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Transfemoral TAVI with balloon-expandable valve for failing aortic root homografts

TAVI transfemoral con prótesis de balón expandible en homoinjertos aórticos degenerados

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To the Editor,

The use of cryopreserved homografts as complete aortic root replacements was introduced for the first time over 3 decades ago with considerable advantages with respect to biological heart valves such as greater durability, lower risk of endocarditis, and better hemodynamic profile with a much greater preservation of the ventricular function in the long run.[1] However, most of these grafts start degenerating 10 years after being implanted, and they often present with massive calcification of the homograft wall, and valvular dysfunction.[2]

In this context, surgical reintervention is associated with a very high risk given the need to operate on a heavily calcified aorta that often requires a new and total replacement of the aortic root,[3,4] which is why transcatheter aortic valve implantation (TAVI) seems especially appealing. Homograft valves often degenerate presenting with clinically pure aortic regurgitation. Also, the aortic root often shows very extensive calcification at sinus and sinotubular junction level; paradoxically, however, annular calcification is sometimes a rare phenomenon.[3,4] This can jeopardize the stability of the balloon-expandable valve. However, to this point, there is scarce scientific evidence on the role it plays in this specific anatomical context.

These are the cases of 5 consecutive patients (mean age: 68.4 ± 10.4 years) with degenerated aortic root homograft presenting with isolated aortic regurgitation (video 1 of the supplementary data) or double aortic lesion treated with transfemoral TAVI with a balloon-expandable valve between 2017 and 2021 in 1 center (table 1). A new surgical aortic valve replacement was discarded in all the cases because of the high risk associated with the procedure due to the massive and circumferential calcification of the homograft. Procedures were performed after obtaining the patients' informed consent under deep sedation (patients #2, #3, and #4) or general anesthesia (patients #1, and #5, to improve tolerance to the transesophageal echocardiogram and achieve greater accuracy when placing the heart valve). Also, the procedures were transesophageal echocardiography-guided plus a computed tomography scan was performed prior to the procedure to assess the degree of calcification and the diameters of the graft. Direct implantation was performed with slow and prolonged inflation of the valve in all the cases except for patient #5 who underwent a first incomplete inflation followed by complete postdilatation (figure 1 and video 2 of the supplementary data) for showing significant resistance to the expansion during the initial inflation. In an female patient (patient #2 of table 1) a guidewire was advanced to protect the left main coronary artery during valve implantation (video 3 of the supplementary data).

Implantation was successful in all the patients, and nobody showed significant paravalvular aortic regurgitation or atrioventricular block after the procedure. Only 1 complication was reported: the presence of a contralateral femoral artery pseudoaneurysm that was treated with ultrasound-guided compression (patient #3 of table 1). The mean hospital stay was 5.2 days. After a median follow-up of 20.2 ± 15.2 months all patients remained free of events, and all the valves were working properly.

To this date, most of the experienced published on degenerated aortic homografts treated percutaneously has been limited to the use of self-expanding valves[5,6] possibly for their capacity to be retrieved and repositioned given the fear of valve embolization due to the lack of calcium in the valve annulus. However, the use of balloon-expandable valves can also bring additional advantages: *a)* it guarantees the proper expansion of the valve, *b)* there is less interference of metal material in the calcified homograft wall, and *c)* it preserves access to coronary arteries at the follow-up of patients whose mean age is often lower compared to that of most patients treated with TAVI.

Degenerated aortic root homograft is a complex scenario on which there is scarce scientific evidence available. Our series of homografts treated with balloon-expandable valve shows that it is a feasible and safe option for this type of patients.

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Table 1. Patients with degenerated aortic homograft treated with transfemoral TAVI

	Patient #1	Patient #2	Patient #3	Patient #4	Patient #5
Baseline characteristics					
Age, years	84	70	63	69	56
Sex	Woman	Woman	Woman	Man	Man
EuroSCORE II (%)	23%	7%	4%	10%	5%
STS (%)	17%	5%	3%	7%	3%
Indication for homograft	BAV-AAA	BAV-AAA	IE	IE	BAV-AAA
Age of homograft, years	12	12	15	14	17
Type of dysfunction	Severe AR	Severe AR	Double lesion	Severe AR	Double lesion
Transprosthetic pressure gradient (mmHg)	NA	NA	80	NA	54
Agatston score of the valve	3824	1936	1873	1650	5555
Agatston score of the homograft	9100	9037	10 456	11 456	17 400
Homograft calcification	Severe	Severe	Severe	Severe	Severe
Diameter derived from the annulus (mm)	24.8	24.2	23.2	25.7	28.02
Perimeter of the annulus (mm)	78	76	73	81	88
Maximum diameter (mm)	24	24	22	25	26
Procedure					
Anesthesia	General	Sedation	Sedation	Sedation	General
Measure of the annulus (TEE, mm)	25	25	22	24	24
Edwards valve	SAPIEN XT 26	SAPIEN 3 26	SAPIEN 3 23	SAPIEN 3 26	SAPIEN 3 Ultra 26
Access	Transfemoral	Transfemoral	Transfemoral	Transfemoral	Transfemoral
Paravalvular regurgitation	0	0	0	0	0
Pacemaker	No	No	No	No	No
X-ray image time (min)	19	23	36	29	21
Contrast (mL)	60	100	80	60	60
Complications according to the VARC-3	No	No	No	No	No
Follow-up					
Follow-up time (months)	41	35	14	10	1
Death after 1 year	None	None	None	None	NA
Heart failure after 1 year	None	None	None	None	NA
Stroke after 1 year	None	None	None	None	NA
Pacemaker after 1 year	None	None	None	None	NA
Transaortic gradient (mmHg)	24	15	35	20	NA
Aortic regurgitation	No	No	No	No	NA
Events at the follow-up	None	None	None	None	NA

AAA, ascending aortic aneurysm; AR, aortic regurgitation; BAV, bicuspid aortic valve; IE, infectious endocarditis; NA, not applicable; TEE, transesophageal echocardiography; VARC-3: Valvular Academic Research Consortium-3.

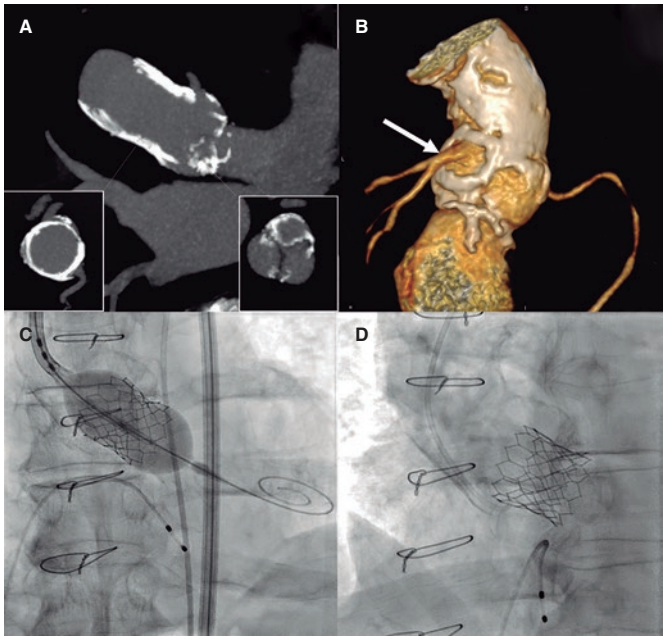

Figure 1. A: multiplanar reconstructed computed tomography images showing the calcified homograft (cross-sectional view in the left lower quadrant) with less calcification in the aortic valve (cross-sectional view in the right lower quadrant. **B:** 3D reconstruction of the aortic root through computed tomography scan with posterior view showing severe calcification of the homograft that preserves the left main coronary artery neo-ostium (arrow). **C:** implantation of a SAPIEN 3 Ultra 26 mm aortic valve (Edwards Lifesciences, United States) with incomplete expansion that is completed in a second inflation. **D:** final angiographic image showing severe calcification of the homograft with a properly expanded valve.

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AUTHORS' CONTRIBUTIONS

All authors have contributed to the preparation, writing, and review this letter.

CONFLICTS OF INTEREST

None whatsoever.

SUPPLEMENTARY DATA

Supplementary data associated with this article can be found in the online version available at https://doi.org/10.24875/RECICE.M21000254.

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State of the STEMI Care Network after the early phase of the COVID-19 pandemic. The experience of a high-volume centre

Situación del Código Infarto tras la fase inicial de la pandemia de COVID-19. Experiencia en un centro de alto volumen

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