Case	Year MVR Operation	Sex/ Age(yr)	Year VIV	Timing MVR-VIV (ys)	Mitral Prosthesis	Size(mm)	Other Cardiac Operation	Type of Dysfunction	Type VIV	Size VIV(mm)
1	2006	F79	2014	8	Edwards SAV	31	AVR	MR	Edwards SAPIEN XT	29
2	2012	F63	2014	2	Edwards Perimount	25	CABG	Mixed	Edwards SAPIEN XT	26
3	2006	M64	2015	9	Edwards SAV	31	—	Mixed	Edwards SAPIEN XT	29
4	2010	F55	2016	6	Edwards Perimount	25	—	MS	Edwards SAPIEN XT	26
5	2006	M65	2016	10	Hancock	29	CABG	Mixed	Edwards SAPIEN XT	29
6	2005	F83	2016	11	SJM Biocor	31	—	MR	Edwards SAPIEN XT	29
7	2001	F45	2015	14	Edwards SAV	29	—	Mixed	Boston Lotus	25
8	2011	F72	2015	4	Perimount	27	CABG	Mixed	Boston Lotus	27
9	2000	F42	2015	15	Edwards standard	27	AVR	Mixed	Boston Lotus	28
10	2001	M22	2015	14	Edwards SAV	27	—	Mixed	Boston Lotus	27
11	2011	F44	2016	5	Edwards Perimount	29	—	MS	Boston Lotus	27
12	2003	F56	2016	13	SJM epic	31	CABG	Mixed	Boston Lotus	27

RESULTS After VIV procedure, several 2D TTE parameters improved during the follow-up period when compared to the baseline TTE, including the severity of mitral regurgitation (0.67 ± 0.49 vs. 3.42 ± 1.17, p<0.001), trans-MV mean pressure gradient (6.67 ± 1.56 vs. 15.33 ± 6.77 mmHg, p<0.001), and pulmonary arterial systolic pressure (43.17 ± 18.58 vs. 66.83 ± 24.58 mmHg, p=0.001) (Figure 2). Interestingly, in 6 patients who received Edward Sapien XT VIV procedure, left ventricular end-diastolic volume improved when comparing the baseline, 3-month and 6-month follow-up TTE (82.17 ± 12.51 vs. 77.33 ± 9.18 vs. 77.17 ± 10.94 ml, p=0.022), which was not observed in the Boston Lotus group (Figure 3). Among 3D MV geometry analysis, many parameters showed improvement in comparison of the pre- and post-procedure 3D TEE, including anterolateral-posteromedial diameter, anteroposterior diameter, 3D annular perimeter, 3D annular area, annular ellipticity, and 3D leaflet total area both in the Edward and Lotus group (p<0.05) (Figure 4). The MV non-planar angle decreased in the Edward group while the aortic-mitral angle decreased in the Lotus group (Figure 4).

variable	MVR V IN V (n=12) pre op mean ± SD	follow 1 mean ± SD	follow 2 mean ± SD	p-value for repeated ANOVA
MR	3.42 ± 1.17	0.42 ± 0.52	0.67 ± 0.49	<0.001
RVSP	66.83 ± 24.58	44.83 ± 22.07	43.17 ± 18.58	0.001
LVEF	59.67 ± 9.16	54.67 ± 11.51	57.42 ± 11.63	0.353
EDV	78.75 ± 13.13	72.67 ± 15.05	79.25 ± 21.84	0.379
ESV	31.42 ± 7.09	33.75 ± 15.42	35.58 ± 23.30	0.734
MPG	15.33 ± 6.77	7.25 ± 2.77	6.67 ± 1.56	<0.001
PPG	30.17 ± 7.33	16.42 ± 4.10	16.08 ± 3.99	<0.001
MVA	1.78 ± 0.79	2.08 ± 0.93	2.17 ± 0.72	0.465

variable	Edward (n=6) pre op mean ± SD	Edward follow 1 mean ± SD	Edward follow 2 mean ± SD	p-value for repeated ANOVA	Lotus (n=6) pre op mean ± SD	Lotus follow 1 mean ± SD	Lotus follow 2 mean ± SD	p-value for repeated ANOVA
MR	3.50 ± 1.23	0.33 ± 0.52	0.67 ± 0.52	<0.001	3.33 ± 1.21	0.50 ± 0.55	0.67 ± 0.52	<0.001
RVSP	80.83 ± 25.02	50.00 ± 29.29	48.83 ± 22.79	0.026	52.83 ± 15.28	39.67 ± 12.24	37.50 ± 12.77	0.005
LVEF	59.17 ± 8.84	56.50 ± 8.89	60.50 ± 7.06	0.226	60.17 ± 10.28	52.83 ± 14.29	54.33 ± 15.00	0.521
EDV	82.17 ± 12.51	77.33 ± 9.18	77.17 ± 10.94	0.022	75.33 ± 13.95	68.00 ± 19.03	81.33 ± 30.32	0.451
ESV	33.50 ± 8.12	33.83 ± 9.54	30.50 ± 7.48	0.121	29.33 ± 5.85	33.67 ± 20.78	40.67 ± 32.81	0.567
MPG	11.17 ± 3.43	6.17 ± 1.33	6.17 ± 0.98	0.001	19.50 ± 6.89	8.33 ± 3.50	7.17 ± 1.94	<0.001
PPG	27.83 ± 5.88	14.67 ± 2.42	15.17 ± 4.02	<0.001	32.50 ± 8.41	18.17 ± 4.88	17.00 ± 4.10	<0.001
MVA	2.32 ± 0.75	1.95 ± 0.82	1.98 ± 0.64	0.582	1.25 ± 0.36	2.22 ± 1.08	2.35 ± 0.81	0.053

variable	Edward (n=6) pre mean ± SD	Edward post mean ± SD	p-value	Lotus (n=6) pre mean ± SD	Lotus post mean ± SD	p-value
MV AL-PM Diam	28.05 ± 4.97	21.10 ± 3.43	0.03	26.44 ± 2.63	23.60 ± 1.67	0.03
MV AP Diam	26.06 ± 3.92	21.44 ± 3.59	0.03	25.23 ± 3.34	23.07 ± 2.20	0.03
MV Ann2D Circ	86.26 ± 13.04	67.34 ± 10.32	0.03	81.81 ± 9.29	74.55 ± 5.26	0.03
MV Ann3D Circ	88.15 ± 13.64	69.28 ± 10.79	0.03	84.73 ± 10.14	77.31 ± 5.93	0.03
MV Ann2D Area	598.13 ± 180.93	365.28 ± 116.34	0.03	532.96 ± 121.33	440.55 ± 64.31	0.03
MV Ann3D Min Area	606.64 ± 183.84	372.20 ± 119.31	0.03	548.04 ± 127.38	452.49 ± 66.73	0.03
MV Ann Ellipsicity	107.70 ± 9.36	98.53 ± 4.12	0.03	105.54 ± 10.31	102.68 ± 6.51	0.03
MV Leaf 3D Area	718.22 ± 219.08	431.36 ± 142.51	0.03	652.35 ± 170.90	525.82 ± 75.34	0.03
MV Nonplanar Angle	96.50 ± 9.61	86.18 ± 10.80	0.03	96.67 ± 8.60	95.33 ± 11.51	0.92
MV Ao-Mitral Angle	130.80 ± 14.47	139.01 ± 9.93	0.25	126.12 ± 11.22	141.61 ± 7.83	0.03

CONCLUSION In this 12-patient series with mitral VIV implantation for previous mitral bioprosthesis failure, 2D TTE revealed lessened mitral regurgitation severity, decreased trans-MV pressure gradient as well as pulmonary hypertension in both the Edward and Lotus valve system.

More reduction of end-diastolic volume in the Edward group may imply better early left ventricular remodeling than in the Lotus group.

Among these cases whose MV function was restored by VIV procedure, 3D MV geometry analysis showed concordant improvements in MV annular size as well leaflet area.

TCTAP A-165

Utility of Intracardiac Echocardiography in Antegrade Balloon Aortic Valvuloplasty for Severe Aortic Stenosis

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BACKGROUND The use of balloon aortic valvuloplasty (BAV) is increasing in the current transcatheter aortic valve replacement era. The recent development of the real-time phased-array intracardiac echocardiogram (ICE) with 2D and color Doppler imaging could play a critical role in monitoring therapeutic effects of balloon inflations or in diagnosing potential complications in their early stages.

METHODS In this study, 10 severe aortic valve stenosis (AS) patients who underwent ICE-guided BAV were retrospectively compared with 12 AS patients in whom the conventional technique was used. ICE-guided BAV was obtained in all cases starting April 2015 (ICE group) while conventional technique without ICE guidance (non-ICE group) was used in cases prior to this date. All BAV procedures were performed by a transvenous transseptal (antegrade) approach to access the aortic valve.

RESULTS The mean age was not found to be statistically significant between the groups (84.2 ± 5.5 vs. 83.3 ± 1.4, p=0.68). Technical success was achieved in all patients. Mean trans-aortic valve pressure gradient improved from 55.3 ± 19.4 mmHg to 37.7± 14.3 mmHg (P<0.01) and aortic valve area increased from 0.63 ± 0.18 cm^2 to

0.86 ± 0.19 cm^2(P<0.01). There was no statistically significant difference between ICE group and non-ICE group. One patient died from a cardiovascular cause within 30 days of BAV procedure and 1 patient developed cardiac tamponade in the non-ICE group. The rates of patients with worsening aortic valve regurgitation were higher in the non-ICE group than in the ICE group after the procedure. Average procedure time was found to be significantly shorter in the ICE group than in the non-ICE group (94 ± 14 minutes vs. 101 ± 15 minutes, P=0.018).

CONCLUSION ICE is now employed to provide real-time imaging of relevant intracardiac structures for BAV procedures. The use of ICE during BAV procedures facilitates procedural efficacy and identifies and potentially reduces complications.

TCTAP A-166

Study of Clinical, Echocardiographic and Hemodynamic Characteristics of Male and Female Patients Undergoing Percutaneous Transvenous Mitral Commissurotomy

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BACKGROUND The technique of balloon mitral commissurotomy has evolved rapidly, with improvements in balloons, guide wires, and the application of double-balloon techniques. Percutaneous transvenous mitral commissurotomy (PTMC) using an Inoue balloon catheter is of established efficacy and safety and is an alternative to surgical valvotomy in selected patients with rheumatic mitral stenosis. Patient selection has an important impact on the outcome of percutaneous balloon mitral commissurotomy.

METHODS A prospective study was done during the period of August 2003 to November 2015. Nineteen hundred and eighty (1980) patients with rheumatic mitral stenosis who underwent PTMC were evaluated clinically, by echocardiography and by catheter during and after the procedure. Out of 1980 patients, 1320 patients were female (Group-1) and rest 660 patients were male (Group-2).

RESULTS Mean age of the study population was 24.56 ± 09.85 years in group-1 (female) and 35.34 ± 12.11 years in Group-2 (male). After PTMC mean mitral valve area increased from 0.85 ± 0.11 cm^2 to 1.65 ± 0.27 cm^2 as measured by echocardiography in group-1 and from 0.80 ± 0.32 cm^2 to 1.46 ± 0.33 cm^2 in group-2. Mitral valve gradient reduced to 11.63 ± 4.15 mmHg from 26.46 ± 03.94 mmHg after PTMC in group-1 and 12.45 ± 3.76 mmHg from 32.64 ± 04.12 mmHg after PTMC in group-2. Mean left atrial pressure as recorded by catheter before PTMC was 27.92 ± 07.31 mmHg while after PTMC it was 17.81 ± 06.28 mmHg in group-1 and 32.81 ± 07.27 mmHg while after PTMC it was 20.76 ± 05.13 mmHg in group-2.

CONCLUSION Male patients are older than female patients at the time of the PTMC procedure, and male patients have worse echocardiographic parameters than female patients.

TCTAP A-167

Percutaneous Transvenous Mitral Commissurotomy in Patients with Calcific Mitral Stenosis: Immediate and In-hospital Clinical, Echocardiographic and Hemodynamic Outcome

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BACKGROUND Rheumatic mitral stenosis is a very common problem in our population having an incidence of 54 percent among rheumatic heart disease with a female preponderance of 2:1. Mitral valve calcification has have shown to be an important factor In determining an immediate outcome of patients undergoing surgical mitral commissurotomy.

METHODS A prospective study was done during the period of August 2003 to November 2015. Nineteen hundred and eighty (1980) patients with rheumatic mitral stenosis who underwent PTMC were evaluated clinically, by echocardiography and by catheter during and after the procedure. Out of 1980 patients, 80 patients had fluoroscopically visible mitral valve (MV) calcification (Group-1) and rest 1900 patients had no fluoroscopically visible mitral valve (MV) calcification (Group-2).

RESULTS Mean age of the study population was 44.25 ± 08.40 years in group-1 and 29.14 ± 12.31 years in Group-2. Most of the population are female, 72% in Group-1 and 75% in group-2. After PTMC mean mitral valve area increased from 0.70 ± 0.15 cm^2 to 1.46 ± 0.34 cm^2 as measured by echocardiography in group-1 and from 0.82 ± 0.22 cm^2 to 1.81 ± 0.33 cm^2 in group-2 . Mitral valve gradient reduced to 12.73 ± 4.19 mmHg from 33.56 ± 04.94 mmHg after PTMC in group-1 and 11.75 ± 3.67 mmHg from 27.34 ± 04.34 mmHg after PTMC in group-2. Mean left atrial pressure as recorded by catheter before PTMC was 32.99 ± 08.58 mmHg while after PTMC it was 22.72 ± 05.38mmHg in group-1 and in group-2, 29.72 ± 06.27 mmHg before while after PTMC it was 22.76 ± 05.12 mmHg in group-2.

CONCLUSION PTMC can be performed effectively and safely in patients had fluoroscopically visible mitral valve (MV) calcification with a good immediate result but the result is inferior to patients had no fluoroscopically visible mitral valve (MV) calcification.

TCTAP A-168

Quantification of Incompletely-apposed Gap after Transcatheter Aortic Valve Replacement Using Patient-specific Models for Understanding the Mechanism of Paravalvular Leak

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BACKGROUND Reduction of paravalvular leak (PVL) after transcatheter aortic valve replacement (TAVR) is demanded for improving prognosis. However, the detailed mechanism of PVL has not been fully understood yet. We aimed to investigate the mechanism of PVL using a pulsatile flow simulator with patient-specific aortic valve models.

METHODS Based on pre-procedural CT data of six patients who had PVL after TAVR with 23-mm Sapien XT (Edwards Lifesciences), anatomically-identical aortic valve models with mechanically-matched calcified lesions were developed. The areas of the aortic valve annulus and transcatheter valve stent-frame after TAVR in the models were adjusted to those in the patients. The models of thoracic, abdominal, and iliofemoral arteries were also duplicated to simulate clinical TAVR procedure. After deployment of the transcatheter valves by transfemoral access with the same balloon inflation volume as in the clinical situations, mean forward flow and heart rate of each patient in two days after an operation was reproduced in the pulsatile flow simulator. Then, PVL were quantitatively measured using electromagnetic flow sensor. Moreover, an incompletely-apposed gap between the transcatheter valves and aortic valve annulus were examined using a micro-CT.

RESULTS The PVL volumes of six patient-specific models in the pulsatile flow test were consistent with PVL grades by echocardiography in the patients (Table). The minimal cross-sectional area of the longitudinally incompletely-apposed gap had a strong correlation with the PVL volumes (R=0.89).

		1	2	3	4	5	6
Model	Paravalvular Leakage L/min	0.49	0.25	0.18	0.35	0.12	0.59
	Total back flow L/min	0.86	0.68	0.63	0.73	0.47	0.90
Patient	TAVR AR Grade	Moderate to Severe	Mild	Mild	Moderate	Mild	Mild to Moderate

CONCLUSION This study revealed that the minimal cross-sectional area of the incompletely-apposed gap between the transcatheter valve and aortic valve annulus was associated with PVL volume.

VASCULAR ACCESS (TRANSRADIAL) (TCTAP A-169 TO TCTAP A-172)

TCTAP A-169

Use of 25cm Long Hydrophilic Radial Sheath Eliminated Clinically Significant Radial Artery Spasm During Trans-radial Coronary Intervention

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BACKGROUND Radial artery spasm (RAS) is one of the main reasons causing failure and/or complication of trans-radial intervention (TRI). Causes of spasm include anxious/sensitive patient, small radial artery size, and frequent catheter passage, especially guiding catheter with