Indian Internet Journal of Forensic Medicine & Toxicology
Vol. 10, No. 2 April-June 2012, 49-51
DOI : 10.5958/j.0973-1970.10.2.014

Case Report

Sudden Death Due to Mechanical Failure of Prosthetic Aortic Valve: A Case Report

Dr. Basappa S Hugar[1]*, Dr S Praveen[2], Dr. Girish Chandra YP[3], Dr. S Harish[4], Dr. Akshith Raj S Shetty[5]

[1]Assistant Professor, [2]Associate Professor, Department of Forensic Medicine, [3]Professor & HOD, [4]Professor, [5]Post Graduate Student, Department of Forensic Medicine, MS Ramaiah Medical College, Bangalore – 560 054

*E-mail id: basavaraj_hugar2007@rediffmail.com

ABSTRACT

One of the major reasons of sudden natural deaths is cardiac arrests. Forensic pathologists rarely encounter sudden deaths in individuals who are already suffering from a cardiac problem. In case the deceased has undergone surgery for such a pre-condition then the treating physician usually issues a cause of death certificate. Failure of cardiac valve prosthesis can lead to sudden death. A 45-year-old male suddenly died 3 ½ months after he underwent aortic valve replacement with size 21 TTK CHITRA TILTING DISC VALVE under cardio pulmonary bypass for rheumatic aortic stenosis and regurgitation. The autopsy revealed that death occurred due to a mechanical failure of the prosthetic aortic valve – after ruling out all other possible causes.

Keywords: Sudden death; Rheumatic heart disease; Aortic stenosis; Aortic regurgitation; Prosthetic valve

INTRODUCTION

Cases of sudden unexpected death due to failure of cardiac valve prosthesis are very rare[1,2]. The four most dreaded complications following mechanical prosthetic valve replacement are dehiscence/disruption/ dysfunction, infection, embolism, and thrombosis[3].

Valve obstruction is one of the most serious complications of a mechanical prosthetic valve with its incidence rate ranging from <0.5 % to 4.5% per patient/year[4-8]. The clinical presentation may vary from insidious onset of mild symptoms[9] to abrupt circulatory decompensation often resulting in death[4]. Almost 50% of the obstructed valves are diagnosed at autopsy[10].

Obstruction of mechanical prosthetic valves is not very common nowadays due to the improved design and quality of the prosthetic material. Thrombosis or pannus formation are the most common causes of obstruction of mechanical valves[11,12]. However, a variety of factors, such as pannus formation, bacterial endocarditis, chordal debris, and papillary muscle entrapment can cause mechanical malfunctions of prosthetic heart valves either perioperatively or long after the surgical replacement[11,13-15].

One such case of sudden death after the valve replacement surgery for severe aortic stenosis and regurgitation of rheumatic origin is being discussed here.

CASE REPORT

A 45-year-old male with a history of childhood rheumatic fever was admitted to the hospital with complaints of easy fatigue. He was diagnosed with severe aortic stenosis with aortic regurgitation of rheumatic etiology. He underwent aortic valve replacement with size 21 TTK CHITRA TILTING DISC VALVE under cardio pulmonary bypass on 29/11/2011. He recovered without any side effects and was called for periodic follow-up visits during which no complaints were voiced. On the day of his demise, that is, 14/03/12, he was travelling in a train when he suddenly experienced severe chest pain, dizziness, and pain in the left arm. He was found dead on arrival by the on- duty railway physician. Since it was a

sudden death, a case of unnatural death was booked and an autopsy was conducted at M S Ramaiah Medical College on 15/03/12.

AUTOPSY FINDINGS

The deceased was a moderately built and healthy male. Apart from a midline sternotomy scar, his external appearance was clear. Internal examination revealed a pulmonary edema and congestion of visceral organs. Pericardium was adherent and his heart weighed 586 g. Dissection of the heart revealed a prosthetic valve in the intra-annular aortic position. The valve was normal and there was no evidence of thrombosis, infection or embolism. The thickness of the right ventricle wall was 0.7 cm and the left ventricle showed concentric hypertrophy with a wall thickness of 2.8cm. The left anterior descending coronary artery showed 50%–60% luminal occlusion along with a 20%–30% luminal occlusion in the right coronary artery. Left circumflex coronary artery was unremarkable. The same was confirmed by histopathological examination. The stomach showed 200 ml of partially digested rice meal, mucosa was unremarkable and all other internal organs were intact and congested.

DISCUSSION

ilting disc valves are mechanical prosthetic heart valves

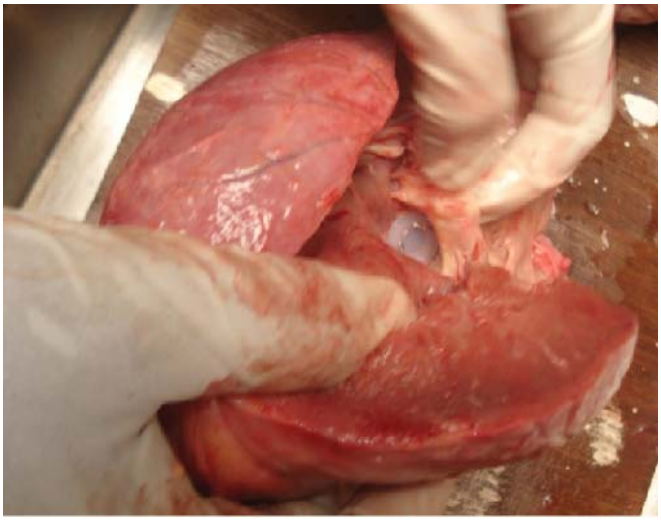

Figure 1: Heart sectioned along the left border (left ventricle) showing the prosthetic heart valve in situ

implanted through thoracotomy/sternotomy and have a single circular occluder controlled by a metal strut. They are made of a metal ring covered by an ePTFE fabric, into which the suture threads are stitched in order to hold the valve in place. The metal ring holds, by means of two metal supports, a disc which opens and closes as the heart pumps blood through the valve. This disc is usually made of an extremely hard carbon material (pyrolytic carbon), in order to allow the valve to function for years without wearing out.

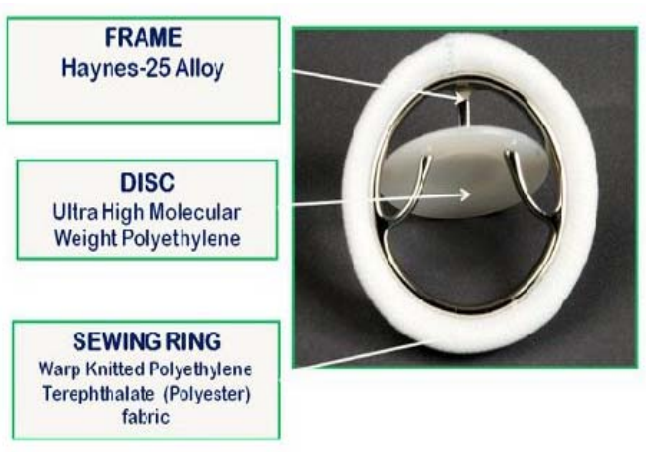

Figure 2: Parts of a tilting disc valve

Death due to complications in cardiac valve replacement are divided into early (29 days or less following surgery) and late (30 or more postoperative days) phases [1, 2]. Early deaths are almost exclusively the result of complications of surgery with thrombosis, dehiscence, and disproportion of valves accounting for only 6% of deaths. Thrombosis and infection of prostheses account for nearly all late deaths with only about 2% of late deaths attributed to mechanical dysfunction of valves[1]. Reported late mechanical failures of prosthetic mitral valves have been rare; 8 of 897 patients in 1 series[16] and 1 of 99 in another series[17] died as a result of prosthetic mitral valve mechanical failures.

The true incidence of sudden death resulting from late failure of prosthetic heart valves is probably higher than the few case reports in the literature would suggest. In many cases, physicians are willing to sign death certificates of patients who have a history of cardiac surgery without any autopsy findings. Such a practice

may result in cases of prosthesis failure because of wear, improper design, or defects in material or workmanship going undiscovered

In the present case, a 45-year-old male was doing well after aortic valve replacement, but 3 and a half months later he complained of sudden chest pain and died. At autopsy, prosthetic valve in the intra-annular aortic position, the valve was normal with no evidence of thrombosis, infection or embolism and there was no other significant pathology in the heart so as to cause sudden death and all other organs were also intact. Hence the cause of death was opined to be due to coronary artery insufficiency consequent upon mechanical failure of the Aortic valve prosthesis

REFERENCES

1. Schoen FJ, Titus JL, Lawrie GM. Autopsy-Determined Causes of Death After Cardiac Valve Replacement. JAMA 1983; 249: 899-902.
2. Silver MD. Late Complications of Prosthetic Heart Valves. Arch Path Laboratory Med 1978; 102: 281-284.
3. Joseph SA. The Thrombosed Prosthetic Valve. J Am Coll Cardiol 2003; 41: 659-660.
4. Edmunds LH. Thromboembolic complications of current cardiac valvular prostheses. Ann Thorac Surg 1982; 34: 104.
5. Butchart EG, Lewis PA, Grunkenmeier GL, Kulatilake N, Breckenbridge M. Low risk of thrombosis and serious embolic events despite low intensity anticoagulation. Circulation 1988;78: 66-77.

.6. Martinell J, Frail J, Artiz V, Cortina J, Frasneda P, Rabago G. Reoperation for left sided low profile mechanical prosthetic obstruction. Ann Thorac Surg 1987; 43: 172-5.

7. Mattingly WT, O'Connor W, Zeok lY, Todd EP. Thrombotic catastrophe in the patient with multiple Bjork-Shiley prostheses. Ann Thorac Surg 1982; 35: 253-56.
8. Montero CG, Mula N, Brugos A, Pradas R, Figuera D. Thrombectomy of the Bjork-Shiley prosthetic valve revisited: long-term results. Ann Thorac Surg 1989; 48: 824-28.
9. Kontos GH, Schaff HV, Orszulak TA, Puga FJ, Pluth JR, Danielson GK. Thrombotic obstruction of disc valves: clinical recognition and surgical management. Ann Thorac Surg 1989; 48: 60-65.
10. Murphy DA, Levine FH, Buckley MH et al. Mechanical valves: a comparative analysis of the Starr-Edwards and Bjork·Shiley prostheses. J Thorac Cardiovasc Surg 1983; 86: 746-52.
11. Vitale N, Renzulli A, Agozzino L, Pollice A, Tedesco N, de Luca Tupputi Schinosa L et al. Obstruction of mechanical mitral prostheses: analysis of pathologic findings. Ann Thor Surg 1997; 63: 1101–6.
12. Barbetseas J, Nagueh SF, Pitsavos C, Toutouzas PK, Quin˜ones MA, Zoghbi WA. Differentiating thrombus from pannus formation in obstructed mechanical prosthetic valves: an evaluation of clinical, transthoracic and transesophageal echocardiographic parameters. J Am Coll Cardiol 1998; 32: 1410–7.
13. Keeble W, Cobbe S. Pressure damping, a 'billowing' septum, and an eerie silence: perioperative, intermittent obstruction of a mitral valve prosthesis. Heart 2000; 84: e6.
14. Borowski A, Reiss N, Klaer R. Intermittent obstruction of the Omnicarbon valve prosthesis in the mitral position due to interference by papillary muscle. Diagnostic and surgical considerations. J Cardiovasc Surg (Torino) 1992; 33: 305–07.
15. Pai GP, Ellison RG, Rubin JW, Moore HV, Kamath MV. Disc immobilization of Bjo¨rk-Shiley and Medtronic Hall valves during and immediately after valve replacement. Ann Thorac Surg 1987; 44: 73–6.
16. Joassin A, Edwards JE. Late Causes of Death After Mitral Valve Replacement: Analysis of 36 Cases. J Thoracic Cardiovascular Surg 1973; 65: 255-263.
17. Saloman NW, Stinson EB, Griepp RB, Shumway NE. Mitral Valve Replacement:Long-Term Evaluation of Prosthesis-Related Mortality and Morbidity. Circulation 1977; 56: II 94-II 101.