OMCR

Oxford Medical Case Reports, 2020;2,39–42

doi: 10.1093/omcr/omz141
Case Report

CASE REPORT

49 years of normal functioning Starr–Edwards aortic valve prosthesis

Mouhamed Amr Sabouni[1,*] and Robin H Baumeister[2] and Paul Traverse[1]

[1]United Health Services Hospitals, Heart and Vascular Institute, Johnson City, NY, USA, and [2]Biomedical Anthropology, Binghamton University, Binghamton, NY, USA

*Correspondence address. United Health Services Hospitals, Heart and Vascular Institute, Johnson City, NY 13790, USA. Tel: 6107301384; Fax: 6077635415; E-mail: mouhamed.a.sabouni@hotmail.com

Abstract

Although it is no longer in production, the Starr–Edwards valve has successfully replaced hundreds of thousands of heart valves in the past 50 years of its use. We report on the case of a valve in the aortic position still functioning 49 years after implantation without replacement, showcasing the valve's durability.

INTRODUCTION

The Starr–Edwards (SE) valve, created by Albert Starr and Lowell Edwards, was first successfully implanted in a human patient in August 1960 [1]. The SE valve is a mechanical ball-and-cage valve and can be placed in either the mitral, aortic or tricuspid positions [2]. Approximately 800 000 SE valves have been implanted since the 1960s [3]. Although hemodynamically functional, the SE valve was discontinued in 2007 related to high risk of thromboembolic and mechanical complications [3, 4]. Our case represents one of the oldest functioning SE mechanical aortic valves (AVs).

CASE REPORT

This is a case of an 85-year-old Caucasian female who developed subacute bacterial endocarditis of the AV at the age of 37 (in the year 1970) and developed severe valvular regurgitation requiring AV replacement with a Starr–Edwards ball in cage mechanical prosthesis. She received vitamin K antagonist/Warfarin for anticoagulation. She subsequently developed nonischemic cardiomyopathy and had left heart catheterization in May 2005, showing mild coronary atherosclerosis. Valve fluoroscopy suspected partial fracture of the apex of the SE valve struts. The valve was functioning normally and no surgical intervention was recommended at that time. Because of her non-ischemic cardiomyopathy, she received biventricular implantable cardioverter defibrillator (ICD) (Figs 1–3). Several echocardiogram studies were carried out since the valve was placed and the last imaging study in May 2019 showed the peak velocity across the valve to be 2.8 m/s, the AV Doppler velocity index (DVI) 0.26, acceleration time (AT) 50 ms and the mean pressure gradient 11.7 mmHg. Left ventricular (LV) systolic function was noted to be reduced and LV ejection fraction (EF) was estimated to be 35% by the Simpson method of disc calculation. LV filling pressure was noted to be elevated and E/e' calculated to be 16.7. Her left atrium was dilated and measured, with a left atrial volume index of 72.9 ml/m^2 (Figs 4–5). The patient passed this year at the age of 85 with a cause of death not related to valve function; during her life and the 49 years following the SE implant, she continued her daily activities with no limiting symptoms that may have been related to any valve dysfunction.

DISCUSSION

The durability of the SE valve has allowed for unique cases of follow-up. Despite its discontinuance, the SE valve has remained satisfactory in its long-term performance [5]. Our case represents

Received: October 1, 2019. **Revised:** November 18, 2019. **Accepted:** November 29, 2019

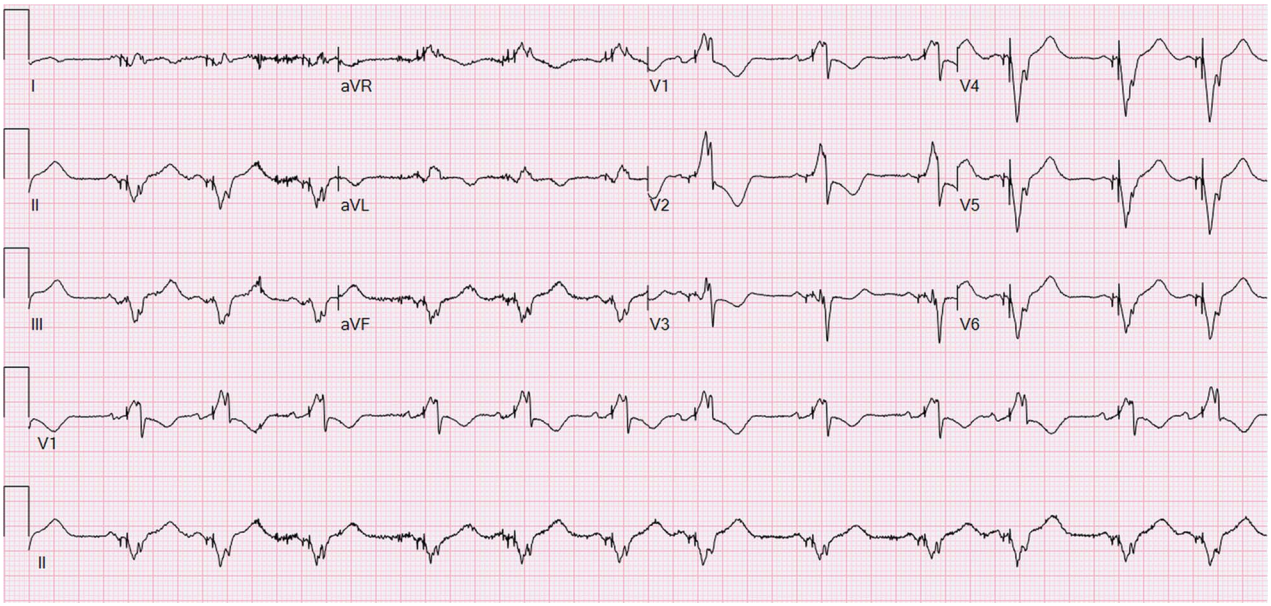

Figure 1: Electrocardiogram indicates atrial sensed ventricular paced rhythm.

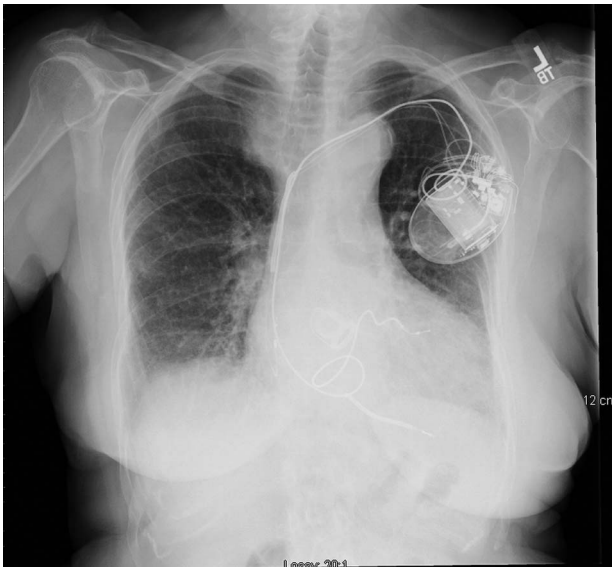

Figure 2: Chest X-ray indicates biventricular ICD/dual-chamber pacemaker, arrow showing the SE valve.

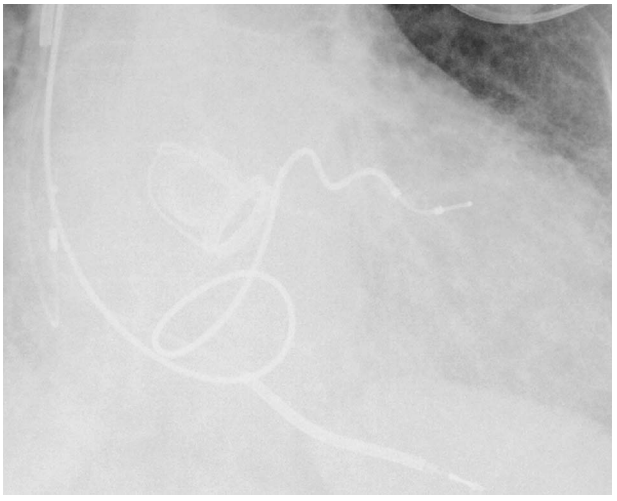

Figure 3: Amplification of the XR showing SE valve.

one of the oldest still functioning SE AV prostheses. During the 49 years since the implantation, there were no major complications or valve dysfunctions noted in our patient. We observe this to be the second oldest reported SE valve case. This follows a 2017 report of an SE valve functioning after 51 years, which was also in the aortic position [2]. Echo evaluation of the valve function is considered challenging. The motion of the occluder may not be well visualized using transthoracic echocardiograms due to the reverberation artifact [6]. Calculating Doppler peak velocity, DVI, AT and effective orifice area in addition to the mean gradient across the SE valve represent the main parameters for assessing valve function [7]. It is important to consider that an overestimation of the mean gradient may occur in SE valves, especially high cardiac output state or small sized valves, which can lead to inaccurate estimations of the valve function [8]. Mechanical heart valves have a greater risk of developing valve thrombosis as compared to bioprostheses. The metallic nature of the valve serves as a thrombogenic structure that attracts clotting factors, platelets, proteins and red blood cells, which can lead to thrombin formation and coagulation cascade activation [9]. To avoid any catastrophic valve thrombotic events, anticoagulation with coumadin is recommended for a target INR of 2–3. Our patient maintained coumadin therapy from valve implantation to her passing.

CONCLUSION

Our case demonstrates an example of the longevity of the Starr–Edwards valve, shown through a 49-year follow-up. A transthoracic echocardiogram is considered the first diagnostic work up to assess valve function. Anticoagulation with coumadin is recommended to avoid valve thrombosis.

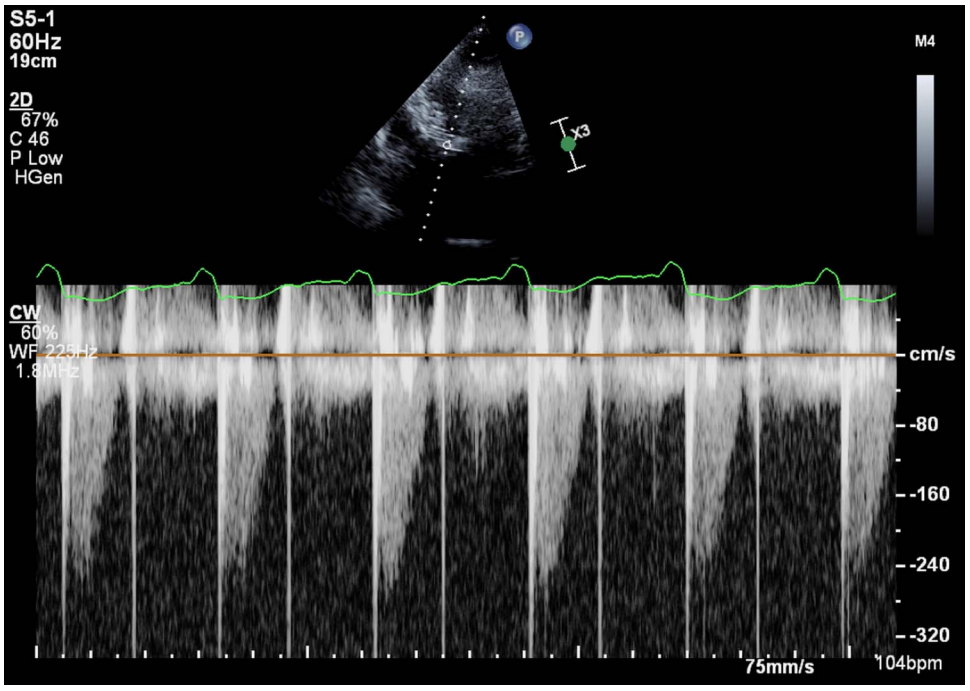

Figure 4: continuous-wave (CW) Doppler in apical five-chamber view showing peak velocity of 2.4 m/s.

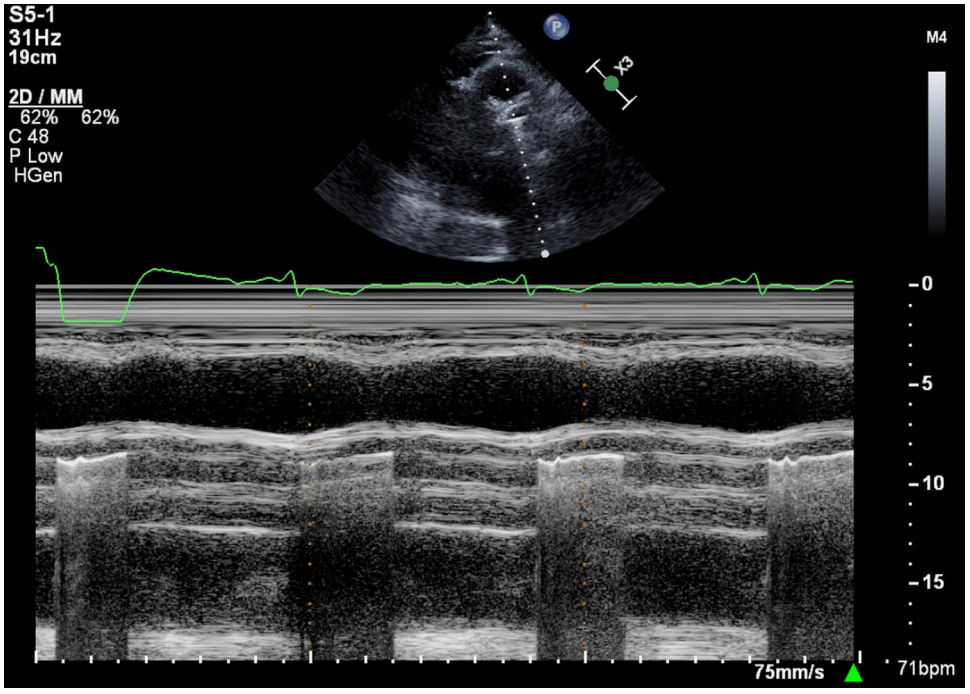

Figure 5: M-mode parasternal long axis through the AV.

SUPPLEMENTARY MATERIAL

Supplementary Material is available at *OMCREP* online.

FUNDING

None.

CONFLICT OF INTEREST STATEMENT

None declared.

ETHICAL APPROVAL

IRB of UHSH, Johnson City, NY.

CONSENT

The patient is deceased/no approval required.

REFERENCES

1. Matthews AM. The development of the Starr-Edwards heart valve. *Tex Heart Inst J* 1998;**25**:282–93.
2. Saxena P, Bonnichsen CR, Greason KL. Starr–Edwards aortic valve: forty-four years old and still working. *J Thorac Cardiovasc Surg* 2013;**146**:21–2.
3. Hirji SA, Kaneko T, Aranki S. The revolution and evolution of mechanical valves: the ball has left the cage. *J Thorac Cardiovasc Surg* 2018;**155**:149–50.
4. Amrane M, Soulat G, Carpentier A, Jouan J. Starr–Edwards aortic valve: 50+ years and still going strong: a case report. *Eur Heart J - Case Rep* 2017;**1**. doi: 10.1093/ehjcr/ytx014.
5. Godje OL, Fischlein T, Adelhard K, Nollert G, Klinner W, Reichart B. Thirty-year results of Starr-Edwards prostheses in the aortic and mitral position. *Ann Thorac Surg* 1997;**63**: 613–9.
6. Alam M, Goldstein S, Lakier JB. Echocardiographic changes in the thickness of porcine valves with time. *Chest* 1981;**79**: 663–8.
7. Dumesnil JG, Honos GN, Lemieux M, Beauchemin J. Validation and applications of mitral prosthetic valvular areas calculated by Doppler echocardiography. *Am J Cardiol* 1990;**65**: 1443–8.
8. Baumgartner H, Khan S, DeRobertis M, Czer L, Maurer G. Discrepancies between Doppler and catheter gradients in aortic prosthetic valves in vitro. A manifestation of localized gradients and pressure recovery. *Circulation* 1990;**82**:1467–75.
9. Dangas GD, Weitz JI, Giustino G, Makkar R, Mehran R. Prosthetic heart valve thrombosis. *JACC* 2016;**68**:2670–89.