

Aortic Valve Replacement with a Stentless Bioprosthesis: A Report of 21 Cases

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ÖZET

STENTSİZ BİYOPROTEZLE AORT KAPAK REPLASMANI: OLGUYA DAYANAN BİLDİRİ

Aort kapak replasmanında kullanılacak ideal materyal henüz bulunmamıştır. Kliniğimizde Freestyle stentsiz kapak (Medtronic Inc. Minneapolis Minn.) ile gerçekleştirilen aortik kapak değişim vakalarının klinik ve ekokardiyografik sonuçlarını değerlendirdik. Yaşları 62 ile 88 (ort. 71 ± 3.2) arasında değişen 16 erkek 5 kadın olmak üzere 21 vakada Freestyle stentsiz kapak kullanıldı. 14 vakada subkoroner teknik, 7 vakada da total kök değiştirme tekniği kullanıldı. Total iskemik süre 90 ± 13 dakika idi. Tüm seride mortalite ve major komplikasyon gözlenmedi. Yoğun bakımda ortalama kalma süresi 1.3 gün ve hastanede ortalama kalma süresi 7 ± 2 gündü. Hastaneden taburcu olurken yapılan ekokardiyografik incelemede sadece 2 hastada minimal bir aort kaçacağı mevcuttu. Takip süresi 4-18 ay (ort. 11 ay) arasında değişmekteydi. Bu süre esnasında kapak gradientlerinde hafif azalma gözlendi ($p=ns$) ve kapağa bağlı herhangi bir komplikasyon gözlenmedi. Taburcu olurken iki hastada gözlenen hafif kaçak kontrollerde de aynıydı. Sonuç olarak biyolojik kapak takılması düşünülen hastalarda Freestyle stentsiz kapakların iyi bir alternatif olduğu düşünülmektedir.

Anahtar kelimeler: Stentsiz kapak, aort kapak replasmanı

The ideal valve substitute is yet to be found. Despite the low valve related morbidity associated with stented porcine xenografts, the evidence of limited durability and suboptimal hemodynamics continue to represent major shortcomings (1). For these reasons, stentless xenografts have risen as a new aortic valve substitute to mirror the advantages of allografts in the aortic position. The expectation is that by offering optimal hemodynamic performance and reducing the mechanical stress on the valve leaflets, degeneration of the bioprosthesis may be slowed and these conduits may prove to be more durable (2,3).

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We present our clinical experience with aortic valve replacement (AVR) using the Freestyle stentless valve in 21 patients.

MATERIAL and METHODS

128 patients underwent AVR in Florence Nightingale Hospital between November 1996-February 1998. Among these 21, received a Freestyle stentless valve. The selection criteria were: 1. age older than 65 years 2. contraindication to oral warfarin therapy 3. deliberate request of a biological valve by the patient. Only one patient in the group was below 65 years of age but this patient could not use oral anticoagulation due to a previous gastrointestinal system bleeding. The demographic data of patients are shown in table 1.

The operations were performed in a standard way. Cardiopulmonary bypass was established via ascending aort and right atrium. Myocardial protection was achieved by moderate hypothermia, combined with antegrade retrograde tepid blood cardioplegia.

In 14 patients the modified subcoronary technique described by Westaby et al. was used (4). In 7 patients the total root replacement was done. Two of these had ascending aortic aneurysms (AAA) and a dacron graft (Hemashield, Meadox Medicals Inc, Oakland, NJ) had to be used to connect the valve with the distal part of the aneurysm. One patient underwent mitral commissurotomy and another received a left internal mammary artery for a tight stenosis of the left anterior descending coronary artery as a concomitant procedure. The operative data is shown in table 2.

Follow-up methods: The patients were followed for a mean period of 11 months (4-18 months). Echocardiographic examination was performed at discharge, and 11 months (mean) postoperatively. One patient was lost during follow up.

Table 1. Demographic data of the patients

AGE (mean)	71±3
GENDER (Male/Female)	16/5
AORTIC INSUFFICIENCY	7
AORTIC STENOSIS	7
AS+AI	5
AORTIC ANEURYSM	2

Table 2. Operative data of the patients

	Subcoronary Technique	Whole Root Technique
Cross Clamp time (Min.)	82±8	110±11
By-pass time (Min.)	120±30	135±18
Associated procedures		
CABG	1	
Mitral valve repair	1	

Table 3. Improvement in functional class

Functional class	No. of patients preoperative	No. of patients after 8-12 Mo.
1	0	16
2	6	4
3	13	1
4	2	0

RESULTS

There were no in-hospital deaths. One patient had to be reoperated for bleeding. One patient had a minor stroke which was resolved in 15 days. The mean intensive care unit stay was 1.3 days and the mean hospital stay was 7 ± 2 days. The mean functional class (NYHA) had dropped significantly in all patients at the end of mean 11 months follow up ($p < 0.001$) (Table 3). Two patients who had a subcoronary implantation had trivial aortic insufficiency at discharge, however this did not change during the follow up. There was a slight decrease in transvalvular gradients during the follow up but this was not statistically significant. All patients were well and alive at the end of follow up, however one patient refused to come for his control. There was no valve failure. The details of the follow up are shown in Table 3 and 4.

Statistical analysis: All data are represented as mean \pm standard deviation. One way analysis of variants

(ANOVA) was used to test the significance of changes in measurements over the follow up time.

DISCUSSION

The concept of AVR with a stentless porcine valve began with the pioneering work of O'Brien and associates in the mid 1960's (5,6). Observations of optimal hemodynamics and hopes of longer durability due to the absence of stents has revived attention for these valves (3,7). Preliminary reports of ideal hemodynamic function comparable to homografts and the advantage of availability in all sizes have made the stentless valve highly attractive. The major advantages of stentless valves are as follows: Better hemodynamics due to the absence of artificial stents, increased durability due to less mechanical stress on the leaflets, unrestricted availability, less thromboembolic phenomenon and probable absence of dramatic failure (7,8).

The major factor influencing durability in tissue valves is collagen degeneration and leaflet calcification due to stents. By avoiding stents, it is hoped that the durability of these valves would surpass their stented counterparts (3,9).

Replacement of the aortic valve with a stentless xenograft is a more demanding surgical procedure and will result in longer periods of ischemia when compared to conventional AVR. The procedure also has

Table 4. Echocardiographic data of the patients

Size of the valve	Effective Orifice Area (cm ²)	Mean Pressure Gradient (mmHg)	
		Discharge	Followup (11 months)
21	1.6±0.2	15.3±0.8	14±0.5
23	1.9±0.3	13±0.5	12±0.6
25	2.1±0.2	7.5±0.8	6±0.5
27	2.6	5.2±0.3	5±0.5

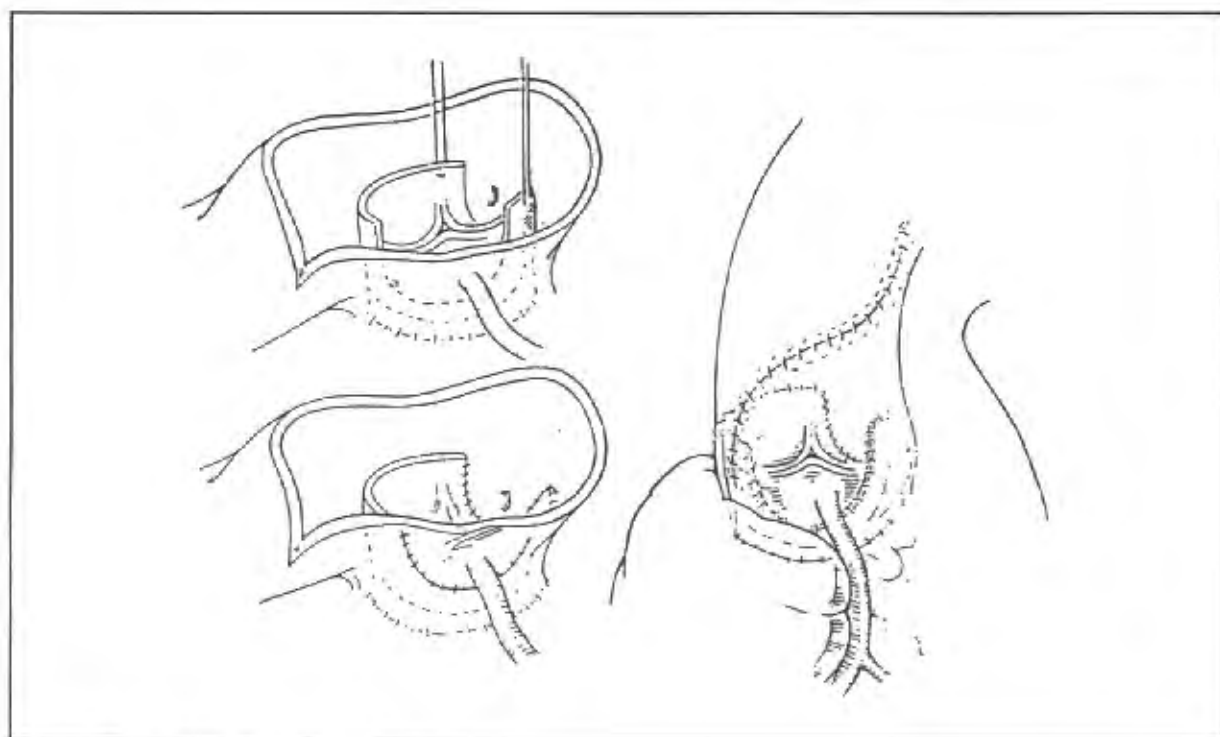


Figure 1. The modified subcoronary technique

a learning curve (4). In our hands average ischemic time for a conventional AVR is 47 ± 8 minutes. With the Freestyle stentless valve, using the subcoronary technique this period was 82 ± 8 minutes, and with the total root replacement 110 ± 11 minutes ($p < 0.001$). However with the excellent current myocardial protection techniques this has not adversely effected the operative results both in ours and others experience.

Among the few stentless xenografts on the market the Freestyle stentless valve remains to be the most versatile one (10). It can be used as a whole root, mini root or a subcoronary implantation can be made. Although the subcoronary technique requires shorter ischemic times, somewhat higher gradients and more incidences of aortic insufficiency have been reported with this technique, and the whole root replacement technique has been preferred by many surgeons. Root replacement is ideal in small roots with a small annulus and gives excellent hemodynamic results (11,12). It also constitutes a good alternative for elderly patients who have an AAA and aortic insufficiency (13). In our series we had two such cases that we performed total root replacement with a 27 mm Freestyle stentless valve

In the beginning of our series, we used the subcoronary technique in 14 patients. Two patients had trivial aortic insufficiency at discharge which did not increase during follow up. At the moment we prefer the whole root technique because like others we found that gradients are somewhat lower and there is less risk of aortic insufficiency. Many studies confirmed that transvalvular gradients decrease with time after AVR with stentless valves. Resolution of the inflammatory changes of the aortic wall and the regression of the left ventricular hypertrophy have been implicated to account for these observations (14). Although the same pattern happened in our series, the drop in transvalvular gradients with time was not statistically significant.

Although only the test of time over ten years after implantation will prove the value of these valves, the results so far are encouraging. Westaby et al. have confirmed the effectiveness of cardiac and systemic physiologic rehabilitation with a stentless valve. Very low transvalvular gradients translate into rapid resolution left ventricular hypertrophy, return to NYHA class 1 and a low incidence of valve related complications (10,11).

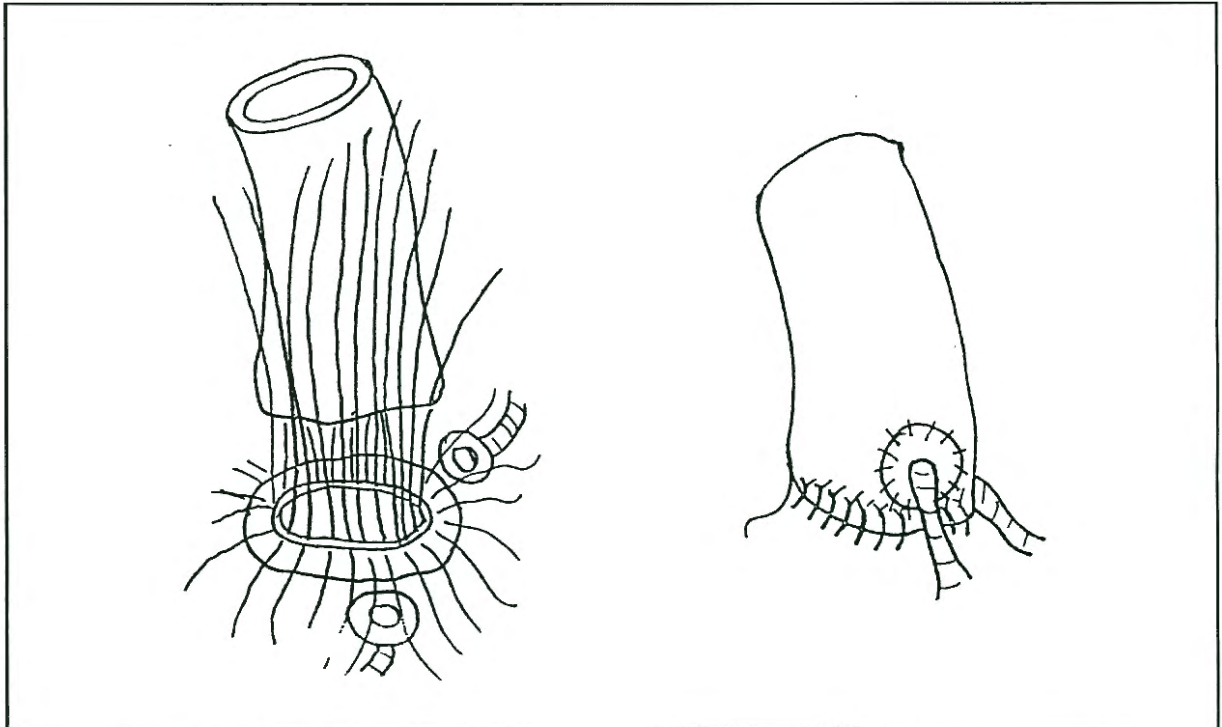


Figure 2. The total root replacement technique

With the data available so far we can conclude that the freestyle stentless valve is an excellent choice for patients over 65 years of age undergoing aortic valve replacement. Although some groups advocate its use in younger age groups as well, there is not enough data to justify this.

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