After mitral valve replacement with a prosthetic valve, the valve should be competent and there should not be any residual prosthetic valve regurgitation. Transvalvular residual prosthetic valve regurgitation are difficult to diagnose and quantify. we are reporting interesting TEE images as a diagnostic dilemma in a case of transvalvular mitral regurgitation following mitral valve replacement secondary to entrapment of sub-valvular apparatus in a Chitra mechanical heart valve.

Key words: Chitra mechanical heart valve; prosthetic valve regurgitation; signature jets; transvalvular regurgitation

INTRODUCTION

Following mitral valve replacement with a prosthetic valve, the valve should be competent, and there should be minimal prosthetic valve regurgitation. Signature jets or washing jets specific for each prosthetic valve are described. They are small jets, which arise between the sewing ring and disc or leaflet. Each mechanical valve will have a characteristic washing jets, and they wash out thrombus formed on the mechanical valve. We are describing a case of prosthetic valve regurgitation due to entrapment of subvalvular mitral tissue following mitral valve replacement using Chitra mechanical heart valve in the immediate postbypass period which was diagnosed using transesophageal echocardiography (TEE). Transvalvular regurgitation has to be differentiated from paravalvular regurgitation. The severity has to be evaluated and appropriately treated. Agostini et al. have published an article where entrapment of the subvalvular apparatus resulted in intermittent heart failure. We are reporting interesting TEE images of prosthetic valve regurgitation following mitral valve replacement.

CASE REPORT

A 31-year-old male patient presented with dyspnea on exertion NYHA Class II and palpitations since 6 months. He was diagnosed to have rheumatic heart disease with severe mitral stenosis, severe aortic stenosis with mild aortic regurgitation and moderate pulmonary hypertension in atrial fibrillation posted for double valve replacement. Preoperative transthoracic echocardiography revealed rheumatic heart disease with severe mitral stenosis, (mitral valve area - 0.8 cm²) severe aortic stenosis (mean gradient - 48 mm of Hg).
with mild aortic regurgitation and moderate pulmonary hypertension (right ventricular systolic pressure - 50 mm of Hg) with left atrial size 54 mm, good bi-ventricular function and no left atrial clot. The patient underwent double valve replacement with a mechanical Chitra heart valve (TTK Company, India) 27 size in the mitral position (placed anti anatomically) and 21 size in the aortic position. Mitral valve anterior and posterior leaflets were resected, and chordae of the posterior leaflet were partially preserved. After weaning from cardiopulmonary bypass TEE revealed residual mitral regurgitation through the prosthetic valve. It was an eccentric wall hugging jet directed posteriorly arising within the sewing ring. The vena contracta width was 3.7 mm, peak velocity 6.1 m/s and it was dense parabolic jet on continuous wave Doppler with the effective regurgitant orifice area 0.3 cm² (using proximal isovelocity area [PISA] method) suggestive of moderate mitral regurgitation. The hemodynamic parameters were heart rate around 90/min and systolic blood pressure was between 130 and 140 mm of Hg. In zoomed mid-esophageal four chamber view [Video 1, Figures 1 and 2] a mobile structure was moving from left ventricle into the left atrium across the prosthetic valve and preventing the closure of the disc completely resulting in moderate mitral regurgitation. On the second run of bypass, surgeon opened the left atrium and found the preserved chordae of the posterior leaflet was interfering with the complete closure of the disc. It was resected, and the valve was rotated. Then the patient was weaned off bypass with minimal inotropes. Postbypass TEE revealed a competent prosthetic valve without residual mitral regurgitation [Video 2 and Figure 3]. He had an uneventful postoperative recovery.

**DISCUSSION**

Mitral valve replacement with total or partial chordal preservation is often desirable to preserve the left ventricular function ventricular function and for improved long-term survival. Mitral valve replacement with chordal and papillary muscle preservation permits more rapid recovery of ventricular function, improves ventricular performance and may prevent progressive dilatation of the left ventricle (remodeling).[1,2] Mitral valve replacement has inherent risks, like thromboembolism, endocarditis, and prosthesis failure or dysfunction.

Postmitral valve replacement the differential diagnosis for residual mitral regurgitation are physiological washing or closing jet, paravalvular leak and transvalvular leak. Each mechanical valve
will have a characteristic washing or closing jet also called as signature jets. As the occluder comes in contact with the sewing ring small amount of blood escapes between the two resulting in closing jets, which wash away the thrombus formed on the disc. Physiological regurgitant jets are short, narrow, flame-like, laminar and of low velocity.\textsuperscript{[3,4]} Chitra TTK mechanical valve (TTK Company, India) normally has three closing jets, one central and two peripheral, small and divergent. Paravalvular leak is between the sewing ring and the annulus. On color flow Doppler, the jet is seen originating outside the sewing ring and is typically eccentric. Trivial paravalvular leaks resolve following protamine or within a few weeks as the sewing ring becomes endothelialized. Significant paravalvular regurgitation at the time of implantation is usually the result of valve sutures tearing out from the endocardium, inadequately tightened sutures or large annular calcification. Delayed paravalvular regurgitation may be due to dehiscence of the sewing ring, suture disruption and endocarditis.\textsuperscript{[4]} Acute transvalvular regurgitation may be due to incomplete disc closure in a mechanical valve or leaflet prolapse or coaptation defect in a bioprosthetic valve. Acute transvalvular regurgitation can also be due to mitral subvalvular Chordae or a suture interfering with the occluder mechanism. Delayed transvalvular regurgitation may be due to thrombus, pannus and infective endocarditis. Pathological jets are longer, wall hugging and broader. They are usually eccentric and difficult to quantify. They can be quantified using vena contracta width, density and contour of continuous wave signal, PISA on the ventricular side of the regurgitant orifice, the effective regurgitant orifice area, regurgitant volume, and a regurgitant fraction.\textsuperscript{[4,5]}

CONCLUSION

Transvalvular regurgitation through a prosthetic valve is rare and it is very difficult to quantify this regurgitant jets, but they have to be appropriately treated if it is severe.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Komeda M, David TE, Rao V, Sun Z, Weisel RD, Burns RJ. Late hemodynamic effects of the preserved papillary muscles during mitral valve replacement. Circulation 1994;90 (5 Pt 2):II190-4.
2. Popovic Z, Baric I, Jovic M, Panic G, Misic M, Bojac M. Ventricular performance following valve replacement for chronic mitral regurgitation: Importance of chordal preservation. J Cardiovasc Surg (Torino) 1999;40:183-90.
3. Khandheria BK, Seward JB, Oh JK, Freeman WK, Nichols BA, Sinak LJ, et al. Value and limitations of transesophageal echocardiography in assessment of mitral valve prostheses. Circulation 1991;83:1956-68.
4. Savage RM. Comprehensive Textbook of Perioperative Transesophageal Echocardiography. 2nd ed., Ch. 16. Philadelphia USA: Lippincot Williams and Wilkins; 2011.
5. Zoghbi WA, Chambers JB, Dumesnel JJ, Foster E, Gottfried JS, Grayburn PA, et al. Recommendations for evaluation of prosthetic valves with echocardiography and Doppler ultrasound: A report From the American Society of Echocardiography’s Guidelines and Standards Committee and the Task Force on Prosthetic Valves, developed in conjunction with the American College of Cardiology Cardiovascular Imaging Committee, Cardiac Imaging Committee of the American Heart Association, the European Association of Echocardiography, a registered branch of the European Society of Cardiology, the Japanese Society of Echocardiography and the Canadian Society of Echocardiography, endorsed by the American College of Cardiology Foundation, American Heart Association, European Association of Echocardiography, a registered branch of the European Society of Cardiology, the Japanese Society of Echocardiography, and Canadian Society of Echocardiography. J Am Soc Echocardiogr 2009;22:975-1014.
6. Agostini F, Click RL, Mulvagh SL, Abel MD, Dearani JA. Entrapment of subvalvular mitral tissue causing intermittent failure of a St Jude mitral prosthesis. J Am Soc Echocardiogr 2000;13:1121-3.