mitral valve disease.

Material and Method: Between January 2013 and June 2015, 71 patients (35 male and 36 female) underwent tricuspid valve repair for tricuspid regurgitation associated with mitral valve disease. Average age of the patients was 45.88 years (ranging between 12 to 67 years). Mitral valve replacement was performed in 48 patients (67.60 %; 46 rheumatic and 2 degenerative). Mitral valve repair was performed in 5 patients (7 %; 4 ischemic and 1 myxomatous) while double-valve replacement was performed in 18 (25.35 %) patients for rheumatic heart disease. Four cases (5.63 %) were re-operations (previous MVR) while in 8 (17.26 %) cases, cryo MAZE was performed. All the patients had a dilated tricuspid annulus with TR ranging from mild-moderate to severe. The surgical techniques for tricuspid valve repair included ring annuloplasty for severe TR (43 cases; in 2 cases with infective endocarditis anterior leaflet augmentation with pericardial patch and tricuspid neochordal construction was also done) and bicuspidization of the valve for mild to moderate TR with annulus size >35 mm. Tricuspid valve replacement was not required in any patient.

Result: There were two hospital deaths (both DVR cases with TV ring repair; one due to CVA on the 12th post-operative day and the other one due to renal failure on the 21st post-operative day). There were no deaths in the early discharge period (30 days). Pre-discharge echocardiography showed no TR in ten patients while only trivial to mild TR in the remaining. There were two late deaths (one MVR case and one DVR case at 6 and 8 months, respectively). At 1 year follow up (in those operated before October 2014), none of the patients had more than trivial to mild TR. All the patients are under follow-up and symptom-free and NYHA functional class I or II.

Conclusion: Our observations support the current recommendations to perform concomitant tricuspid repair with mitral valve surgery. Also, bicuspidization of tricuspid valve is an effective modality in mild to moderate TR with annular dilation.

Mitral valve repair without ring—our centre experience

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Objective: This was the study of experience with the mitral valve repair without ring operated from 2014 to 15 (1 year). The aim of the study was to preserve the mitral valve as far as possible by a specific technique instead of straightforward replacement of mitral valve. Reconstructive study of the mitral valve is still deemed superior to prosthetic replacement because of the lower operative risk as well as thromboembolic complications.

Material and Method: The analysis of patients who were operated for mitral stenosis with LAA clot, LA clot, mitral valve score (6–9), and trivial to mild MR in last 1 year was done. Diagnosis was made by physical examination echocardiography, TTE and TEE at our institute. There were 46 patients where mitral valve repair without ring was carried out. Technique of repair procedure include: LA was opened, if LA or LAA clot is present then it was removed with gentle care followed by

LAA internal placation then mitral valve was assessed, 5.0 Prolene stitch were taken in the mid of AML and mid of PML, then commissurotomy was done. Sub valvular apparatus was assessed if fused then papillary muscle lengthening by simple splitting the papillary muscle head with help of pot scissor up to lateral free wall of ventricle was done. If there was little bit of calcification, the cusps and commissure were decalcified very gently. There after mitral valve assessed for mitral valve area and associated MR by passing the No.-24. Hegar through orifice and water compulsion test was done to assess degree of MR. Post operative mitral valve was reassessed by TEE after CPB.

Result: Clinical study included 46 patients, 26 males, and 20 females; their age ranges from 20 to 60 years, who underwent mitral valve repair. Post operative examination done by echocardiography at discharge and follow up to establish overall survival (98 %) for residual trivial to mild MR (1 to 2 %), thromboembolization (2 %), endocarditis (2 %), and repair free survival rate (98 %).

Conclusion: Mitral valve repair without ring is a successful and effective procedure in the treatment of distinct mitral valve pathology and complication.

Rheumatic heart disease mitral valve repair: our experience

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Objective: The aim of this study is to study the outcome of mitral valve repair with ring annuloplasty in patients suffering from RHD with isolated mitral valve pathology. Also, short-term follow-up of these patients with trans-thoracic or trans-esophageal echocardiography.

Material and Method: Patients admitted with rheumatic heart disease with mitral valve pathology of age and sex was included in our study group. Associated aortic, tricuspid, or pulmonary valve pathology was excluded. The period of study was from June 2014 to September 2015, a 16-month study. All the patients were subjected to per-operative echocardiography for the following: nature of disease, morphology of the valve, and status of sub-valvular and chordae. The same assessment was done immediately post-operatively and 3 months after surgery to study the quality of repair and degree of the mitral valve disease.

Result: Out of 17 cases that underwent repair with ring annuloplasty during the study period, 8 patients had no mitral regurgitation, 5 had trivial mitral regurgitation, 3 had trivial to mild mitral regurgitation, 1 had mild to moderate mitral regurgitation, and 1 patient died (5.88 %) during the course in the hospital post-operatively due to re-operation for infective endocarditis. We also analyzed these patients for the need of pacer machine and inotropic support, which will definitely affect the long-term outcome of our repair.

Conclusion: Mitral valve repair with ring annuloplasty is always challenging and time-consuming procedure during initial stages, but it is very safe, easily reproducible, and definitely beneficial to the patients, because he/she is free from oral anti-coagulation drugs and its complications. Mitral valve repair is not reserved for certain group of patients; it can be performed in all age/sex group of patients irrespective of nature of disease. This study proves beyond doubt that repair is feasible even in rheumatic heart disease patients which is more common in our part of the world.

Mid-term results of mitral valve repair in predominantly rheumatic population

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Objective: The aim of this study is to assess mid-term results of mitral valve repair in predominantly rheumatic population.

Material and Method: We present our experience from June 2010 through August 2014 in this study of 74 patients (32 males, 44 females). The mean age was 29.20 ± 14.48 years (range from 4 to 68 years). Intra operative TEE was done to assess leaflet thickness, mobility, calcification, sub-valvular apparatus, and areas of prolapse. The cause of mitral regurgitation was rheumatic in 60 patients, congenital in 5, myxomatous in 2, infective in 2, and ischemic in 4, others 1. Sixty four (87 %) had pure mitral regurgitation (MR) while 10 (13 %) had mixed mitral stenosis and MR. All patients were in NYHA functional class III or IV. None of them had CHF. Twelve patients (19 %) had pre-operative atrial fibrillation. Six (9.5 %) underwent surgery for mitral stenosis and 57 (90.4 %) for MR. The reparative procedure included ring annuloplasty (63; 92 %), commissurotomy (18; 25.4 %), cuspal thinning (3; 4.7 %), chordal fenestration (5; 7.9 %), neo-chordae reconstruction with ePTFE suture (19; 26.9 %), chordal transfer (5; 7.9 %), chordal shortening (2; 3.1 %), and PML augmentation with pericardial patch (2; 3.1 %). TTE was done before discharge, warfarin was given for 3 months, and follow up 2-D Echo and clinical assessment was done every 3 months.

Result: There was no early mortality. Mean aortic cross clamp (ACC) time was 82.6 ± 27.51 min and mean cardio-pulmonary bypass (CPB) time was 127.21 ± 47.29 min. Mean hospital stay after surgery was 4.77 ± 2.86 days. There was one in-hospital mortality following low cardiac output with multi-organ dysfunction and sepsis 40 days after surgery. Mean follow up was 15.26 ± 10.66 months and was 78 % complete. No MR, trivial MR, or mild MR was present in 29 (70 %) patients, 3 (7.1 %) have severe MR, 7 (16.6) have moderate MR, and 2 (4.7 %) have moderate or severe MS. Eighty-eight percent of patients were in NYHA functional class I. One (1.58 %) patient had thromboembolic event and one (1.58 %) had intracranial bleed. There was one (1.58 %) late death; one patient underwent re-operation for severe MR and MVR was done 31 months after first surgery. No one had infective endocarditis.

Conclusion: Mitral valve repair is feasible in rheumatic heart disease with acceptable mid-term results.

Concomitant valve replacement with coronary artery bypass grafting: early and mid term results

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Objective: Conventional approach to combined coronary artery bypass grafting (CABG) and valve replacement is associated with longer cardio-pulmonary bypass (CPB) and aortic cross clamp (ACC) time leading to high mortality and morbidity. In order to reduce the aortic cross-clamp time and hence the morbidity and mortality, we performed CABG on beating heart followed by valve replacement using conventional CPB with cardioplegia arrest.

Material and Method: Between 2011 and 2015, 47 patients underwent valve replacement combined with coronary artery bypass grafting. These patients were divided into two groups. Group A ($n=27$) patients underwent off-pump CABG (OPCAB) followed by valve replacement on CPB. Group B ($n=20$) patients consists of conventional CABG + valve replacement on CPB and cardioplegic arrest.

Result: An analysis of operative details and outcomes were done to compare early and mid term morbidity and mortality between two groups. There was a significant reduction in cardiopulmonary bypass and aortic cross-clamp time in group A as compare to group B. This has resulted in reduced CK-MB release, less blood loss, reduced use of blood products, reduced ventilatory time, and shorter ICU stay in group A patients. Inotropic requirement and IABP usage was also less in group A as compare to group B. Incidence of post op atrial fibrillation and overall complication rate was also less in group A. Thirty-day mortality was 2.2 % in group A and 4.5 % in group B. At 1 month, 90 % of survivors are free of

MACE in group A as compare to 73.5 % in group B. There was no statistically significant difference in the groups with respect to stroke and thromboembolism rate.

Conclusion: The present approach is simple and yet reduces the CPB and ACC times significantly while providing better cardioplegia distribution. CABG on beating empty heart is a safe method to perform while preventing subendocardial damage in this high-risk subgroup patients.

Prophylactic tricuspid annuloplasty in patients with dilated tricuspid annulus undergoing mitral valve replacement

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Objective: Progression of functional tricuspid regurgitation is common after mitral valve replacement and is associated with poor outcomes. We tested the hypothesis that concomitant tricuspid valve annuloplasty in patients with tricuspid annulus dilatation (40 mm) prevents tricuspid regurgitation progression after mitral valve replacement

Material and Method: We enrolled 50 patients undergoing mitral valve replacement showing less than moderate (+2) tricuspid regurgitation and dilated tricuspid annulus (40 mm) at preoperative echocardiography. They were randomized to receive ($n=25$) or not receive ($n=25$) concomitant tricuspid annuloplasty (SJM Tailor flexible tricuspid annuloplasty ring) at the time of mitral valve replacement. Clinical and echocardiographic follow-up was 100 % completed at 12 months after surgery.

Result: Preoperative clinical and echocardiographic characteristics were comparable in the two groups. Operative mortality was 4 % (one death in each group). At 12 months follow-up, tricuspid regurgitation was absent in 68 % ($n=17$) versus 20 % ($n=5$) of patients in the treatment and control groups, respectively ($P=.001$). Moderate to severe tricuspid regurgitation (+3) was present in 0 % versus 32 % ($n=8$) of patients in the treatment and control groups, respectively ($P=.02$). Pulmonary artery systolic pressure significantly decreased from baseline in all cases ($P<.001$) and was comparable in the two groups (40 ± 8 vs. 41 ± 6 mmHg; $P=.6$). Right ventricular reverse remodeling was marked in the treatment group (right ventricular long axis: 70 ± 7 vs. 64 ± 6 mm; $P=.01$; short axis: 33 ± 4 vs. 27 ± 5 mm; $P=.001$) but only minimal in the control group (right ventricular long axis: 72 ± 6 vs. 70 ± 7 mm; $P=.08$; short axis: 33 ± 5 vs. 33 ± 6 mm; $P=.1$).

Conclusion: Prophylactic tricuspid valve annuloplasty in patients with dilated tricuspid annulus undergoing mitral valve replacement was associated with a reduced rate of tricuspid regurgitation progression, improved right ventricular remodeling, and better functional outcomes.

Left atrial Maze procedure using diathermy and high-frequency ultrasound as an adjunct to mitral valve replacement in mitral valve disease with atrial fibrillation: a comparative study

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Objective: Background and objectives: Conventional treatment for AF associated with mitral valve disease is Maze III procedure which is a complex and extensive surgery. It has now been replaced by various energy sources. We used diathermy and high-frequency ultrasound to create maze lines and compared these two energy sources regarding

reversion to a regular or sinus rhythm, intraoperative cardiac parameters, and post-operative recovery.

Material and Method: Forty patients having atrial fibrillation, requiring mitral valve replacement were included in the study. Twenty patients underwent Maze procedure using diathermy and 20 using high-frequency ultrasound (Harmonic scalpel probe). All Maze lines were made endocardially from within the cavum of the left atrium isolating the pulmonary veins. All patients underwent mitral valve replacement with or without other valve replacement. All patients were assessed by standard 12 lead ECG in the post-operative period as well as in each follow up visit.

Result: Sinus rhythm was restored in 95 % of patients in immediate post op period in diathermy group and in 90 % in high-frequency ultrasound group. At 3 months, 90 % of diathermy group patients were in sinus rhythm and in 85 % of HFU group patients were in sinus rhythm. However, no statistically significant differences were noted between groups in sinus rhythm conversion rates at time point 0, 3, 7, 15, 30, and 90 days. Statistically significant differences between groups was observed in the following variables—CPB time ($p=0.011$), cross clamp time ($p=0.019$), maze time ($p=0.00$), and in hospital stay ($p=0.05$). No statistically significant differences were noted between groups in the need for antiarrhythmic, pacing, or postoperative complications. However, a significant difference ($p=0.03$) was observed in the proportion of patients requiring inotropes.

Conclusion: Both energy sources (diathermy and high-frequency ultrasound) used in the study for creation of the maze lines are safe, time sparing, effective, and simple; however, the diathermy takes less time to perform maze than HUF and also the total CPB time and cross-clamp time was less in diathermy group; however, both of these energy sources restores sinus rhythm in majority of the cases.

Organic tricuspid valve disease repair vs. replacement

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Objective: An organic TV disease is not very common, but the management of these patients is a nightmare to young cardiac surgeon. This study is indented to create awareness among budding cardiac surgeons in view of morbidity and mortality with replacement over repair of organic TV valve pathology. This study also analyzes the outcome of repair vs. replacement, need for high inotropic support, prolonged ventilation, and hospitalization in replacement patients. Also, altered liver function test in replacement rather than repair patients.

Material and Method: Twenty-three patients underwent surgery for organic TV disease in our institute during November 2010 to October 2015. Clinical, laboratory, and echocardiography was done and compared the same with repair and replacement group. Out of 23 patients, 16 underwent repair with or without ring annuloplasty and the remaining 7 patients were replaced with mechanical valve.

Result: Out of 16 patients who underwent repair, in 13 patients, TV repair with ring annuloplasty was done; in the remaining 3 patients, TV repair alone was done. In contrary, seven patients were replaced with mechanical valve. In repair group, mortality is two, and four died in replacement group

Conclusion: Tricuspid valve repair is associated with better perioperative, postoperative event-free survival when compared with TV replacement in organic TV disease patients. Despite that the number of cases is more compared with replacement, the rate of reoperation, functional class was similar and rate of mortality is high with replacement, rather with repair. Hence, it is conclusive that repair should be attempted irrespective of severity of organic tricuspid valve disease. Before replacement which is very simple and easy

Comparison of mitral valve repair and replacement in rheumatic heart disease

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Objective: Introduction: Rheumatic fever is still the main cause of valve disease in developing countries. Mitral valve repair has been widely regarded as the optimal surgical procedure to treat mitral valve dysfunction of all etiologies.

Material and Method: Six hundred ninety-three patients of rheumatic heart disease who underwent mitral valve surgery from September 1997 to December 2013 were reviewed retrospectively. All patients were allocated into three groups: group I mitral valve repair, group II mitral valve replacement (Mechanical), and group III mitral valve replacement (bioprosthetic).

Result: Mitral valve repair which was done in 238 (34.34 %) patients. Mechanical mitral valve replacement was done in 343 (49.50 %) of patients. Bioprosthetic mitral valve replacement was done in 112 (16.16 %) of patients. The results of three groups are described in table. Post operative outcomes repair N=238, Mech N=343, and Biop N=112. Statistical significance mortality early late I* n=238, II** n=178, 14 (4.08 %), 31 (11.07 %), 7 (6.25 %), 1 (1.06 %); P=0.01. Significant 11 (4.62 %), 6 (2.91 %), 10 (5.62 %), and 5 (3.13 %). Readmission for any cause 20 (9.71 %), 15 (9.37 %), 57 (20.36 %), and 13 (13.83 %); P=0.01. Significant thromboembolic and bleeding complications 4 (1.94 %), 4 (2.5 %), 39 (13.93 %), and 2 (2.13 %); P=0.000. Highly significant endocarditis 4 (1.94 %), 4 (2.5 %), 7 (2.5 %), and 5 (5.32 %); P=0.357. Not significant NYHA Class I/II III/IV 191 15 152 8 269 11 91 3; P=0.458. Not significant follow up percentage 90.75, 95.24, 94.22, and 96.91 %. Not significant re-operation rate 27 (11.89 %), 7 (4.12 %), 17 (5.17 %), and 2 (2.06 %); P=0.779. Not significant follow up (mths), Mean \pm SD 81 \pm 43, 61 \pm 23, 109 \pm 34, 65 \pm 23. Significant MS and MR[^] 28 (13.6 %), 10 (6.25 %), –Stuck Valve – 30 (8.7 %) –Prosthesis Degeneration - - - 4 (3.57) *Mitral valve repair Including CMV + OMV **Complete mitral valve repair.

Conclusion: This study concludes that MV repair has excellent durability comparable to mechanical or bioprosthetic valve replacement in rheumatic disease, therefore, repair appears to be more beneficial than replacement as this avoids the need for lifelong anticoagulation therapy and the associated risks of bleeding and thromboembolism.

Comparison of outcomes of thrombolysis vs. reoperation for stuck prosthetic valve in mitral position—10 year experience

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Objective: The aim of this study is to analyze the outcomes of thrombolysis vs. reoperations for prosthetic valve obstruction in mitral position

Material and Method: From the time period of January 2005 till December 2015, a total of 36 patients had undergone thrombolysis and 31 patients had undergone reoperations for prosthetic valve obstruction in mitral position in our institution. The follow up period was 225 patient years in thrombolysis group and 208 patient years in re-operative group. The prosthetic sizes were 25, 27, 29, and 31 mm in mitral position. Mean functional class was 2.6 \pm 0.8 in thrombolysis and 3.4 \pm 0.9 in re-operation group. The peak and mean gradient was 37.5 \pm 4.8, 18.2 \pm 3.56 in thrombolysis and 40 \pm 2.7, 20 \pm 4.3 in reoperation group, respectively. Transthoracic and transesophageal echocardiographs along with fluoroscopy were done for all the patients. The causes of obstruction were pannus formation in 7, generation of thrombus in 50, and both pannus and thrombus in 10. The presence of pannus was an indication for surgery.

Result: The analysis of thrombolytic group is as follows: incidence of death was 2 %/patient year, freedom from peripheral embolism 97.3 \pm 1.8 %, freedom from CNS bleeding 98.2 \pm 3.8 %, freedom from stroke 97.2 \pm 2.6 %, freedom from TIA 98.1 \pm 2.8 %, freedom from coronary embolism 100 %, freedom from major bleeding with transfusion 96.3 \pm 4.8 %, freedom from thrombolytic failure 95.4 \pm 3.7 %. The peak and mean gradient was 11.5 \pm 4.8, 5.2 \pm 3.56 at the end of completed thrombolysis. The analysis of re operative group are as follows: incidence of death was 3 %/patient year, freedom from peripheral embolism 98.3 \pm 4.8 %, freedom from CNS bleeding 99.2 \pm 2.8 %, freedom from stroke 95.2 \pm 3.5 %, freedom from TIA 100 %, freedom from coronary embolism 100 %, and freedom from major bleeding with transfusion 94.3 \pm 5.4 %. The peak and mean gradient was 9.5 \pm 4.8, 4.2 \pm 3.56 at the end of reoperation in the 7th post op day, 10.5 \pm 4.8, 4.2 \pm 1.56 at the end of first year, and 11.5 \pm 4.8, 5.2 \pm 3.75 at the end of third year, respectively.

Conclusion: Reoperation and thrombolysis are the widely accepted options for treatment of mechanical heart valve thrombosis and both seem to be equally effective. The percentage of embolic events and recurrent thrombosis are higher in thrombolysis group while we had almost comparable mortality in both the groups. Longer follow up with a large group of patients is necessary for further results.

Thrombectomy or valve re-replacement for mechanical valve obstruction—is thrombectomy a viable option?

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Objective: Mechanical valve obstruction is a dreaded complication following valve replacement surgery. Approximately 10 % of the patients with mechanical valve replacement develop at least one episode of valve thrombosis in 1 year. There are many guidelines regarding the management of the same. In this paper, we review the surgical management of mechanical valve obstruction.

Material and Method: This study was a retrospective analysis of 12 consecutive patients who presented to our center with mechanical valve obstruction. The study period was from January to September 2015. The patients demographic details, presenting symptoms, previous history of cardiac surgery, history of thrombolysis and stroke, adequacy of anticoagulation, type, position and size of valve placed in the previous surgery, echocardiographic details, intraoperative findings, postoperative echocardiographic findings, outcome, and follow up details were recorded and analyzed.

Result: The mean age of presentation was 36 years in the study population with range between 23 and 45 years. There was a predisposition toward female gender (75 %), and all but one patient presented with NYHA IV status. Three patients had history of thrombolysis in the past and three patients had history of cerebrovascular accident in the past. Three patients (25 %) had obstruction of the aortic valve and the rest had mitral valve involvement. TTK Chitra tilting disc valve was present in six patients (50 %) while there were four patients with St. Jude bileaflet valve and one patient each with ATS valve and Omniscience valve. All but one patient had their index surgery elsewhere. Only four patients (33 %) had adequate anticoagulation. The mean duration to mechanical obstruction was 60 months while the range varied between 5 and 204 months. Nine patients underwent thrombectomy or pannectomy while three patients required valve re-replacement. There was one mortality in the thrombectomy group due to sepsis. All other patients are on regular follow up, and there is no mortality or morbidity till date.

Conclusion: We conclude that thrombectomy and debridement for mechanical valve obstruction is a safe, easy, fast, and has a favourable outcome particularly when all parts of the thrombus or pannus are removed leaving mobile and functioning valve to avoid the risk of re replacement. AbstractNo_12000149

Beating heart mitral valve replacement: our centre experiences

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Objective: This study is aimed to determine the safety and efficacy of beating heart mitral valve replacement with cross-clamp and controlled antegrade continuous coronary perfusion.

Material and Method: The study was conducted on the patients with isolated mitral valve disease requiring mitral valve replacement (MVR). In this study, 15 patients underwent MVR using beating heart technique with cross-clamp and controlled antegrade continuous coronary perfusion (group A) and 20 underwent MVR using arrested heart technique (group B). Of those patients who underwent beating heart MVR, all patients underwent MVR with cross-clamping the aorta. Controlled and continuous antegrade coronary perfusion was maintained with the double-lumen cannula commonly used for cardioplegia delivery. All patients were operated via conventional sternotomy. The operation was performed either via trans-septal approach or via classical left atriotomy. The following variables were assessed: serum enzyme (CK and CK-MB) and lactate concentrations; duration of aortic cross clamping, cardiopulmonary bypass time, mechanical ventilation support, drainage, postoperative bleeding, stay in the surgical intensive care unit, and total operation time; and amount of blood lost, blood transfused, and postoperative complications.

Result: In all patients, mechanical prostheses were used. Differences between the two techniques were not found to be statistically significant, which suggests that both are equally safe. However, the differences observed seem to be clinically important and favor the beating heart technique. Beating heart MVR patients had lower serum concentrations of total CK, CK-MB, and lactate; less total blood loss; and less need for transfusion. They also required less time on mechanical ventilation support in the intensive care unit, spent fewer days in the hospital, and presented fewer postoperative complications compared to patients who underwent arrested heart MVR.

Conclusion: Beating-heart mitral valve surgery is a good and safe option for myocardial protection in patients undergoing mitral valve surgery in high-risk patients.

Role of leaflet augmentation with pericardium in rheumatic mitral valve repair—our experience

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Objective: Mitral regurgitation in rheumatic disease presents the difficult subset for mitral valve repair because of leaflet retraction due to fibrosis of leaflet and subvalvular apparatus. Role of leaflet augmentation with pericardium is very useful technique. We are presenting midterm results of leaflet augmentation in rheumatic mitral valve repair with glutaraldehyde preserved autologous pericardium

Material and Method: From 2009 to till date, 26 patients underwent mitral valve repair with leaflet augmentation of posterior or anterior leaflet. All patient had predominant mitral regurgitation or mixed lesion severely calcified or predominant mitral stenosis were not included in the study. All repair are supported with annuloplasty and patient are followed up from 3 to 5 years.

Result: Age of the patient ranged from 8 to 42 years (mean age 16.2 years). Male and female ratio was 1:4. Most of the patients were in NYHA class III (19/26). Predominant mitral regurgitation was present in 23 patients, posterior leaflet retraction seen in 24 patients, and 2 patients had anterior leaflet pathology. Posterior leaflet augmentation was done in 24 cases and anterior leaflet augmentation in 2 cases. All repairs were supported by annuloplasty. Associated procedure includes commissurotomy, secondary chordal

resection, and Goretex neochordal reconstruction, tricuspid annuloplasty, or aortic valve repair. Mean aortic cross clamp was 72.4 min (62–128 min). Mean CPB time was 89.6 min (76–176 min). During follow up, two patients had moderate mitral regurgitation which were followed medically. Echo evaluation showed good leaflet movements with good coaptation in majority of patients without sign of deterioration.

Conclusion: Leaflet augmentation with autologous pericardium is a useful adjunct to compensate leaflet and chordal retraction. With low incidence of adverse outcomes in follow up phase, it offers the definitive advantage for repair in this subset of patients. In conclusion, leaflet augmentation is simple and reproducible method of valve repair in rheumatic pathology with good midterm results

Bentall's procedure with hand-made biological conduit

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Objective: Biological composite valved conduits are prohibitively expensive and not available everywhere. We present our experience with hand-made composite valved conduit over a period of 10 years.

Material and Method: Between January 2005 and November 2015, in 67 patients, aortic root replacement (Bentall's procedure) was performed using a hand-made composite biological valved conduit. An appropriate sized stented bioprosthesis was sutured in a straight polyester tube graft using a running suture. This composite valves conduit was inserted in the aortic annulus using two layers of sutures (interrupted followed by continuous). The age ranged from 52 to 78 years; 54 were males. The indications were root dilatation with aortic valve disease in 58, acute type A aortic dissection in 5, and chronic type A aortic dissection in 4.

Result: Cardiopulmonary bypass time ranged from 74 to 234 min (median 92 min). Cardiac ischemia time was 58 to 140 min (median 64 min). One 62-year-old female who presented with acute type A dissection and hemiplegia died of neurological complications. The post-operative drainage in first 24 h ranged from 80 to 760 ml (median 140 ml). One patient was explored for bleeding. Bioprosthetic valve function was normal in all the patients. Follow up ranged from 1 to 94 months. There was no re-operation. One patient developed stroke.

Conclusion: Hand-made composite valved conduits are feasible and yield satisfactory results. Preparation of conduit does not prolong the ischemic time. There is no added morbidity.

Different types of vascular procedures—operative and interventional: our centre experience

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Objective: This was a study of the experience with all vascular diseases at a tertiary level referral centre in north India. The objective of this study was to analyze the cause, surgical approach, outcome, and complication in the patients with all vascular diseases operated from 2014 to 2015 (1 year).

Material and Method: An analysis of patients who were operated for vascular diseases in the last 1 year was done. Diagnosis was made by physical examination, Doppler study, and cardiac CT scan-128 slice at our institute. There were 54 patients where vascular repair was carried out. Procedures performed include ascending to descending aorta bypass graft under CPB in complete interruption of aorta (1), inter-positional synthetic graft in infra-renal aorta aneurysm not involving B/L common iliac

vessels (1), infra-renal aorto-bifemoral synthetic graft in aortic aneurysm involving both iliac (1), renal artery stenting in unilateral (2) and bilateral block (1), femoro-popliteal (15), femoro-tibial (7) RSVG graft, femoro-femoral synthetic graft (5), axillo-bifemoral (extra anatomical) (2), carotid endarterectomy, axillo-radial (10), axillo-subclavian (2), CABG with aorto-axillary (5), femoral-pseudo-aneurysm vein patch repair (2), etc.

Result: Of 54 patient, 40 were males (74 %) and 14 were females (26 %). Their age ranges from 16 to 65 years. Atheroma was the most common cause of occlusion (80 %) followed by pseudo-aneurysm (5 %), interruption of arch of aorta (3), etc. Repair was performed in 70 % by vein graft and in 30 % by synthetic graft. Majority of patient had good outcome (96 %), about 4 % had non-functional but viable limb; minor complication included seroma formation and wound infection.

Conclusion: Early diagnosis and treatment of vascular diseases is crucial for saving patient limbs and life. Our study is the largest study from a single centre in state of UP. Increased awareness is required to ensure that the patients identified to have a vascular disease are transferred to a specialist vascular surgery centre like ours. Due to our cardiac CT Scan-128 slice, diagnosis is made early so definitive surgery can be planned. Prompt and decisive management maximizes patient survival and limb salvage.

Comparison of graft patency for various surgical revascularization techniques in infrainguinal femoro-popliteal chronic arterial occlusive disease

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Objective: This study is aimed at comparing graft patency rates of the revascularization techniques and graft materials available for infrainguinal revascularization.

Material and Method: From August 1, 2012 to July 31, 2015, 95 infrainguinal arterial reconstructive procedures were performed. Femoropopliteal bypass was done in 22 (23.16 %), below knee popliteal in 34 (35.79 %), popliteal bifurcational in 18 (18.94 %), tibial in 12 (12.64 %), and segmental bypass in 9 (9.47 %) patients. Autogenous saphenous vein graft (SVG) was used in 86 (90.52 %) patients and prosthetic grafts were used in 9 (9.48 %). Of these 86 patients with SVG, 68 patients (71.58 %) were grafted with reversed (RSVG), 6 (6.32 %) patients with in-situ (ISVG), and 7 patients (7.36 %) were grafted with translocated (TSVG). Remaining 5 (5.26 %) patients had prior endarterectomy of the distal anastomosis site along with RSVG grafting. The criteria for patency rates used in this study are those outlined by the Ad Hoc Committee on Reporting Standards of the Society for Vascular Surgery and the North American Chapter of the International Society for Cardiovascular Surgery.

Result: Eleven patients (11.57 %) failed to patency criteria during follow-up, and 13 patients (13.68 %) were lost to follow-up. Early graft failure (in first 6 months) occurred in 2 operations (11 %); overall graft patency rates were comparable in all procedural configurations at 12 months (segmental bypass 100 %, above knee femoro-popliteal 94.87 %, below knee bypass 96.67 %, bifurcation bypass 94.44 %, tibial bypass 91.67 %) and at 3 years (segmental bypass 87.50 %, above knee femoro-popliteal 89.60 %, below knee bypass 86.71 %, bifurcation bypass 88.54 %, tibial bypass 81.49 %). Early patency rates (at 6 months) were 98.49 % for RSVG, 100 % for prosthetic, ISVG and TSVG conduits. Endarterectomy patients showed a lower early patency rates (80 %). Late patency at 3 years is very similar to each other in all groups (RSVG 86.79 %, ISVG 100 %, TSVG 85.72 %, endarterectomy along with RSVG bypass 80 %, and prosthetic 88.89 %).

Conclusion: Several alternative conduit and surgical procedure options are available for use but autogenous SVG appears to provide the best results with regard to long-term patency in all clinical situations, particularly when the bypass graft extends below the knee. Prosthetic graft also

appears to provide same advantage in revascularization procedures, as compared with autogenous vein grafts if their use is optimally decided

Mycobacterial aortopathy: it is a reality!

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Objective: Mycobacterial aortic involvement of aorta is a rare but definite entity in developing countries. We present our experience of 56 patients with mycobacterial aortopathy.

Material and Method: From 1995 to 2015, we treated 56 cases of tuberculosis of aorta and its branches. The diagnosis was made on the basis of clinical evidence of tuberculosis and/or histopathological/bacteriological/immunological confirmation of the etiology. The site of involvement were abdominal aorta (n=23), descending thoracic aorta (n=14), ascending aorta (n=10), arch (n=10), and its branches (n=4). Five patients had more than one site of involvement. There were 49 pseudo-aneurysms, 10 true aneurysms, and 2 stenosing lesions. Open surgery was performed in 48, endovascular stenting in 4, and 4 patients refused any intervention. In surgical group, patch repair was done in 21, interposition graft in 18, Bentall operation in 3, primary repair in 3, AVR in 1, and extra-anatomic bypass in 2 patients. On histopathological examination, 28 patients had granulomatous inflammation and 6 patients had positive AFB stain. Culture for AFB was positive in 9 patients and PCR analysis was positive in 3 patients. All patients received anti-tubercular treatment postoperatively.

Result: There were five early deaths. Three patients died of extensive tuberculosis. One patient died of aorto-esophageal fistula. Fifth patient had esophageal perforation and died of its complication. The median stay in ICU was 3 days (range 2–34 days). Median hospital stay was 8 days. Among four patients who refused any intervention, one patient died in hospital as a consequence of miliary tuberculosis. Three patients decided not to receive any treatment and were lost to follow-up. The median duration of follow up was 70 months (ranging from 1 to 214 months). There was one late death. This patient had earlier undergone primary closure of aortic rent in ascending aorta 8 months back. He developed recurrence at the original site. He was reoperated but died of sepsis and multiorgan failure.

Conclusion: Mycobacterial aortopathy is not so rare. All the segments of aorta are prone to get involved. With adequate surgical/endovascular intervention and proper chemotherapy, satisfactory results are achieved.

Extra-anatomic bypass to supra-celiac abdominal aorta for complex thoracic aortic obstruction

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Objective: The standard surgical treatment of coarctation of aorta is through a left posterolateral thoracotomy. However, when concomitant cardiac procedure is required or conventional approach is not possible or is hazardous, extra-anatomic bypass to supra-celiac abdominal aorta may be advantageous. We discuss our technique and report the long-term results.

Material and Method: Between January 1986 and January 2015, 25 patients (16 males, 9 females) underwent extra-anatomic bypass to supra-celiac abdominal aorta for various types of arch and descending thoracic aorta lesions. Extra-anatomic bypass to supra-celiac abdominal aorta was performed for those patients where balloon dilatation was not feasible due to associated arch hypoplasia (n=9) or long segment thoracic aorta narrowing due to non-specific aortoarteritis (n=3) or isolated long segment coarctation of aorta (n=3). Patients who needed

concomitant cardiac procedures such as aortic valve replacement (n=4), ascending aortic aneurysm repair (n=2), coronary artery bypass grafting (n=1), and in whom balloon dilatation had failed, also underwent extra-anatomic bypass to supra-celiac abdominal aorta. Three patients with recurrent coarctation after surgical repair and in whom balloon dilatation was not feasible/unsuccessful also underwent extra-anatomic bypass.

Result: There were no early or late deaths. The peak to peak gradients between upper limb and lower limb decreased from 59.3 ± 16.3 to 2.0 ± 2.8 mmHg.

Conclusion: Extra-anatomic bypass to supra-celiac abdominal aorta provides effective palliation for complex cases of aortic obstructions. It is easy and quick to perform, avoids fatal complications, and is well tolerated in all age groups.

Addition of hemiarch replacement for moderately dilated distal ascending aorta: is it safe?

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Objective: Safety of prophylactic hemiarch replacement for moderately dilated distal ascending aorta at the time of Bentall's procedure needs to be established.

Material and Method: Fifty consecutive patients undergoing elective Bentall procedure with hemiarch replacement for non-dissecting aneurysms of aortic root and ascending aorta (group I) were compared with 50 consecutive patients undergoing only Bentall procedure for similar indications (group II). All patients were operated under mild hypothermia ($30\text{--}32^\circ\text{C}$). Antegrade cerebral perfusion was the sole mode of cerebral protection during hemiarch replacement.

Result: Both the groups were comparable preoperatively. Mean cardiopulmonary bypass time (112 ± 34 vs. 106 ± 25 min, $p=0.317$), and myocardial ischemia time (72 ± 14 vs. 69 ± 20 min, $p=0.387$) were not different in both the groups. In group I, lower body ischemia time at the time of hemiarch replacement ranged from 10 to 17 min. There was no early death in group I. In group II, one patient died due to non-cardiac cause. None of the patients developed new onset neurological deficit, delirium, agitation, or confusion. Two patients in group I and one in group II developed psychosis after 72 h. Mini-Mental Scale score was within normal limits in all. Median hospital stay was 8 days in group I and 7 days in group II. Mean follow-up was 22.4 ± 16.5 months in group I and 30.6 ± 10.7 months in group II. There were no late deaths.

Conclusion: Hemiarch replacement with Bentall procedure does not carry an additional morbidity, particularly neurological sequelae, provided it is carried out in experienced and expert hands.

Outcome in patients undergoing aortic arch procedures with high flow cerebral perfusion

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Objective: The aim of this study is to assess the outcome of aortic arch reconstruction performed with continuous high flow antegrade cerebral perfusion (ACP).

Material and Method: From January 2006 to November 2015, 182 patients underwent aortic arch surgery for acute type A aortic dissection in 68, chronic type A dissection in 24, aneurysm of ascending aorta with involvement of aortic arch in 77, and other indications in 13. Normothermia or

mild hypothermia ($30\text{--}34^\circ\text{C}$) was used in 124, moderate hypothermia ($24\text{--}29^\circ\text{C}$) was used in 37 patients, and deep hypothermia ($<24^\circ\text{C}$) was used in 21 patients. During arch reconstruction, continuous ACP was maintained by perfusion of right carotid artery alone in 116 patients and along with left common carotid artery perfusion in 66 patients. For right-sided perfusion, 30 % of total calculated flow at normothermia were used. For bilateral ACP, 40 % of total calculated flow at normothermia was used. Cerebral perfusion was monitored by near infrared spectroscopy. Detailed neurological examination including mini mental status scoring system (MMS) on post-operative day 4 was performed in 102 patients.

Result: The surgical procedure performed included Bentall with arch replacement with elephant trunk in 10, Bentall with arch replacement and antegrade stent placement in 5, Bentall with arch replacement in 26, ascending aorta with arch replacement in 16, Bentall with hemiarch replacement in 83, and others in 32 patients. There were 5 operative deaths. Mean extubation time was 4 h. There was no new neurological deficiency in any of the patient. Five patients had seizures. MMS score was within normal range in all. MRI was performed in 37 patients after 2–6 months. MRI did not show any lesion related to hyperperfusion. Follow up ranged from 1 to 108 months. There was no new onset of neurological symptoms in follow up.

Conclusion: Aortic arch reconstruction can be safely performed with continuous high flow antegrade cerebral perfusion with good neurological outcome.

Role of surgical embolectomy after failed thrombolysis for acute massive pulmonary embolism

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Objective: Acute massive embolism is a fatal condition which requires rapid diagnosis emergent and suitable therapeutic approaches. Surgical embolectomy is reserved in failed embolectomies. The aim of the study was to analyze the clinical outcomes of patients undergoing surgical embolectomy after failed thrombolysis.

Material and Method: This retrospective study consisted of 14 consecutive patients who underwent emergency pulmonary embolectomy after failed thrombolysis in a single institute from April 2012 to November 2015. The medical records of all patients were reviewed for demographic and preoperative data and postoperative outcomes. Five (37.71 %) patients presented with cardiogenic shock with poor right ventricular function. Six patients (42.86 %) were previously thrombolysed with Streptokinase. Eight patients (57.14 %) had previous history of DVT. **Result:** The mean age of the patients was 38.85 ± 11.04 years (range of 22–64 years) with 12 males. The most common risk factor found was DVT (n=8, 57.14 %). There were two (14.29 %) perioperative deaths. Mean ventilation time was 37.07 ± 19.31 and average hospital stay was 14 days (13.57 ± 6.21). Postoperatively, nine patients (64.29 %) received IVC filter. The mean follow up period was 36 months, and no late deaths were noted. Postoperative echocardiography PA pressure measurements showed significant improvements.

Conclusion: Surgical embolectomy after failed thrombolysis is a reasonable option in spite of cardiogenic shock, if it performed early.

Hybrid procedures for thoracic aortic aneurysms—our experience

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Objective: Despite significant advances in surgical technique and perioperative critical care, the traditional open repair of thoraco abdominal aortic aneurysms is still associated with high rates of morbidity and

mortality. Thoracic aortic aneurysms affecting the arch and proximal descending thoracic aorta requires two-stage repairs that include Bentall De Bono procedure and completion of thoracic or thoracoabdominal repair. The application of endovascular grafting to complete the proximal procedure avoids a thoracotomy and may improve the morbidity and mortality of patient.

Material and Method: We report our experience of five patients with complex aortic pathologies treated with hybrid procedures consisting of Bentall De Bono procedure using mechanical valved conduit and aortic arch vessel debranching (two patients), thoracic aorta endovascular stenting using Medtronic Valiant thoracic grafts (four patients), and surgical debranching of left subclavian artery and anastomosis to left common carotid artery (one patient).

Result: In two patients, Bentall De Bono procedure using mechanical valved conduit and aortic arch vessel debranching was done successfully, and thoracic aorta endovascular stenting was done successfully in four patients. In one patient, stent graft could not be deployed because of extensive hardened thrombus. Debranching of left subclavian artery was done in one patient. Out of five patients, four patients have no intra-operative or post-operative complications and discharged from hospital in good clinical condition. One patient expired following failure to deploy stent graft, after developing brain stroke and unresponsiveness in post-operative period.

Conclusion: Hybrid procedures minimize surgical invasiveness in thoracic aortic aneurysm repair, but further evaluation of a larger number of patients is necessary.