

The longest survival after mitral valve replacement with a tilting-disc Lillehei-Kaster prosthesis?

Najdłuższe przeżycie po wszczepieniu mitralnej protezy zastawkowej Lillehei-Kaster z uchylnym dyskiem?



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Kardiochirurgia i Torakochirurgia Polska 2011; 4: 469–471

Abstract

In 1960, Starr implanted the first mitral valve prosthesis, starting the era of mitral valve replacement (MVR). Since that time, millions of valve devices have been implanted and many patients have been followed-up and reported. However, it is difficult to find reports regarding cases of more than 25-year survival after MVR. Therefore, we present a unique case of the patient who underwent MVR with the Lillehei-Kaster prosthesis on 14 March 1979. During the 32-year follow-up the patient had some events (infective, thromboembolic and hemorrhagic) but they were effectively treated. Through the observation period he remained in functional class II of the New York Heart Association on optimized medical therapy regimen. The most recent echocardiography showed a relatively good functioning mitral prosthesis with a small effective orifice area of 1.0 cm² and transvalvular gradient of 13/6 mm Hg. The 32-year survival after MVR is an excellent and rarely seen result.

Key words: mitral valve replacement, long-term results, Lillehei-Kaster prosthesis.

Streszczenie

W roku 1960 Starr wszczepił pierwszą mitralną protezę zastawkową, rozpoczynając erę wymiany zastawki mitralnej (ang. *mitral valve replacement* – MVR). Od tego czasu wszczepiono miliony protez zastawkowych, a wielu pacjentów poddano obserwacji w celu określenia wyników odległych MVR. Jednak w piśmiennictwie niełatwo znaleźć doniesienia o przeżyciu dłuższym niż 25 lat. Niniejsza praca przedstawia unikalny opis przypadku pacjenta, który przeżył operację MVR z wszczepieniem protezy mechanicznej Lillehei-Kaster z uchylnym dyskiem 14 marca 1979 roku. Podczas ponad 32 lat obserwacji u pacjenta wystąpiły powikłania odległe MVR (infekcyjne, zakrzepowo-zatorowe i krwotoczne), ale były one skutecznie leczone. Przez większość tego okresu pozostawał on w II klasie czynnościowej wg Nowojorskiego Towarzystwa Chorób Serca (ang. *New York Heart Association* – NYHA). W ostatniej echokardiografii uwidoczniono stosunkowo dobrze funkcjonującą protezę zastawkową z małym efektywnym polem przepływu (1 cm²) i dość wysokim gradientem przezastawkowym (13/6 mm Hg). 32-letnie przeżycie wydaje się bardzo dobrym i rzadko spotykanym wynikiem odległym po MVR.

Słowa kluczowe: wymiana zastawki mitralnej, wyniki odległe, proteza Lillehei-Kaster.

Introduction

Five decades ago, Starr implanted the first mechanical ball-and-cage prosthesis in the mitral position, starting the era of mitral valve replacement (MVR). Since that time, millions of patients after MVR have been followed-up and reported. However, it is difficult to find reports regarding cases of more than 25-year survival after MVR.

Case report

We present a case of a 83-year-old man who in the late 1940s had a course of rheumatic fever resulting in a heart valvular disease. Through the next three decades, symptoms of heart failure were gradually increasing, and finally he found himself in functional class III of the New York Heart Association (NYHA). In 1979, after cardiac catheteri-

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zation the diagnosis of combined mitral valve disease (predominantly regurgitation) was established and the patient was referred for the cardiac surgery.

On 14 March 1979, MVR was performed in the Department of Cardiac Surgery, Medical University of Lodz. The patient was operated on through median sternotomy, on standard cardiopulmonary bypass with moderate systemic hypothermia, intermittent aorta cross-clamping and topical cooling. A tilting-disc mechanical prosthesis Lillehei-Kaster 20 (internal diameter of 20 mm, external diameter of 27.5 mm) was implanted using interrupted sutures of 2/0 Ticon (Fig. 1). The early postoperative period was uneventful.

In 1981, the patient was hospitalized due to fever and treated with intravenous penicillin and excessive teeth extraction as a treatment of suspected infective endocarditis. In the following year he had a neurological embolic event with transient hemiparesis and aphasia.

Until 1986 the patient remained in the sinus rhythm and between 1986 and 1994 he had several electric cardioversions because of paroxysmal atrial fibrillation (AF). Since 1994 the patient has had permanent AF and due to slow ventricular rhythm he had the VVI pacemaker implanted.

Throughout all those years the patient experienced several hemorrhagic events usually associated with surgical interventions like re-implantation of the pacemaker (2000), prostatic biopsy (2003) or excision of facial keratoacanthoma (2008). These events were connected with both anticoagulation and previously noticed thrombocytopenia. Considering this fact, he has been ordered an oral anticoagulation with a target INR from 2.0 to 3.0.

During the follow-up period the patient has been also regularly monitored by echocardiography (Fig. 2). The examination performed at the end of 2010 revealed a relatively good function of the mitral prosthesis with an opening angle of tilting disc of about 50 degrees, small effective orifice area of 1.0 cm² and transvalvular gradient of 13/6 mm Hg (small-size device). The left atrium was significantly enlarged to 6.3 cm. The diastolic dimension of the left ventricle was 5.5 cm with a satisfactory global left ventricular ejec-

tion fraction of 40%. Besides, there was moderate tricuspid insufficiency. Systolic pulmonary artery pressure was 38 mm Hg.

The patient worked as a white-collar employee until 2002 and nowadays he continues to be in a good mental condition. Through the observation period he remained in NYHA functional class II on optimized medical therapy regimen.

Discussion

Tilting-disc valvular prostheses replaced ball-and-cage Starr-Edwards devices used in the late 1960s. The Lillehei-Kaster prosthesis was introduced into clinical use in 1970 as one of the first of this type [1]. It was not a perfect valve with a limited opening angle (50°-70°), quite small orifice-to-annular area ratio and turbulent flow. Those disadvantages were to be eliminated in the second-generation devices derived from the Lillehei-Kaster project, called Omniscience and introduced in 1978. Meanwhile, in 1977, the first bi-leaflet mechanical valve, St. Jude Medical (SJM), was implanted. Simultaneously, an alternative branch of heart valve devices was developed: the biological prostheses.

In our patient's case, the operation was performed in the pre-cardioplegia era, therefore it was more challenging than it is nowadays. Implanting a 20 mm diameter prosthesis (the only available size) into the adult male patient's

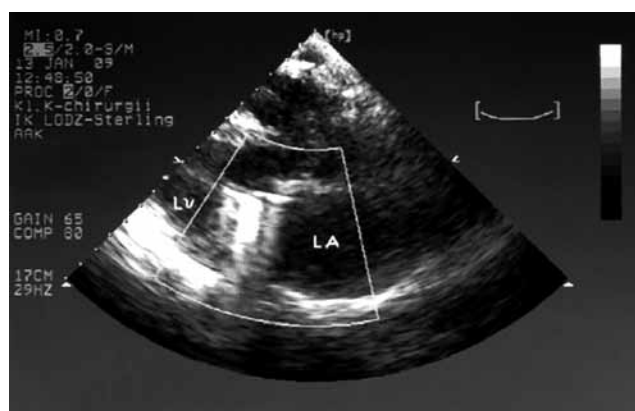


Fig. 1. Chest X-ray (lateral projection) of the patient: visible shade of a tilting-disc Lillehei-Kaster mitral prosthesis with characteristic long pointed struts and a VVI pacemaker electrode in the right ventricle



Fig. 2. Echocardiographic scan of the patient's heart. Between the left atrium (LA) and the left ventricle (LV), visible echo of a tilting-disc Lillehei-Kaster mitral valve prosthesis

heart was indeed changing severe mitral regurgitation into a well-tolerated moderate mitral stenosis. In the first postoperative echocardiography, the mitral valve area was 1.2 cm². Who could expect that this patient will survive 32 years without re-operation?

There is limited literature regarding long-term results of MVR with Lillehei-Kaster prosthesis. Olesen et al. [2] presented 185 such patients operated in the 1970s and 1980s. Operative mortality rate was quite high (13%), 10-year survival was 56% as well as 76 ±5% of patients were free from thromboembolic events. A similar group was reported by Milano et al. [3] with a comparable operative mortality rate (15%) and with quite poor 15-year survival of 32 ±6%. In this subset, the rates of thromboembolic, hemorrhagic and infective events per year were 2.7%, 1.8% and 0.3%, respectively. Horstkotte et al. [4] conducted a 5-year follow-up of 50 patients after MVR with Lillehei-Kaster valve with operative mortality of 12%, long-term survival of 76% and late complications rate of 50%. Whereas Teijeira [5] published data on 716 valve-year follow-up of 103 patients after MVR with Omniscience prosthesis and the rates of thromboembolism, valve thrombosis, bleeding and endocarditis per year were 0.71%, 0.42%, 0.99% and 0.14%, respectively.

In the current literature, there are several long-term follow-ups of the patients after MVR with SJM mechanical prosthesis, but none exceeds 25 years. Toole et al. [6] presented a group of 408 such patients with operative mortality of 4.9%, 25-year survival of 23%, a re-do surgery rate of 19%, thromboembolic complication rate of 48%, bleeding rate of 36% and endocarditis rate of 3%. A much bigger group was shown by Emery et al. [7] who followed 1498 patients after MVR with SJM device for 25 years (mean follow-up 7 ±5 years). The operative mortality rate in this

population was as much as 9% but long-term survival was satisfactory (63%) and thromboembolic and hemorrhagic events were observed in 19% each. What is interesting, the longest survival of an individual patient was 24.8 years and the oldest patient reached 102 years of age living for 8 years with mitral prosthesis implanted.

The thirty-two years' survival after MVR with a Lillehei-Kaster prosthesis, in a good clinical condition, covering more than a half of the whole history of this operation, seems to be a very good result. In available literature, no comparable reports were found.

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