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Immediate and Early Outcomes Following Myval Octacor Transcatheter Heart Valve Implantation for the Treatment of Patients With Severe Aortic Valve Stenosis: The OCTACOR-EU Study

Alfonso Ielasi[1] | Rodolfo Caminiti[1] | Arturo Giordano[2] | Andreas Holzamer[3] | Giampaolo Vetta[4] | Luca Testa[5] | Mihajlo Farkic[6] | Nikolay Stoyanov[7] | Francesco Gallo[8] | Alessia Azzano[9] | Juergen Leick[10] | Federico De Marco[11] | Mila Kovacevic[12] | Eike Tigges[13] | Marcin Protasiewicz[14] | Sebastiano Immè[15] | Antonio Mangieri[16] | Maurizio Tespili[1]

[1]IRCCS Ospedale Galeazzi Sant'Ambrogio, Milan, Italy | [2]Cardiovascular Interventional Unit, Pineta Grande Hospital, Castel Volturno, Italy | [3]UniKlinik, Regensburg, Germany | [4]Heart Rhythm Management Centre, Postgraduate Program in Cardiac Electrophysiology and Pacing, Universitair Ziekenhuis Brussel-Vrije Universiteit Brussel, European Reference Networks Guard-Heart, Brussels, Belgium | [5]Policlinico San Donato, San Donato Milanese, Italy | [6]IKVB Dedinje, Belgrade, Serbia | [7]University Hospital Saint Anna, Sofia, Bulgaria | [8]Ospedale dell'Angelo, Mestre, Italy | [9]Cliniche Gavazzeni, Bergamo, Italy | [10]Krankenhaus der Barmherziger Bruder, Trier, Germany | [11]Centro Cardiologico Monzino, Milan, Italy | [12]Institute of Cardiovascular Diseases Vojvodina, Sremska Kamenica, Serbia | [13]Asklepios Klinik St. Georg, Hamburg, Germany | [14]Department of Cardiology, Institute of Heart Diseases, Wrocław Medical University, Wroclaw, Poland | [15]Centro Cuore Morgagni Pedara (CT), Pedara, Italy | [16]Istituto Clinico Humanitas, Rozzano (MI), Italy

Correspondence: Alfonso Ielasi (alfonso.ielasi@gmail.com)

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ABSTRACT

Background: THV is a standard treatment for elderly patients with severe AS, using either BE or self-expanding (SE) THVs. While the Myval BE THV has demonstrated safety and efficacy, data on its latest iteration, the Octacor, are limited.

Aims: To evaluate the clinical performance of the next-generation Myval Octacor balloon-expandable (BE) transcatheter heart valve (THV) in patients with severe, symptomatic native aortic valve stenosis (AS).

Methods: This observational, real-world, multicenter study involved patients deemed suitable for TAVR and treated with Octacor BE THV at 15 European centers. The primary endpoint was the rate of technical success (exit from procedure room) per VARC-3 criteria. Secondary endpoints included overall mortality, stroke, moderate-to-severe paravalvular leak (PVL), and need for permanent pacemaker (pPM) at 30-day and the longest available follow-up. An analysis by THV sizes (standard −20 to 29 mm vs. XL sizes −30.5 and 32 mm) was performed.

Results: From January to December 2023, 252 patients with severe AS underwent TAVR with the Octacor THV. The average age was 80.6 ± 6.7 years, and the mean STS score was 3.45%. Bicuspid anatomy was reported in 7.1% of cases (standard group 5.4% vs. XL group 20%, $p = 0.004$). Technical success was achieved in 98.8% of procedures (standard group 99.1% vs. XL group 96.7%, $p = 0.2$). At 30 days, overall mortality was 1.2%, stroke 3.2%, moderate-to-severe PVL 0.8%, and pPM 16.3%.

Abbreviations: AS, aortic valve stenosis; BARC, Bleeding Academic Research Consortium; BE, balloon-expandable; CE, Conformité Européenne; EOA, effective orifice area; IQR, interquartile range; LVOT, left ventricular outflow tract; MSCT, multi-slice computed tomography; NYHA, New York Heart Association; PET, polyethylene terephthalate; pPM, permanent pacemaker; PVL, paravalvular leak; RCT, randomized controlled trial; SE, self-expanding; TAVR, transcatheter aortic valve replacement; THV, transcatheter heart valve; VARC, Valve Academic Research Consortium; XL, extra-large.

Conclusions: The novel BE Myval Octacor THV showed high technical success and favorable early clinical outcomes. Longer follow-up and a head-to-head comparison versus other commercially available THVs are awaited.

1 | Introduction

Transcatheter aortic valve replacement (TAVR) has become an established treatment option for older patients (aged ≥ 75 years) with severe, symptomatic aortic valve stenosis (AS) regardless of surgical risk [1–3].

Two categories of transcatheter heart valves (THVs) are used in everyday TAVR practice: balloon-expandable (BE) or self-expanding (SE). The latter, particularly in case of supra-annular leaflet design, provides better hemodynamic results [4]. While it is associated with a higher risk of permanent pacemaker implantation (PPM) and paravalvular leak (PVL) [5]. Several novel-generation THVs have been designed to overcome the drawbacks of the previous generations aiming to improve procedural success as well as mid- and long-term outcomes.

The Myval THV (Meril Life Sciences Pvt. Ltd., India) is a newly available, BE THV which provides unique sizes (e.g., intermediate as well as extra-large-XL-) and features (e.g., THV pre-crimped over a balloon outside the human body; extremely flexible shaft of the delivery system) [6]. The novel Myval iteration, Octacor, maintains the same frame height as its predecessor but features only two rows of identical interlacing octagonal cells (instead of three rows of homogenous hexagonal cell geometry), reducing foreshortening during expansion and enabling more accurate deployment.

The safety and efficacy of the Myval BE THV have been shown in observational or propensity-matched studies assessing the performance of this bioprosthesis in subjects with severe AS [7, 8].

Furthermore, data coming from the LANDMARK randomized controlled trial (RCT) recently demonstrated the non-inferiority of Myval compared to contemporary THVs (e.g., Sapien 3 and Evolut families) in terms of a composite clinical end-point at 30-day [9].

However, only 4% of the patients enrolled in the Myval arm received the new iteration of Octacor. This novel THV received

TABLE 1 | Baseline characteristics.

	Overall (n = 252)	Myval Octacor (n = 222)	Myval Octacor XL (n = 30)	p value
Age, years (mean ± ST)	80.6 ± 6.7	80.8 ± 6.5	79 ± 7.1	0.16
Male sex, n (%)	175 (69.4)	146 (65.8)	29 (96.7)	0.001
Body mass index, kg/m^2 (mean ± ST)	26.9 (24.2−30.06)	26.7 (24.2−30.1)	27.7 (24.5−30.4)	0.308
Body surface area m^2, (mean ± ST)	1.88 (1.77−2.0)	1.87 (1.76−1.99)	1.95 (1.80−2.16)	0.016
Arterial hypertension, n (%)	227 (90.1)	201 (90.5)	26 (86.7)	0.505
Dyslipidaemia, n (%)	174 (69)	152 (68.5)	22 (73.3)	0.589
Diabetes mellitus, n (%)	71 (28.2)	61 (27.5)	10 (33.3)	0.503
Coronary artery disease, n (%)	86 (34.1)	74 (33.3)	12 (40.0)	0.470
Previous cardiac surgery, n (%)	19 (7.5)	15 (6.8)	4 (13.3)	0.200
Previous PM/ICD, n (%)	41 (16.3)	34 (15.3)	7 (23.3)	0.264
Previous stroke/TIA, n (%)	22 (8.7)	17 (7.7)	5 (16.7)	0.101
Peripheral artery disease, n (%)	15 (6)	12 (5.4)	3 (10)	0.318
COPD, n (%)	31 (12.3)	26 (11.7)	5 (16.7)	0.438
eGFR, mL/min (mean ST)	57.0 (43.1−72.5)	57.4 (42.7−72.2)	59.5 (51.4−79.4)	0.436
Atrial fibrillation, n (%)	82 (32.5)	68 (30.6)	14 (46.7)	0.078
First degree atrioventricular block, n (%)	18 (7.1)	16 (7.2)	2 (6.7)	0.914
Left bundle branch block, n (%)	18 (7.1)	16 (7.2)	2 (6.7)	0.914
Right bundle branch block, n (%)	15 (6.0)	12 (5.4)	3 (10)	0.318
Euroscore II, % (mean ± ST)	2.53 (1.68−4.65)	2.5 (1.7−4.61)	3.0 (1.5−5.6)	0.695
Logistic Euroscore, % (mean ± ST)	10.4 (6.54−17.97)	10.1 (6.6−17.9)	11.9 (6.0−18.8)	0.253
STS score mortality, % (mean ± ST)	3.45 (2.30−5.69)	3.45 (2.3−5.68)	2.9 (2.1−5.7)	0.897
Active malignancies, n (%)	8 (3.2)	7 (3.2)	1 (3.3)	0.958

Abbreviations: COPD, chronic obstructive pulmonary disease; eGFR, estimated glomerular filtration rate; ICD, implantable cardioverter defibrillator; PM, pacemaker; ST, standard deviation; TIA, transitory ischemic attack.

CE mark on 2022 and it is used in Europe for TAVR since January 2023.

As few data are actually available on the performance of this novel BE THV, we aimed to provide Valve Academic Research Consortium-3 (VARC-3) defined immediate and early outcomes following Octacor implantation in real world patients with severe, native AS.

2 | Methods

Octacor-EU is an observational, retrospective, multicenter, investigator-driven registry with the aim of assessing the safety and efficacy of the Myval Octacor BE THV in patients with severe, native AS, deemed suitable for TAVR. Between January and December 2023, patients treated with Octacor in 15 European centers were enrolled. Subjects with degenerated surgical bioprostheses in aortic position and pure aortic regurgitation (AR) were excluded from this analysis while young patients (aged < 75 years) as well as patients with bicuspid aortic valve disease were included. The study complied with the Declaration of Helsinki and was approved by local ethics committees. All patients provided written informed consent for the procedure and subsequent data collection on the basis of local practice and/or local Institutional Review Board approval. Local Heart Teams evaluated all patients as per normal practice and confirmed the indications for TAVR. All patients underwent preprocedural screening by means of clinical assessment, in addition to electrocardiographic, echocardiographic, and multislice computed tomographic (MSCT) data collection. Aortic leaflet, annular, and left ventricular outflow tract (LVOT) calcifications were classified and graded using a semiquantitative scoring system [10]. Procedural approaches as well as postprocedural antithrombotic regimen were left to the operators' discretion. Procedural characteristics, clinical outcomes, and predischarge echocardiographic findings were collected and the principal investigators at each site vouch for the completeness and accuracy of data entry. Short-term clinical and echocardiographic evaluations were scheduled at 30 days after the index procedure. Echocardiographic and MSCT images were analyzed by expert operators at each center, following current recommendations [11, 12].

Baseline clinical, imaging, and procedural characteristics, along with outcomes, were reported for the entire study population.

TABLE 2 | Baseline imaging characteristics.

	Overall ($n = 252$)	Myval Octacor ($n = 222$)	Myval Octacor XL ($n = 30$)	p value
Echocardiographic variables				
Left ventricular ejection fraction, % (median IQR)	55 (45−60)	55 (47.5−60)	45 (35.7−55)	0.082
Mean aortic gradient, mm Hg, (median IQR)	42 (34−50)	42 (34.7−51)	38 (26.7−46.5)	0.253
Aortic valve area, cm^2 (median IQR)	0.70 (0.60−0.85)	0.70 (0.60−0.81)	0.80 (0.60−0.90)	0.054
Bicuspid aortic valve, *n* (%)	18 (7.1)	12 (5.4)	6 (20)	0.004
MSCT variables				
Annulus diameter, mm (median IQR)	25.7 (24.0−27.7)	25.3 (23.9−27.13)	30.3 (29.1−32.4)	0.0001
Annulus area, mm^2 (median IQR)	510.0 (436.7−590.3)	495.1 (430.2−567.4)	724.2 (676.5−800.8)	0.0001
Annulus perimeter mm (median IQR)	81.4 (75.5−87.5)	79.8 (75.1−85.6)	96.4 (93.7−101.4)	0.0001
Moderate-to-severe annulus calcification, *n* (%)	54 (21.4)	46 (20.7)	8 (30)	0.456
Severe leaflet calcification, *n* (%)	84 (33.3)	68 (30.6)	16 (53.3)	0.013
LCA height, mm (median IQR)	14.2 (12.1−16.4)	13.8 (12−15.8)	17.7 (14.8−19.4)	0.0001
RCA height, mm (median IQR)	17.9 (15.2−20.5)	17.2 (15−19.8)	21.6 (19−23.5)	0.0001
LVOT diameter mm (median IQR)	25.7 (23.8−27.9)	25 (23.2−27.2)	31 (28.9−32.6)	0.0001
LVOT calcification moderate-to-severe, *n* (%)	35 (13.9)	31 (14)	4 (13.3)	0.925
Sinotubular junction diameter, mm (median IQR)	31 (28.5−33)	30.5 (28−32.6)	34.2 (33.2−37.9)	0.0001
Sinus of valsalva diameter, mm (median IQR)	34 (31.4−36.6)	33.2 (31−36)	38 (36.8−39.5)	0.0001
Horizontal aorta, *n* (%)	107 (53.5)	88 (51.2)	19 (67.9)	0.10

Abbreviations: IQR, interquartile range; LCA, left coronary artery; LVOT, left ventricle outflow tract; MSCT, multislice computed tomography; RCA, right coronary artery.

According to the Octacor's THV size, patients were divided into two groups: the standard group (THV sized from 20 to 29 mm including intermediate sizes: 21.5, 24.5, and 27.5 mm) and XL group (THV sized 30.5 and 32 mm). The standard versus the XL groups were compared to assess potential differences in outcomes.

2.1 | Study Device

Myval Octacor is the latest BE THV designed as an evolution of the original Myval [12–14]. Its nickel−cobalt alloy stent structure is characterized by two rows of interlacing octagonal cells—replacing the three hexagonal rows of Myval—while retaining the same frame height (17.35−21.14 mm). This new arrangement helps minimize foreshortening during balloon inflation, allowing for more precise depth control (ideally 85% in the aorta and 15% in the left ventricle). The large, 6 mm open-cell octagons in the outflow zone are intended to improve coronary access and blood flow, while the inflow zone features an inner and outer polyethylene terephthalate (PET) fabric skirt covering about half of the frame height, designed to reduce PVL by enhancing annular tissue contact.

The three-leaflet valve is made of decellularized bovine pericardium and treated with the proprietary AntiCa process to improve its durability. Like Myval, Octacor comes in nine sizes (from 20 to 32 mm), including intermediate diameters (21.5, 24.5, 27.5, and 30.5 mm) to better match patient anatomies and reduce oversizing or undersizing risks [8, 12]. In addition, Octacor is designed for implantation with the OctaAlign technique [15], which aligns the commissures accurately and may optimize leaflet performance while lowering the potential for high residual gradients in future TAV-in-TAV or valve-in-degenerated-surgical-bioprosthesis procedures. Finally, Octacor is crimped directly onto the Navigator Inception THV balloon delivery system (Meril Life Sciences Pvt. Ltd., India) and introduced through a 14 Fr Python sheath, similarly to Myval.

2.2 | End-Points

The endpoints were defined according to the VARC-3 criteria [12]. The primary end-point was the rate of technical success (at exit from the procedure room). Secondary endpoints were: overall mortality, overall stroke, moderate-to-severe PVL, and

TABLE 3 | Procedural characteristics.

	Overall (n = 252)	Myval Octacor (n = 222)	Myval Octacor XL (n = 30)	p value
General anesthesia, n (%)	48 (19)	37 (16.7)	11 (36.7)	0.009
Transfemoral approach, n (%)	249 (98.8)	219 (98.6)	30 (100)	0.522
Pre-dilatation, n (%)	109 (43.3)	93 (41.9)	16 (53.3)	0.235
Post-dilatation, n (%)	15 (6.0)	11 (5.0)	4 (13.3)	0.069
Procedural time, min (median IQR)	59 (47−75)	60 (47.7−75)	55 (45.5−83.5)	0.335
Fluoroscopy time, min (median IQR)	15 (12−19)	15 (11.9−18.4)	14.2 (12−22)	0.553
Contrast amount, mL (median IQR)	100 (80−134.5)	100 (77−130)	121.5 (98−162.5)	0.005
Embolic protection, n (%)	5 (2.0)	4 (1.8)	1 (3.3)	0.798
Concomitant coronary angiography, n (%)	28 (11.1)	25 (11.3)	3 (10)	0.913
Intermediate sizes, n (%)	132 (52.4)	121 (54.5)	11 (36.7)	0.066
Myval Octacor 32 mm, n (%)	19 (7.5)	0 (0)	19 (63.3)	0.0001
Rapid pacing through the LV wire, n (%)	50 (19.8)	44 (19.8)	6 (20)	0.981
Implantation depth, mm (median IQR)	3 (2−4)	3 (2−4)	3 (1.8−4)	0.28
Invasive peak gradient pre-THV, mmHg (median IQR)	60 (50−76.5)	62 (50−78.5)	58 (43.8−68.2)	0.131
Invasive mean gradient pre-THV, mmHg (median IQR)	42 (35−50.3)	42.5 (36.8−50.8)	35.5 (32.5−49.8)	0.500
Invasive peak gradient post-THV, mmHg (median IQR)	5 (4−8)	5 (3.9−8)	5 (3.75−6.25)	0.554
Invasive Mean gradient post-THV, mmHg (median IQR)	1 (0−4)	1 (0−4)	1 (0−3)	0.807
Echo mean gradient post-THV, mmHg (median IQR)	8 (6−10)	9 (6−11)	6 (4−8)	0.001
Need for 2nd THV deployment[a], n (%)	3 (1.2)	2 (0.9)	1 (3.8)	0.19

Abbreviations: IQR, interquartile range; TAVI, transcatheter aortic valve implantation; THV, transcatheter heart valve.
[a]Within 24 h from the index procedure.

need for pPM rates at 30-day and at the longest follow-up available.

Moreover, VARC-3 defined 30-day device success and 30-day safety were assessed.

In details, technical success was defined as freedom from mortality; successful access, delivery of the THV, and retrieval of the delivery system; correct positioning of a single THV into the proper anatomical location; freedom from surgery or intervention related to the device or to a major vascular or access-related, or cardiac structural complication [12].

Device success was defined as the composite of technical success, freedom from mortality, freedom from surgery or intervention related to the device or a major vascular or access-related or cardiac structural complication, and intended performance of the THV (mean gradient < 20 mmHg, peak velocity < 3 m/s, Doppler velocity index ≥ 0.25, and less than moderate AR) at 30-day [12].

2.3 | Statistical Analysis

Categorical data were summarized as percentages, and continuous data as mean ± standard deviation (SD). The *t*-test for independent samples was used to compare the means of continuous variables, the Mann−Whitney test in case of a non-normal distribution, and the χ^2 test for qualitative variables. We used the Kolmogorov−Smirnov test for normality to evaluate the assumption of *t*-test. A *p* value less than 0.05 was considered significant. Statistical analyses were performed using IBM SPSS Statistics v26 software.

3 | Results

During the study period, 252 patients with severe, symptomatic native AS underwent TAVR with Myval Octacor THV in 15 European Centers. Baseline clinical and electrocardiographic characteristics are reported in Table 1. Patients' age at the time of the procedure was 80.6 ± 6.7 years (n = 38 patients, 15.1%, aged less than 75 years) while male sex accounted for 69.4% of the overall population with a significantly higher representation in the XL group (96.7% vs. 65.8%, $p < 0.001$) as well as larger mean body surface area (1.95 vs. 1.87 m^2, $p = 0.01$). No major differences were noted between the groups in terms of the prevalence of cardiovascular risk factors and previous PPM implantation. The mean STS score in the overall cohort was 3.45% without significant differences between the groups. Baseline imaging (echocardiographic and MSCT) characteristics are reported in Table 2. Bicuspid anatomy was reported in 7.1% of the overall cohort with a significantly higher rate in the XL group (20% vs. 5.4%, $p = 0.004$). Almost 54% of the patients had horizontal aorta (defined as an aortic angle > 48° at MSCT assessment) while 13.9% had moderate-to-severe calcification at the LVOT, without significant differences between groups. Procedural characteristics are reported in Table 3. Transfemoral access was used in 98.8% of the cases (0.8% trans-apical and 0.4% trans-subclavian) while 19% of the procedures were performed under general anesthesia (standard group 16.7% vs. XL group 36.7%, $p = 0.009$).

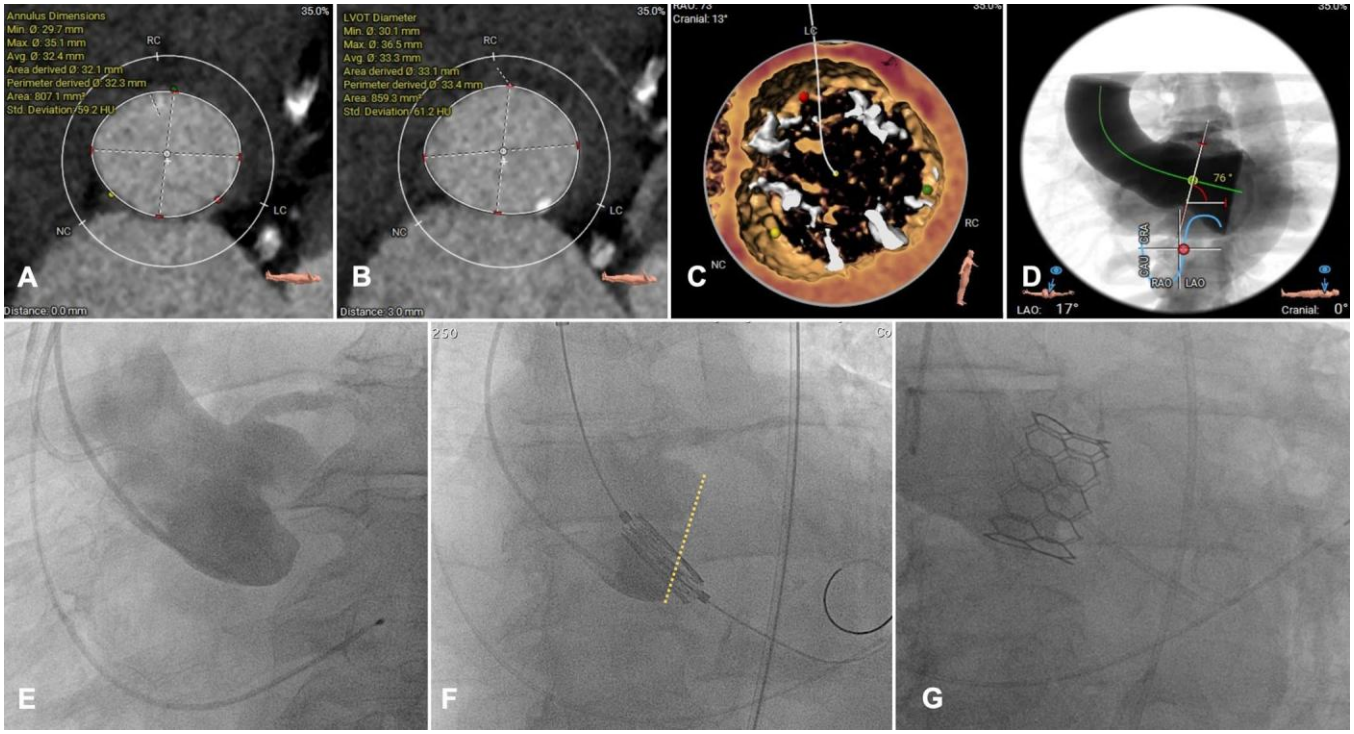


FIGURE 1 | Case example of TAVR in a patient with an extra-large annulus (area 807 mm^2) and horizontal aorta (aortic angle 76°) treated by Octacor 32 mm. (A, B) MSCT example of extra-large annulus and left ventricular outflow tract areas (807 and 859 mm^2, respectively). (C) Aortic leaflet calcifications (total calcium amount: 913 mm^2). (D) Aortic angle (76°). (E) Baseline aortogram. (F) Octacor positioning (ventricular end of the radiopaque marker aligned to the bottom of the pigtail located in the noncoronary cusp) before deployment. (G) Final result after Octacor 32 mm deployment. [Color figure can be viewed at wileyonlinelibrary.com]

Pre-dilatation was performed in 43.3% of the cases while post-dilatation in 6% (no significant differences between the groups). Octacor's intermediate sizes were deployed in 52.4% of the patients treated, while the XL 32 mm size was deployed in 7% (Figure 1). Efficacy and safety outcomes are reported in Table 4. Technical success was obtained in 98.8% of the procedures without differences between the standard group versus XL group (96.7% vs. 99.1%, $p = 0.2$). Three technical failures occurred: two involved embolization of 24.5 mm Octacor devices in the ascending aorta, while the third, a 32 mm Octacor implanted emergently due to severe hypotension, was caused by initial THV malpositioning/migration toward the LVOT in a patient with mild leaflet calcification and a tubular annulus/LVOT complex. In the two cases of embolization, likely related to loss of capture through the super stiff guidewire placed in the left ventricle, Octacor was "anchored" by inflating the Mammooth balloon, retrieved in the descending aorta, and finally deployed. A second Octacor (same size) was successfully deployed at the target site in both cases. In the third case, a different BE THV (Sapien 3 29 mm) was successfully implanted to finally anchor the first implanted THV (TAV-in-TAV) within 24 h after the index procedure. The same patient also experienced a major vascular complication at the access site requiring vascular surgery and stage III acute kidney injury. The patient was discharged to a Rehab Unit and alive at 30 days.

TABLE 4 | Efficacy and safety outcomes.

	Overall ($n = 252$)	Myval Octacor ($n = 222$)	Myval Octacor XL ($n = 30$)	p value
In-hospital mortality, *n* (%)	3 (1.2)	2 (0.9)	1 (3.3)	0.249
Cardiovascular mortality, *n* (%)	1 (0.4)	1 (0.5)	0 (0)	0.713
VARC-3 technical success, *n* (%)	249 (98.8)	220 (99.1)	29 (96.7)	0.21
Stroke, *n* (%)	6 (2.4)	4 (1.8)	2 (6.7)	0.101
Disabling, *n* (%)	2 (0.8)	1 (0.5)	1 (3.3)	0.095
Not disabling, *n* (%)	4 (1.6)	3 (1.4)	1 (3.3)	0.415
Major vascular complications, *n* (%)	4 (1.6)	3 (1.4)	1 (3.3)	0.415
Acute kidney injury 3−4, *n* (%)	3 (1.2)	1 (0.5)	2 (6.7)	0.003
VARC 2−4 bleeding, *n* (%)	2 (0.8)	0 (0)	2 (6.7)	0.001
VARC 1 bleeding, *n* (%)	9 (3.6)	9 (4.1)	0 (0)	0.261
Permanent pacemaker implantation, *n* (%)	40 (15.9)	36 (16.2)	4 (13.3)	0.685
Development of new advanced AVB or BBB *n* (%)	58 (23)	53 (23.9)	5 (16.7)	0.379
Spontaneous regression of new advanced AVB or BBB, *n* (%)	16 (29.1)	13 (26)	3 (60)	0.110
PVL moderate to severe, *n* (%)	2 (0.8)	1 (0.5)	1 (3.3)	0.095
Intensive care unit stay, days	0 (0−1)	0 (0−1)	0 (0.2−2)	0.091
Hospital stays, days (median IQR)	6 (5−9)	6 (5−9)	7 (4−11.5)	0.215
30-day follow-up				
VARC-3 device success, *n* (%)	245 (97.2)	218 (98.2)	27 (90)	0.010
VARC-3 early safety, *n* (%)	196 (77.8)	177 (79.7)	19 (63.3)	0.043
Overall mortality, *n* (%)	3 (1.2)	2 (0.9)	1 (3.3)	0.249
Cardiovascular mortality, *n* (%)	1 (0.4)	1 (0.5)	0 (0)	0.713
Stroke, *n* (%)	8 (3.2)	6 (2.7)	2 (6.7)	0.245
Disabling, *n* (%)	2 (0.8)	1 (0.5)	1 (3.3)	0.095
Not disabling, *n* (%)	6 (2.4)	5 (2.3)	1 (3.3)	0.715
VARC 2-4 Bleeding, *n* (%)	2 (0.8)	0 (0)	2 (6.7)	0.001
Permanent pacemaker implantation, *n* (%)	41 (16.3)	37 (16.7)	4 (13.3)	0.642
PVL moderate to severe, *n* (%)	2 (0.8)	1 (0.5)	1 (3.3)	0.095
Rehospitalization, *n* (%) x	4 (1.6)	4 (1.8)	0 (0)	0.459
Rehospitalization for cardiac reasons, *n* (%)	0 (0)	0 (0)	0 (0)	
Echo mean trans-valvular gradient, mmHg (median IQR)	8 (6−11)	9 (6−11)	7 (5−8)	0.042

Abbreviations: AVB, atrioventricular block; BBB, bundle branch block; IQR, interquartile range; PVL, paravalvular leak; VARC, Valve Academic Research Consortium.

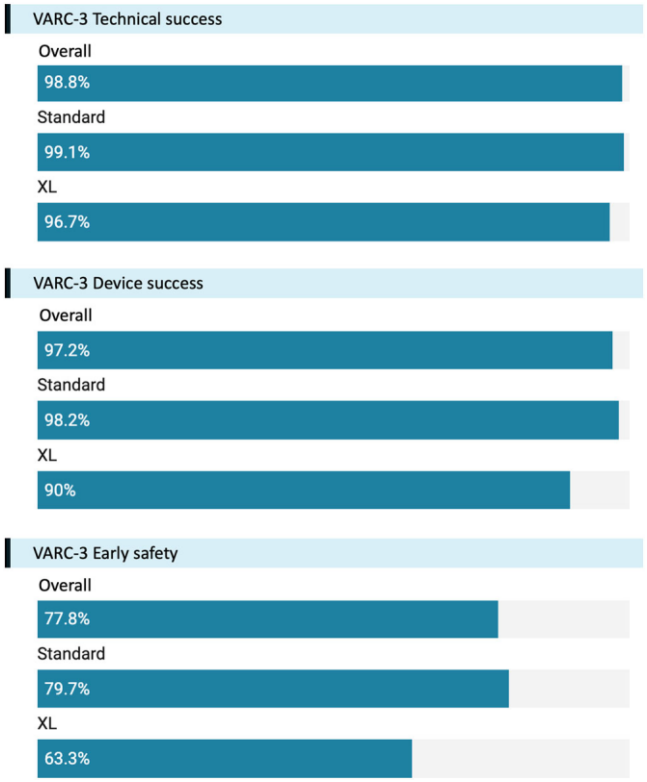


FIGURE 2 | Percentage of technical success, device success, and 30-day early safety according to VARC 3 criteria in the overall population. [Color figure can be viewed at wileyonlinelibrary.com]

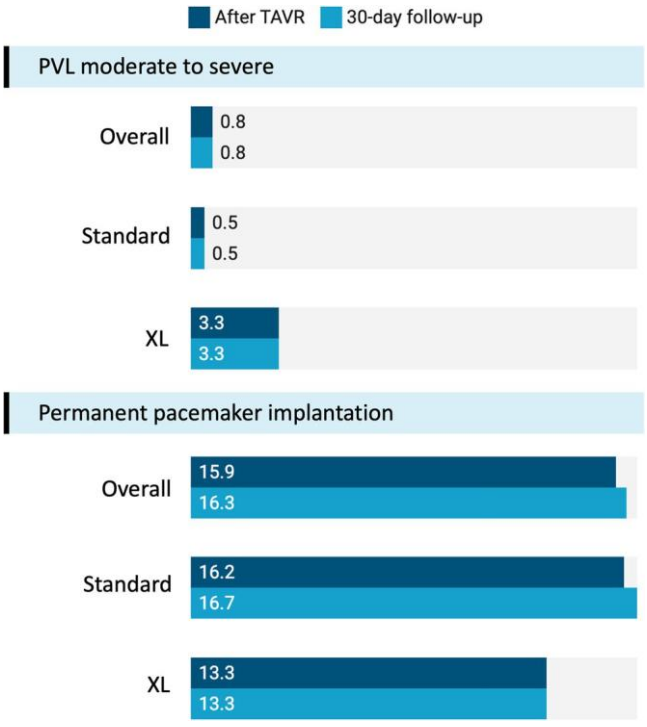


FIGURE 3 | Percentage of moderate-to-severe paravalvular leak (PVL) and permanent pacemaker implantation after the procedure and at 30-day follow-up in the overall population. [Color figure can be viewed at wileyonlinelibrary.com]

In-hospital overall mortality was reported in three patients (overall 1.2%; standard group 0.9% vs. XL group 3.3%, $p = 0.2$) while in-hospital cardiovascular death occurred in one patient (0.4%).

In detail, 5 days after the index procedure, the patient had cardiac arrest due to cardiac tamponade secondary to aortic dissection (technical failure at the index procedure: the embolized Octacor 24.5 mm was retrieved in the descending aorta without signs of acute aortic dissection at post-procedural echo/MSCT analysis).

Peri-procedural disabling stroke occurred in two patients (overall 0.8%; standard group 0.5% vs. XL group 3.3%, $p = 0.09$) while major vascular complication rate was 1.6% (standard group 1.4% vs. XL group 3.3%, $p = 0.4$). PPM implantation was reported in 15.9% of the patients (standard group 16.1% vs. XL group 13.3%, $p = 0.6$); the trivial/mild PVL rate was 25.6% while moderate-to-severe PVL occurred in 0.8% of the overall cohort (0.5% standard group vs. XL group 3.3%, $p = 0.09$).

3.1 | 30-Day Follow-Up

At 30-day follow-up, overall VARC-3 device success was 97.2% (standard group 98.2% vs. XL group 90%, $p = 0.01$). The overall VARC-3 early safety composite end-point was 76.8% (Figure 2). Overall 30-day mortality was 1.2% without significant difference between the groups (standard group 0.9% vs. XL group 3.3%, $p = 0.2$). Cardiovascular mortality at 30-day remained stable (0.4%), with no deaths reported in the XL group as well as stroke rates (disabling and not disabling). The new pPM implantation rate was 16.3% (standard group 16.7% vs. XL group 13.3%, $p = 0.6$) (Figure 3 and Table 5).

Moderate-to-severe PVL maintained numerically stable with any worsening of trivial/mild PVL from discharge to 30 days.

Rehospitalization rates were low and similar between groups (overall 1.7%, standard group 2% vs. XL group 0%, $p = 0.4$), with no cardiac-related rehospitalizations in either group.

Additionally, the NYHA functional classification showed significant improvements at 30-day follow-up compared to baseline (Figure 4). Details on 30-day outcomes are reported in Table 4.

No extra events occurred between 30-day and 4 months (IQR 1−9) follow-up (Central Illustration 1).

4 | Discussion

Main findings of this study reporting the immediate and early clinical outcomes of real-world European patients with severe AS undergoing TAVR with the novel BE Myval Octacor THV are:

1. High rate of technical success irrespective by the THV size (standard vs. XL);

TABLE 5 | Permanent pacemaker implant according to pre-existing conduction disturbances.

	Overall (252)	No permanent pacemaker (211)	Permanent pacemaker (41)	*p* value
Pre-existing conduction disturbance, *n* (%)	41 (16.3)	26 (12.3)	15 (36.6)	0.0001
First-degree atrioventricular block, *n* (%)	18 (7.1)	10 (4.7)	8 (19.5)	0.001
Right bundle branch block, *n* (%)	15 (6.0)	9 (4.3)	6 (14.6)	0.01
Left bundle branch block, *n* (%)	18 (7.1)	13 (6.2)	5 (12.2)	0.17
AVB + RBBB, *n* (%)	3 (1.2)	2 (0.9)	1 (2.4)	0.42
AVB + LBBB, *n* (%)	6 (2.4)	3 (1.4)	3 (7.3)	0.023

Abbreviations: AVB, advanced atrioventricular block; LBBBB, left bundle branch block; RBBB, right bundle branch block.

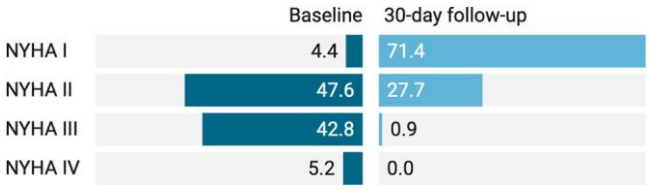


FIGURE 4 | Percentage of NYHA class at baseline and at 30-day follow-up in the overall population. [Color figure can be viewed at wileyonlinelibrary.com]

2. Low rate of clinical events (overall and cardiovascular mortality, stroke) at early follow-up;
3. Low rate of moderate-to-severe PVL while relatively high pPM rate at early follow-up.

The LANDMARK RCT recently demonstrated that the Myval THV is non-inferior to established devices (e.g., Sapien 3 and Evolut R/Pro) in terms of the primary composite endpoint of safety and effectiveness at 30 days. Moreover, Myval THV provided a significantly higher 30-day effective orifice area (EOA) than the BE, intra-annular Sapien 3, and produced similar EOA values compared with the SE, supra-annular Evolut R/Pro [9].

Since January 2023, Myval Octacor, a new iteration of the Myval family is available on the European market. As only 4% of the patients enrolled in the LANDMARK RCT received this novel THV, the OCTACOR EU registry had the aim to provide more information on its clinical performance in a real-world population including patients with XL annulus, which were not included in the LANDMARK RCT because of lack of XL sizes in the comparison group.

Main differences of Octacor versus Myval are related to its design, in particular the novel iteration has a frame composed of two rows (stacked one above the other) of tessellating interlacing octagonal cells (as opposed to three rows of exagonal cells of the Myval). This feature theoretically allows a more precise deployment because of a less foreshortening during THV deployment.

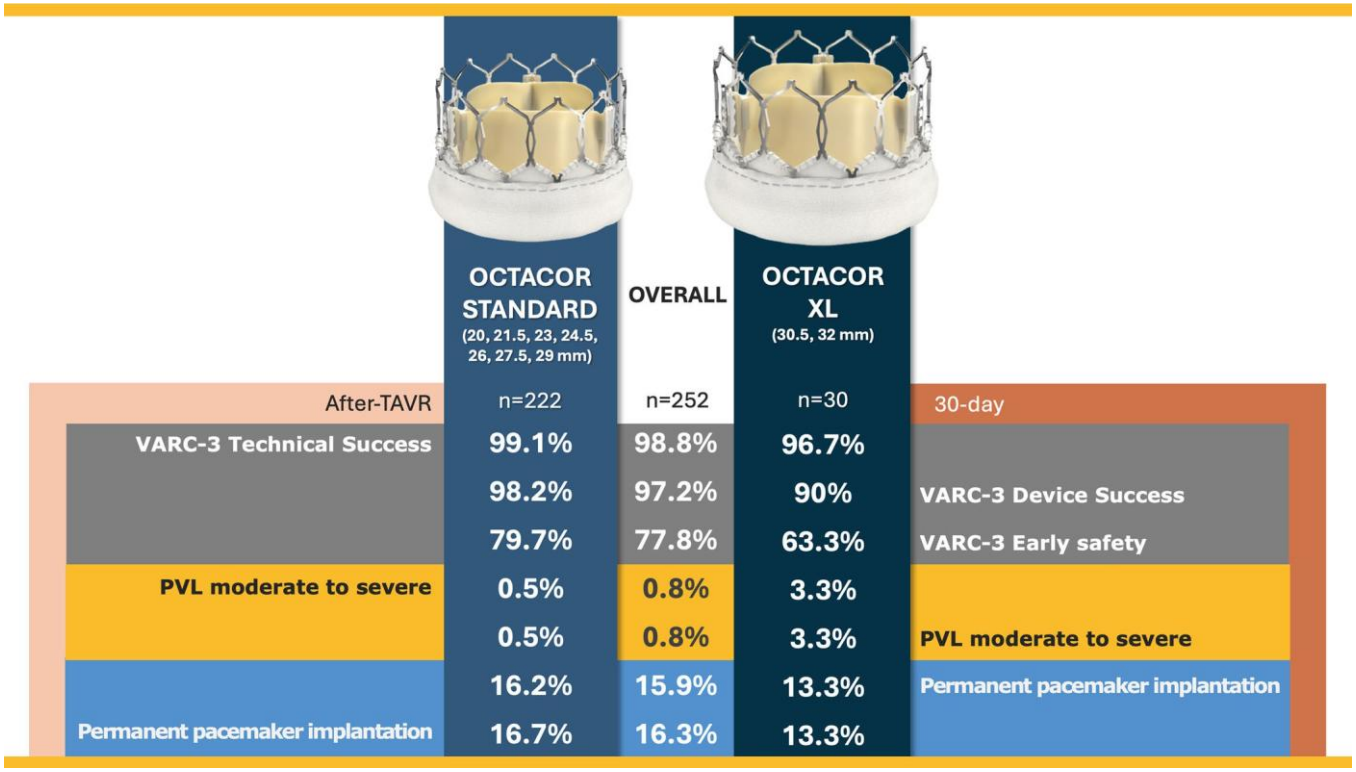
Moreover, frame cells located at the inflow, have an inner and outer (more robust in Octacor vs. Myval) skirt made of PET fabric, allowing more contact with the surrounding tissues with the aim to reduce the risk of significant PVL.

The only data actually available for this novel THV comes from an Indian study on 123 patients of whom only 1 (0.8%) patient received an Octacor XL size (30.5 mm) while 49 (39.8%) patients had bicuspid AS [13].

Technical success reported in our study was high irrespective by the THV size and comparable to that reported in the Indian registry (98.8% vs. 100%). This result, obtained in a complex anatomical population (i.e., high rates of horizontal aorta, bicuspid AS, and heavily calcified LVOT) confirms the performance shown with Myval THV highlighting the reliability of the external crimping, trackability of the Navigator delivery system, and then final THV deployment even with this novel iteration.

In-hospital mortality and disabling stroke rates were very low (1.2% and 0.8%, respectively) in both groups and comparable to the ones reported in the Indian study (0.8% and 0%, respectively) and to those reported in post-market studies with other THVs without XL sizes [14, 15].

The moderate-to-severe PVL rate was 0.8% irrespective of the Octacor size implanted. This extremely low rate, even lower to that reported in the Indian registry (1.6%), in the Myval cohort of the LANDMARK trial (3%) and other post-market studies with other THVs, could be the result of both, the availability of intermediate sizes (implanted in more than half patients of our cohort as in other Myval studies) and more probably to the larger (compared to Myval) external PET skirt. This feature theoretically allows a complete sealing of the annulus in the early phase due to steric hindrance and progressive increase in volume because of blood filling. However, besides positive effects, this feature may also be associated with increased pressures on the surrounding tissues, favoring the occurrence of conduction disturbances. In our population, in-hospital pPM rate was 15.9%, while 16.3% at 30-day without differences between standard group and XL group Octacor sizes. The relatively high pre-dilatation rate (43%), bicuspid AS (7%), heavily calcified leaflets (33.3%), and LVOT (13.9%) could also have influenced this result which is in line with the one reported in the Myval cohort of the LANDMARK trial (15%) while higher compared to the Indian study result (10.6%).



CENTRAL_ILLUSTRATION 1 | Octacor THV performance according to "standard" versus XL size. [Color figure can be viewed at wileyonlinelibrary.com]

However, this aspect deserves more investigation and understanding to eventually modify implantation techniques with this novel BE THV. In particular, the impact of the Octacor deployment in cusp overlap view could help, as with SE THV [16], to land slightly below (1−2 mm) or at the level ("ground zero") of the aortic "annulus" minimizing the risk of injuries to the conduction system. Furthermore, a lower (0%−5% instead of 5% −10%) oversize according to the MSCT assessed annular area could be considered when choosing the Octacor size to minimize the conduction system disturbances after THV deployment.

Overall, BARC 2−4 bleeding was low (0.8%) even if both episodes occurred in the XL group. The structural characteristics of the 14 French Python sheath, suitable for all Octacor size transit, could facilitate some external bleeding because of potential incomplete sealing particularly after crossing of an XL Octacor size. Further improvements in the Python are ongoing with the aim to lower as much as possible events associated with XL size usage.

Of interest, 11.9% of our patients had an XL aortic annulus (median annular area by MSCT: 724.2 mm^2), and among these patients, 20% had bicuspid AS. Although technical and technological improvements allowed the treatment of more complex aortic valve scenarios (e.g., bicuspid, horizontal aorta, small annuli), a non-negligible percentage of patients screened for TAVR still has to be excluded for anatomical reasons. Among the excluded patients, 45% have a large aortic annulus (area > 680 mm^2 and perimeter > 94 mm) representing the main exclusion criteria [16]. The largest available current standard THVs sizes are limited to an annular area of 683 mm^2 (Sapien 3, Edwards) and an annular perimeter of 94.2 mm (Evolut R/Pro/Fx, Medtronic, USA) by manufacturer's instructions for use. Data from the TAVR Large registry (average area in the "large" subgroup was 617 mm^2 while 704 mm^2 in the "XL group"; average perimeter in the "large" subgroup was 89.1 mm while 96 mm in the "XL" group) showed that both THVs can be used with similar results to regular large anatomy in the "so called" XL group (off label usage).

Myval and Octacor provide the option to treat "true" XL annuli (annular area up to 842 mm^2) by the implant of 30.5 or 32 mm THVs. In a small cohort of 10 patients (three of them with bicuspid AS) treated by Myval 32 mm, the average MSCT assessed aortic annulus area was 765.5 mm^2. Pre-dilatation was performed in 90% of the procedures, and VARC-2 device success was obtained in 100% of the cases. One (10%) minor vascular complication was reported while pPM implantation was required in 20% (2/10) of the patients at 30-day [16].

Our study reports the performance of the largest cohort of XL Octacor (average annulus area 724 mm^2) actually available showing very good early clinical results (VARC-3 technical success 96.7%, moderate-to-severe PVL 3.3% at 30-day, PPM 13.3% at 30-day, VARC-3 device success 90%) without major complication irrespective by the high prevalence of bicuspid AS.

The availability of XL THV sizes definitely contributes to significantly lower the number of TAVR candidates excluded from this procedure while increasing the potential benefits of this therapy to a wider population of patients by using appropriately sized prostheses.

5 | Limitations

As a single arm registry, the data collected in Octacor-EU cannot be directly compared with those of other contemporary THVs. Data interpretation in the current study is somewhat limited by the fact that clinical event rates were site reported and, as such, were not reviewed by an independent committee. Also, PVL assessment was not analyzed by an external independent core laboratory potentially limiting the consistency of the reported results.

6 | Conclusions

Our multicenter analysis demonstrated that the novel BE Myval Octacor THV (standard and XL sizes) is associated with high technical success and favorable clinical results according to VARC-3 criteria at early follow-up. Longer-term follow-up and a head-to-head comparison versus other commercially available THVs are needed to confirm the encouraging early outcomes following TAVR using Octacor THV in real-world patients with severe AS.

Acknowledgments

The authors have nothing to report.

Ethics Statement

This study was purely observational and did not involve any experimental procedures or interventions. All data were collected from routine clinical records with no patient identifiers. Therefore, no additional institutional review board approval or informed consent was required.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

1. A. Vahanian, F. Beyersdorf, F. Praz, et al., "ESC/EACTS Guidelines for the Management of Valvular Heart Disease," *European Heart Journal* 43, no. 7 (February 2021): 561–632, https://doi.org/10.1093/eurheartj/ehab395.

2. C. M. Otto, R. A. Nishimura, R. O. Bonow, et al., "2020 ACC/AHA Guideline for the Management of Patients With Valvular Heart Disease: Executive Summary: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines," *Circulation* 143, no. 5 (2021): e35–e71, https://doi.org/10.1161/CIR.0000000000000932.

3. R. Caminiti, A. Ielasi, G. Vetta, et al., "Long-Term Results Following Transcatheter Versus Surgical Aortic Valve Replacement in Low-Risk Patients With Severe Aortic Stenosis: A Systematic Review and Meta-Analysis of Randomized Trials," *American Journal of Cardiology* 230 (2024): 6–13, https://doi.org/10.1016/j.amjcard.2024.08.014.

4. H. C. Herrmann, R. Mehran, D. J. Blackman, et al., "Self-Expanding or Balloon-Expandable TAVR in Patients With a Small Aortic Annulus," *New England Journal of Medicine* 390, no. 21 (2024): 1959–1971, https://doi.org/10.1056/NEJMoa2312573.

5. M. Abdel-Wahab, J. Mehilli, C. Frerker, et al., "Comparison of Balloon-Expandable vs Self-Expandable Valves in Patients Undergoing Transcatheter Aortic Valve Replacement: The Choice Randomized Clinical Trial," *Journal of the American Medical Association* 311, no. 15 (April 2014): 1503–1514, https://doi.org/10.1001/jama.2014.3316.

6. S. K. Sharma, R. S. Rao, P. Chandra, et al., "First-in-Human Evaluation of a Novel Balloon-Expandable Transcatheter Heart Valve in Patients With Severe Symptomatic Native Aortic Stenosis: The MyVal-1 Study," *EuroIntervention* 16, no. 5 (2020): 421–429, https://doi.org/10.4244/EIJ-D-19-00413.

7. E. Moscarella, A. Ielasi, C. Montonati, et al., "Comparing Two-Year Outcomes of Balloon-Expandable Myval and Self-Expanding Evolut R in Severe Aortic Valve Stenosis," *International Journal of Cardiology* 400 (2024): 131701, https://doi.org/10.1016/j.ijcard.2023.131701.

8. J. R. Delgado-Arana, M. X. Gordillo-Monge, J. Halim, et al., "Early Clinical and Haemodynamic Matched Comparison of Balloon-Expandable Valves," *Heart* 108, no. 9 (2022): 725–732, https://doi.org/10.1136/heartjnl-2021-319349.

9. A. Baumbach, N. van Royen, I. J. Amat-Santos, et al., "LANDMARK Comparison of Early Outcomes of Newer-Generation Myval Transcatheter Heart Valve Series With Contemporary Valves (Sapien and Evolut) in Real-World Individuals With Severe Symptomatic Native Aortic Stenosis: A Randomised Non-Inferiority Trial," *Lancet* 403, no. 10445 (2024): 2695–2708, https://doi.org/10.1016/S0140-6736(24)00821-3.

10. M. Barbanti, T. H. Yang, J. Rodès Cabau, et al., "Anatomical and Procedural Features Associated With Aortic Root Rupture During Balloon-Expandable Transcatheter Aortic Valve Replacement," *Circulation* 128, no. 3 (2013): 244–253, https://doi.org/10.1161/CIRCULATIONAHA.113.002947.

11. W. A. Zoghbi, F. M. Asch, C. Bruce, et al., "Guidelines for the Evaluation of Valvular Regurgitation After Percutaneous Valve Repair or Replacement: A Report From the American Society of Echocardiography Developed in Collaboration With the Society for Cardiovascular Angiography and Interventions, Japanese Society of Echocardiography, and Society for Cardiovascular Magnetic Resonance," *Journal of the American Society of Echocardiography: Official Publication of the American Society of Echocardiography* 32, no. 4 (April 2019): 431–475, https://doi.org/10.1016/j.echo.2019.01.003.

12. P. Généreux, N. Piazza, M. C. Alu, et al., "Valve Academic Research Consortium 3: Updated Endpoint Definitions for Aortic Valve Clinical Research," *European Heart Journal* 42, no. 19 (2021): 1825–1857, https://doi.org/10.1093/eurheartj/ehaa799.

13. J. Jose, A. Mandalay, M. N. Cholenahally, et al., "Safety and Effectiveness of the Novel Myval Octacor Transcatheter Heart Valve in Severe, Symptomatic Aortic Valve Stenosis: A Real-World Indian Experience (The OCTACOR India Study," *Cardiovascular Revascularization Medicine* 63 (2024): 1–7, https://doi.org/10.1016/j.carrev.2024.01.016.

14. G. Manoharan, A. S. Walton, S. J. Brecker, et al., "Treatment of Symptomatic Severe Aortic Stenosis With a Novel Resheathable Supra-Annular Self-Expanding Transcatheter Aortic Valve System," *JACC: Cardiovascular Interventions* 8, no. 10 (2015): 1359–1367, https://doi.org/10.1016/j.jcin.2015.05.015.

15. A. Vahanian, M. Urena, T. Walther, et al., "Thirty-Day Outcomes in Patients at Intermediate Risk for Surgery From the SAPIEN 3 European Approval Trial," *EuroIntervention* 12, no. 2 (2016): e235–e243, https://doi.org/10.4244/EIJV12I2A37.

16. A. Holzamer, F. Bedogni, P. van Wyk, et al., "Performance of the 32 mm Myval Transcatheter Heart Valve for Treatment of Aortic Stenosis in Patients With Extremely Large Aortic Annuli in Real-World Scenario: First Global, Multicenter Experience," *Catheterization and Cardiovascular Interventions* 102, no. 7 (December 2023): 1364–1375, https://doi.org/10.1002/ccd.30820.