Progressive understanding of the relevance of commissural alignment in TAVI has led to the development of custom software to help plan this procedure and to technical changes in the devices that make the procedure easier and faster. On the other hand, it is known that platelet activation takes place not only in situations of increased wall stress, such as aortic stenosis, but also in diseases with abnormal flows, such as bicuspid aortic valve disease.[5] An association has been found between platelet activation and an increased risk of thrombotic and hemorrhagic phenomena.[5] Previous studies have shown that computational models are quite accurate in predicting such activation; for example, they are able to predict thrombosis in coronary bifurcation stenting (figure 1B).[3] The absence of differences in the degree of platelet activation as a function of the degree of misalignment, regardless of whether the flow is helical (figure 2B, left) or linear (figure 2B, right), suggests that the risk of clinical or subclinical thrombosis of the leaflets does not appear to differ as a function of the degree of misalignment. These models are based on purely mechanical assumptions (blood velocity fields), although there is a possibility that the development of more advanced models, which include elements of the coagulation cascade, will enable the detection of differences in thrombogenicity depending on commissural alignment.

On the other hand, the impact on ventricular energy efficiency suggests that, in each individual patient, the result in terms of gradients could differ depending on the degree of alignment. To detect this difference, the models used should simulate flows that are as realistic as possible (helical), given that current simulation laboratories use uniform flows through the prostheses under study.[1] Should our findings be prospectively validated, it could be demonstrated that commissural alignment has an impact on prosthetic valve durability.

In conclusion, CT analysis prior to TAVI is highly accurate in predicting the rotation of the system to achieve correct commissural alignment, especially when using self-expanding prostheses. Furthermore, based on the same imaging tests, computational fluid dynamics analysis highlights the benefits of commissural alignment in taking advantage of the mechanical energy provided by the ventricular wall, but which can only be visualized in realistic (helical) simulations of flow in the outflow tract. We found that commissural alignment had no impact on the risk of leaflet thrombosis.

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AUTHORS' CONTRIBUTIONS

I. Amat-Santos and J. Sierra-Pallares designed and conducted the study. All authors approved the final version of the manuscript.

CONFLICTS OF INTEREST

None declared.

APPENDIX. SUPPLEMENTARY DATA

Supplementary data associated with this article can be found in the online version, at https://doi.org/10.1016/j.rec.2023.01.012

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Potential for controlled heart donation after circulatory determination of death

Potencialidad de la donación cardiaca de donantes en asistolia controlada

To the Editor,

Heart transplant is the treatment of choice for advanced heart failure. The number of ideal brain-dead donors, however, has decreased in recent decades, requiring the implementation of strategies to increase the number of transplantable hearts. These strategies include expanding donor acceptability criteria and using controlled donation after circulatory determination of death (cDCD), which currently accounts for 40% of organ donations in Spain.[1]

Promising results have been reported for different cDCD protocols implemented in Spain since 2020. No studies to date, however, have analyzed the potential for cDCD in Spain. To this end, we conducted a retrospective, observational study of all eligible cDCD donors (category-III donors according to the Maastricht classification adapted to Catalan policies) aged between 18 and 50 years who were registered with the Catalan Transplant Organization (OCATT) between January 1, 2013 (when cDCD was initiated in Catalonia) and February 28, 2021. We collected identifying information on donors and hospitals (whether or not they were located in the Barcelona Metropolitan Area [BMA]), demographic data, medical history pertinent to heart donation (hypertension; obesity; diabetes mellitus; dyslipidemia; drug use and type; smoking; and heart, lung, vascular, liver, and kidney disease), and heart retrieval data (use of normothermic regional perfusion, warm ischemia time [total and functional], and liver viability and reasons for nonviability).

5Suitability for cDCD was evaluated using the criteria applied at Hospital Universitario de Bellvitge in Barcelona, Spain (figure 1). To investigate the potential increase in donor availability, we examined 3 additional groups of potential donors: those with a single cardiovascular risk factor (CVRF) other than diabetes, smokers, and smokers with a single CVRF other than diabetes. We also made a note of where the donation took place (within or outside the BMA). Continuous variables are described as mean ± SD deviation for normally distributed variables and median [interquartile range] for nonnormally distributed variables. Categorical variables are expressed as frequencies and percentages. Analyses were performed in SPSS version 25 (IBM Statistics).

A total of 1279 potential DCD donors (categories IIa, IIb, and III) were registered with the OCATT between January 1, 2013 and February 28, 2021. Of these, 511 (39.95%) were excluded due to medical contraindications or family refusal to donate. Of the 768 potential donors remaining (60.05%), 624 (81.25%) did not meet the age criteria for heart donation. This left 144 (18.75%). Of these, 36 were category IIa or IIb donors and were therefore also excluded, leaving 108 potential cDCD donors (14.06%) aged 18 to 50 years. Eighteen fully met the criteria for donation. Another 3 had characteristics requiring further evaluation: 1 was a lung transplant recipient (previous sternotomy) and 2 were drug users. Two potential donors met all the criteria but were smokers, 12 had a single CVRF, and 8 had a single CVRF and were smokers (figure 1). Five donations (3 from donors who met all the criteria and 2 from donors who met criteria but were smokers) were made outside the BMA. The potential availability of cDCD heart donors was calculated for the different groups analyzed (table 1).

cDCD is an emerging practice in several countries, including the United Kingdom, the United States of America, Australia, Belgium, and, more recently, Spain, where it is now available throughout the country. By the end of 2021, 15 transplants had been performed using hearts from cDCD donors in Spain. Survival data are not yet available, but reports from other countries have shown satisfactory outcomes (92% survival at 90 days).[2]

Based on strict application of the criteria at our hospital, 18 (16.6%) of the donors analyzed during the study period would have been eligible for cDCD. In this same period, 435 hearts from brain-dead donors were transplanted (57% in Catalonia). The 18 cDCD hearts represent a potential increase of 4.14%. Expanding the acceptability criteria would have increased the potential donor pool to 48 (44.4% of the 108 donors analyzed). This corresponds to a potential increase of 11% in heart transplants performed during the study period.

Studies on the potential of cDCD for heart transplants outside Spain have reported similar results to ours. Signalhal et al.[3] analyzed 334 transplants performed over a 2-year period and reported a 4% increase in transplantable hearts per year of donation activity. Noterdaeme et al.[4] reported an increase of 11% (70 donors over a period of 6 years), Osaki et al.[5] an increase of 17%

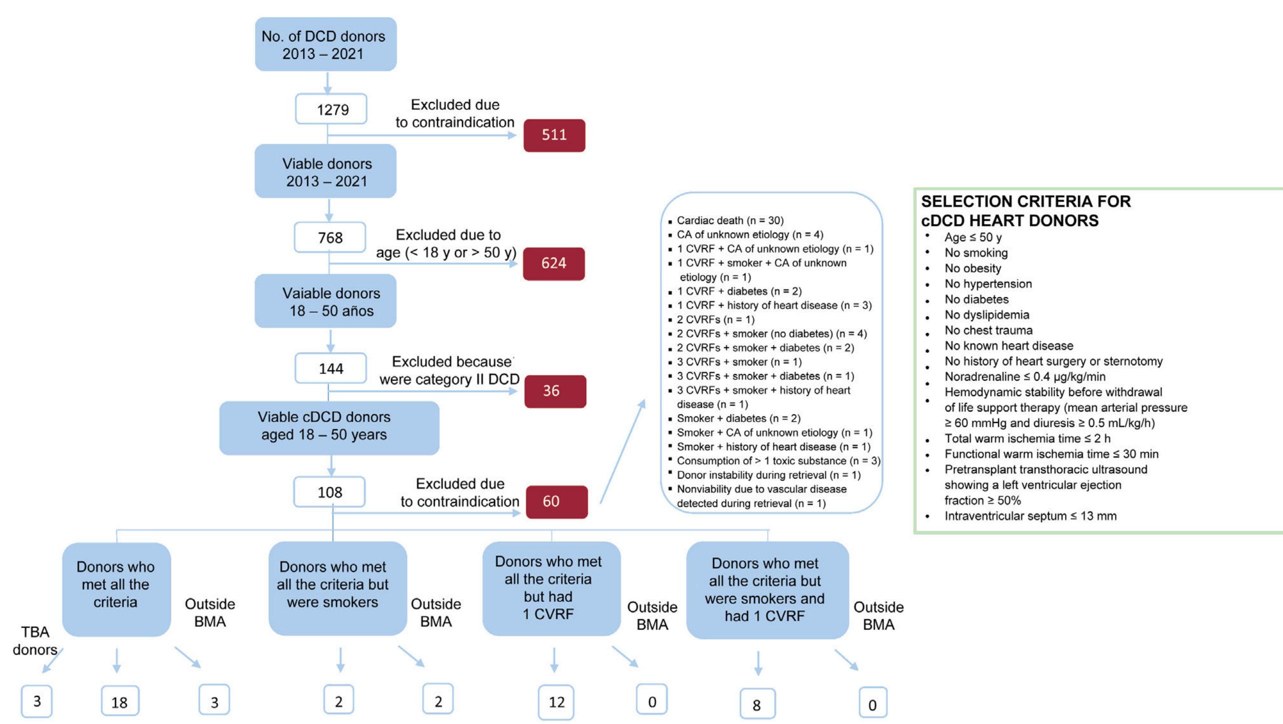

Figure 1. Flowchart showing the selection of potential heart donors. BMA, Barcelona Metropolitan Area; CA, cardiorespiratory arrest; cDCD, controlled donation after circulatory determination of death; CVRF, cardiovascular risk factor; DCD, donation after circulatory determination of death;DM, diabetes mellitus; TBA, donors to be assessed by the transplant coordinator.

Table 1
Potential for cDCD heart transplantation in Catalonia 2013 to 2021

	BMA	Outside BMA	TBA	Total	Potential in relation to total number of eligible cDCD donors (n = 108)*		Potential in relation to total number of brain-dead transplants (n = 435)*	
					BMA-MBA + TBA	BMA and outside BMA-BMA and outside BMA + TBA	BMA-MBA + TBA donors	BMA and outside BMA-BMA and outside BMA + TBA
Full criteria	18	3	3	24	16.66-19.44	19.44-22.22	4.13-4.82	4.82-5.51
Full criteria + smoker	2	2	3	7	1.85-4.62	3.70-6.48	0.45-1.14	0.92-1.61
Full criteria + 1 CVRF	12	0	3	15	11.11-13.88	11.11-13.88	2.75-3.44	2.75-3.44
Full criteria + smoker + CVRF	8	0	3	11	7.4-10.18	7.4-10.18	1.84-2.52	1.83-2.53
Total	40	5	3	48	37.03-39.81	41.66-44.44	9.19-9.88	10.34-11.03

BMA, Barcelona Metropolitan Area; cDCD, controlled donation after circulatory determination of death; CVRF, cardiovascular risk factor; TBA, donors to be assessed.
* The numbers on the left show absolute numbers of donors in each category. The numbers on the right show potential donors expressed as a percentage.

(70 donors in 2 years), and Messer et al.[2] an increase of 8.6% (6429 donors in 5 years).

Our study demonstrates that cDCD could increase the potential number of hearts available for transplant. It also shows that the potential donor pool could be further increased by expanding the acceptability criteria to include smoking and/or certain CVRFs. CVRFs do not necessarily have to be a limiting factor in heart donation, as coronary angiography can be performed in advance. Accepting donors from outside the hospital could also increase the pool of transplantable hearts. In such cases, normothermic regional perfusion to reduce ischemia-reperfusion injury could be combined with cold preservation after retrieval or ex situ normothermic perfusion, although the procedure is costly. Another option for increasing the number of available hearts would be to progressively expand the age range for donation.

The main limitation of our study is its retrospective design. One or more of the 18 donors meeting all the criteria for cDCD might have eventually been excluded, and this possibility is even more likely in the group of expanded-criteria donors.

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AUTHORS' CONTRIBUTIONS

N. Martínez-Franco: data collection and analysis; literature review; and drafting, revision, and approval of manuscript. E. Oliver-Juan and L. Anguela-Calvet: data analysis and revision and approval of manuscript. J. Tort and N. Manito-Lorite: data analysis and manuscript revision and approval. G. Moreno-González: study design, data analysis, literature review, and manuscript revision and approval.

CONFLICTS OF INTEREST

The authors certify that they have no conflicts of interest to declare and have no affiliations with or involvement in any organization or entity with any financial interest such as honoraria and educational grants.

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Outflow tract ventricular tachycardia ablation from the axillary artery

Ablación de taquicardia ventricular con origen en el tracto de salida desde la arteria axilar

To the Editor,

The femoral artery is the access site of choice for the ablation of cardiac arrhythmias with a retrograde aortic approach, such as idiopathic ventricular arrhythmias or those associated with scar tissue or specific left-sided accessory pathways. However, the proximal portion of the aorta cannot always be reached via this access site.

We present the case of an 89-year-old man with a history of anteroapical myocardial infarction who had undergone dual-chamber pacemaker implantation due to complete atrioventricular block and who had aortoiliac occlusive disease treated with aortocoronary surgery 40 years previously. The patient presented to the emergency department due to asthenia. Upon arrival, he was found to have hypotension and tachycardia. Electrocardiography was performed, showing regular wide QRS tachycardia with an inferior axis at 176 bpm, compatible with sustained monomorphic ventricular tachycardia originating in the region of the outflow tracts. A V_3 transition with a positive QRS complex in lead I and QS morphology in V_1 with notching in the descending branch of the QRS complex suggested a likely successful approach from the aorta[1] (figure 1A). Termination was unsuccessfully attempted using overdrive pacing from the ventricular pacemaker lead, which was followed by attempted electrical cardioversion with a biphasic synchronized shock at 200 J. However, the tachycardia was incessant, with an almost immediate relapse after 3 cardioversion attempts. Accordingly, intravenous perfusion of amiodarone was begun, which slowed the tachycardia to 155 bpm without stopping it. Electrical cardioversion was attempted 3 times, but the incessant behavior remained. Given the hemodynamic impact and the impossibility of stopping the tachycardia using conservative strategies, emergency ablation was indicated.

Both femoral arteries were cannulated with the aid of a guidewire but we were unable to reach the abdominal aorta. Accordingly, angiographic probes were used, which confirmed the complete bilateral occlusion of the aortoiliac arteries. A possible approach from the right ventricular outflow tract was not completely ruled out. However, we decided to attempt a retroaortic approach, even though it would involve a less conventional strategy, because its speed would avoid hemodynamic deterioration and the possibility of complications related to the use of radiofrequency in the right ventricle,[2] given that the electrocardiographic pattern was highly compatible with a mappable origin in the right sinus of Valsalva or the commissure between the right and left sinuses. Ultrasound-guided access was obtained via the left axillary artery (video 1 of the supplementary data) with an 8-Fr Avanti+ introducer (Cordis, Cardinal Health, United States), and a ThermoCool SmartTouch contact forcesensing irrigated ablation catheter (Biosense Webster, United States) was advanced to the aortic root (figure 1B,C). Activation mapping performed with the CARTO3 electroanatomic mapping system (Biosense Webster) revealed greater precocity of the ventricular electrogram in the right sinus of Valsalva, whose bipolar signal also showed a prepotential that preceded the QRS onset by 29ms, in addition to an electrogram with QS morphology in the monopolar signal (figure 2A). A 50-W application to this area terminated the tachycardia in 3.6 seconds (figure 2B); another 5 adjacent applications were applied as backup. After a 30-minute evaluation period in which we failed to observe arrhythmia recurrence or to induce tachycardia with ventricular pacing protocols (with trains and up to 3 extrastimuli, as well as ramps, with a minimum cycle length of 200 ms), the introducer was extracted and hemostasis of the puncture site was performed via application of an Angio-Seal vascular closure device (St Jude Medical, United States). Vascular ultrasound on the following day ruled out complications at this location.

Transfemoral arterial access can be limited in 13% to 20% of patients due to prior vascular interventions, severe aortoiliac atherosclerotic disease, and major calcification or tortuosity.[3] Given the current growth in the older population affected by tachyarrhythmia, increases are expected in the number of patients with these comorbidities and the impossibility of a conventional approach via the femoral artery. Although transseptal access to the left ventricle can help to avoid this problem, mapping and ablation of the anterior wall or aortic root using this approach is often complicated due to insufficient maneuverability,[4] which can lead to worse outcomes and major complications. A previous publication has already reported successful ablation of ventricular tachycardia via a 6-Fr radial artery access site with a 4-mm nonirrigated tip.[5] However, the reduced diameter of this artery impedes the use of larger-caliber introducers and, thus, conventional irrigated ablation catheters. Axillary artery access has been proven to be a valid alternative in cardiac interventions and permits transcatheter aortic valve implantation and establishment