Safety of MitraClip Implantation in Patients With a Left Ventricular Endocardial Lead for Cardiac Resynchronization Therapy Through the Interventricular Septum

Seguridad del MitraClip en pacientes con cable endocárdico de resincronización cardiaca en el ventrículo izquierdo a través del septo interventricular

To the Editor,

Cardiac resynchronization therapy (CRT) is a widely-accepted therapeutic strategy used in a large number of patients with heart failure due to left ventricular (LV) dysfunction and asynchrony.[1] Although the coronary sinus is the access of choice for the LV lead, it cannot be used in up to 10% of patients because of anatomical difficulties.[2] An alternative access has therefore also been proposed, passing through the interventricular septum.[3]

We report 2 cases of patients with severe LV failure who had not responded to CRT with the LV endocardial lead implanted through the interventricular septum. Both had severe mitral regurgitation (MR) and underwent MitraClip implantation.

The patients were aged 67 and 73 years, with nonischemic dilated cardiomyopathy, LV ejection fraction of 15% and 20%, respectively, and grade III-IV functional MR (FMR). In the electrocardiograms, complete left bundle branch block was observed, leading to LV asynchrony.

After several admissions for decompensated heart failure, the patients were readmitted for implantable cardioversion/defibrillator placement and CRT. Initially, an attempt was made to implant the LV lead with a conventional approach in the coronary sinus, but, because of the anatomical features of this structure, the LV endocardial lead had to be implanted by interventricular septal puncture. During the following year, further admissions to hospital were required for decompensated heart failure. Given the presence of severe FMR and, after confirmation that the patients were appropriate candidates, a MitraClip was implanted. Technical precautions were taken, such as avoiding going any lower than necessary within the LV when capturing the leaflets, through careful monitoring of movements, both by echocardiography and by fluoroscopy (Figure 1 and Figure 2). A decrease of FMR from grade III-IV to grade I-II was achieved with approximation of the A2/P2 segments with a single mitral clip, without any complications or interference from the endocardial LV lead (Figures 2C and 2F). Transeptal puncture was performed at the optimal site for implanting the MitraClip, while still ensuring good device handling (Figure 2A). In addition, the distance between the endocardial LV lead and the mitral leaflets in diastole was measured with particular care (Figures 2A and 2B).

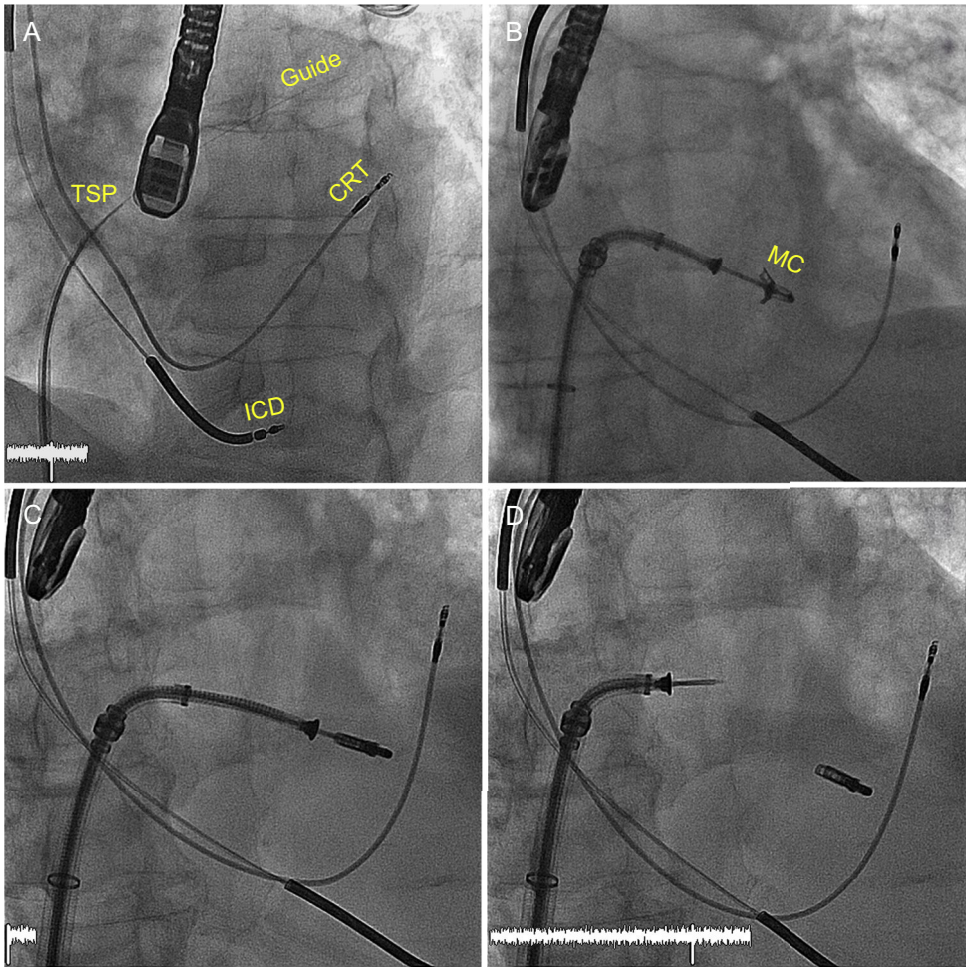

Figure 1. Fluoroscopic images. A, Left oblique anterior view showing the TSP needle and an angioplasty guide catheter toward the left superior pulmonary vein; CRT is the cardiac resynchronization lead passing from the right ventricle through the interventricular septum to the lateral wall of the left ventricle; ICD is the lead for the implantable cardioverter/defibrillator device. B, C, and D, Right oblique anterior view showing the different phases of MitraClip intervention with positioning, capture, and release, respectively, and its position relative to the CRT cable. CRT, cardiac resynchronization therapy; ICD, implantable cardioverter/defibrillator; MC, MitraClip; TSP, transseptal puncture.

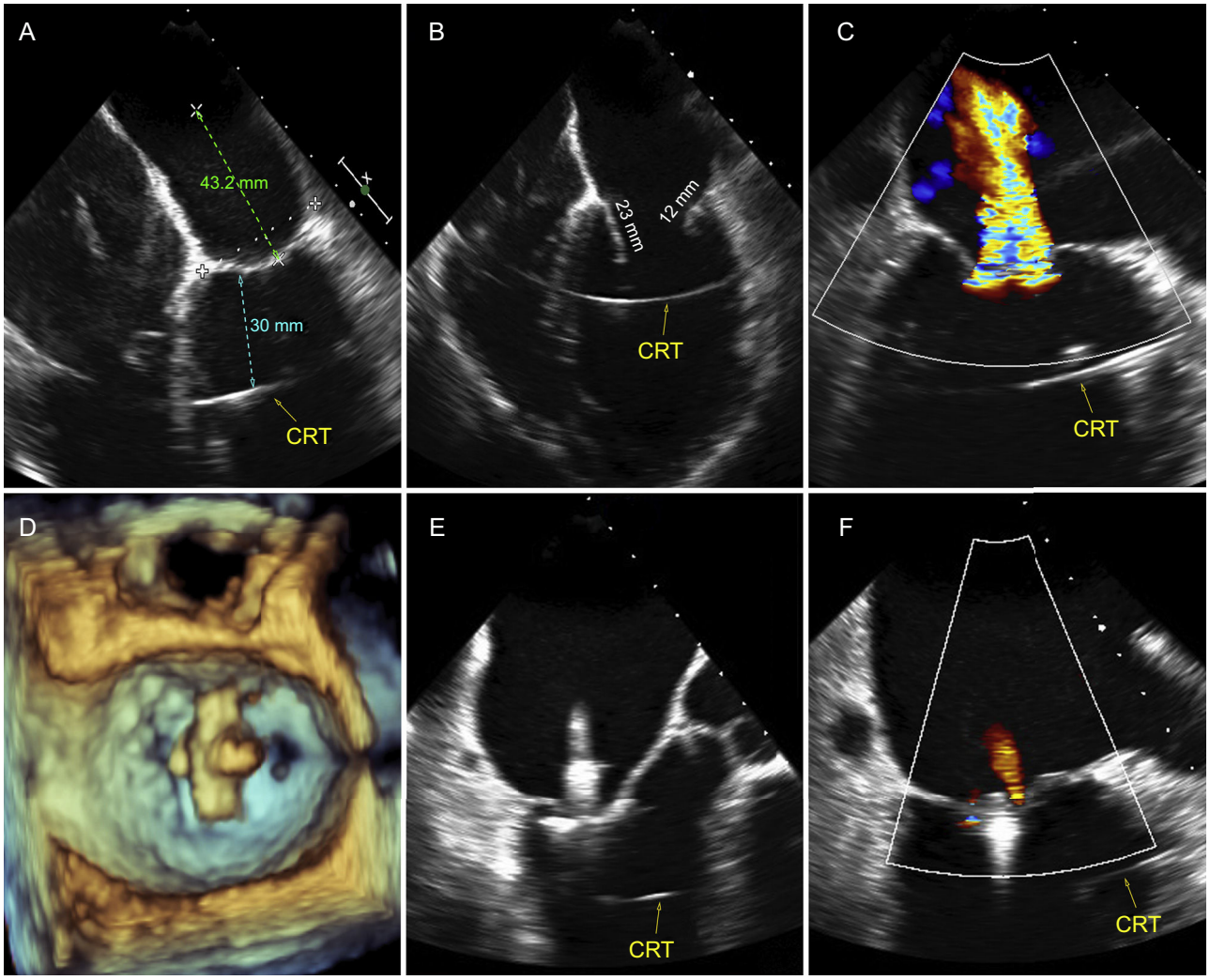

Figure 2. Transesophageal echocardiography images during the intervention. A and B, 4-chamber view (0°); relationship of the closed and open mitral valve and with the CRT lead. Panel A shows the distance from the point of transeptal puncture to the line of fusion of closure of the mitral leaflets and the distance from the lead to the mitral plane. Panel B shows the measurements of the A2/P2 leaflets, respectively. C, bicommissural view (70°); severe mitral regurgitation toward the left atrium can be observed. D, 3-dimensional image of the MitraClip, perpendicular to A2/p2 leaflets of the mitral valve. E, outflow tract view (120°). F, bicommissural view (70°); capture of the mitral leaflets (E) and release of the clip (F), with minimal residual regurgitation, and its position relative to the CRT lead. CRT, cardiac resynchronization therapy.

With follow-up currently of 1 year and 3 months, respectively, the outcome has been favorable with significant improvement in the patients' functional grade.

It is known that 30% to 40% of these patients do not respond to CRT and, in many cases, if severe FMR is present (as occurs in approximately one third of patients), the next step is MitraClip placement (Abbott Vascular). This technique has been shown to be effective at reducing symptoms and readmission rates in these patients.[4,5]

The PERMIT-CARE study included 51 symptomatic patients who did not respond to CRT. Of these, 46% had moderate-severe FMR and 54% had severe FMR. The decrease in FMR after MitraClip placement was accompanied by decreases in LV end-diastolic and end-systolic volumes at 6 to 12 months and improvement in functional class.[4]

The combination of these 2 therapies (CRT and MitraClip) is becoming increasingly widespread, given the importance of reducing FMR in patients who do not respond to CRT, and therefore there will be an increasing number of patients in whom the coronary sinus cannot be used for LV access. To our knowledge, no articles have been published on this combination of MitraClip (and corresponding safety) with CRT using endocardial LV leads with interventricular septal access. Our experience in this context is therefore particularly relevant.

CONFLICTS OF INTEREST

R. Estévez-Loureiro and C. Garrote-Coloma are Abbot consultants for MitraClip.

José R. López-Mínguez,[a,*] Rodrigo Estévez-Loureiro,[b] Victoria Millán-Núñez,[a] María Eugenia Fuentes-Cañamero,[a] Reyes González-Fernández,[a] and Carmen Garrote-Coloma[b]

[a]*Servicio de Cardiología, Hospital Universitario Infanta Cristina, Badajoz, Spain*
[b]*Servicio de Cardiología, Complejo Hospitalario Universitario de León, León, Spain*

*Corresponding author:
E-mail address: lopez-minguez@hotmail.com (J.R. López-Mínguez).

Available online 13 September 2017

REFERENCES

1. Cleland JG, Daubert JG, Erdmann E, et al. for the Cardiac Resynchronization - Heart Failure (CARE-HF) Study Investigators. The effect of cardiac resynchronization on morbidity and mortality in heart failure. *N Engl J Med.* 2005;352:1539–1549.
2. Gras D, Böcker D, Lunati M, et al. CARE-HF Study. Steering Committee and Investigators. Implantation of cardiac resynchronization therapy systems in the CARE-HF trial: procedural success rate and safety. *Europace.* 2007;9:516–522.
3. Betts TR, Gamble JH, Khiani R, Bashir Y, Rajappan K. Development to a technique for left ventricular endocardial pacing via puncture of the interventricular septum. *Circ Arrhythm Electrophysiol.* 2014;7:17–22.
4. Auricchio A, Schillinger W, Meyer S, et al. Correction of mitral regurgitation in nonresponders to cardiac resynchronization therapy by MitraClip improves symptoms and promotes reverse remodeling. *J Am Coll Cardiol.* 2011;58:2183–2189.
5. Pan M, Jiménez-Quevedo P, Serrador A, Pérez de Prado A, Mesa D, Estévez Loureiro R. Selección de lo mejor del año 2016 en el tratamiento de la insuficiencia mitral funcional mediante implante de MitraClip. *Rev Esp Cardiol.* 2017;70:216–218.

http://dx.doi.org/10.1016/j.rec.2017.08.010
1885-5857/

Guidewire-driven Left Ventricular Pacing During Transcatheter Aortic Valve Implantation

Estimulación ventricular izquierda a través de la guía del implante percutáneo de válvula aórtica

To the Editor,

Cardiac pacing at 180 to 200 bpm is an effective means to stabilize the balloon during aortic valvuloplasty and transcatheter aortic valve implantation (TAVI). Classic temporary pacing requires femoral or jugular puncture for placement of the active fixation electrode in the right ventricle (RV). However, effective cardiac pacing can also be achieved using a unipolar electrode in the left ventricle (LV).[1] We describe a prospective and consecutive series of 25 patients (Table) who underwent femoral TAVI. Because evaluation by the cardiology team responsible for patient selection revealed that the patients were at high or moderate risk[2,3] from conventional valve replacement, they were selected for TAVI, preferably using a minimalist approach (sedation, without systematic transesophageal echocardiography, without previous aortic valvuloplasty, percutaneous femoral occlusion). In addition, implantation of an active fixation electrode in the RV was omitted because, in our first 105 TAVI procedures with expandable balloon (EB) valves, RV perforation occurred in 2 patients and rapid LV pacing was induced through a 0.035" super-stiff guidewire used for the TAVI.

All patients had severe aortic stenosis with elective or emergent indication for TAVI or dysfunction of a valve prosthesis previously implanted via aortic valve replacement surgery. Once the aortic valve was crossed with a 5-Fr Amplatz AL1 catheter, the guidewires used were a 0.035" super-stiff wire (Cook; Bloomington, Indiana, United States) precurved in the shape of a pig's tail and placed within the LV or a Safari guidewire (Boston Scientific), which is already spiral-shaped and did not require manipulation. The extreme end of the guidewire was connected to the negative electrode (cathode) of a Medtronic 5348 temporary pacemaker using an alligator clamp while the positive electrode (anode) was connected to the skin of the right inferior extremity using an intramuscular or curved needle and similarly connected by an alligator clamp to the external pacemaker (Figure A). Pacing was performed at between 180 and 240 bpm, with a maximal output and reduced sensitivity. We waited until the blood pressure was reduced to 40 mmHg with a pulse wave of about 10 mmHg (Figure B) before implanting the Edwards-SAPIEN 3 and Edwards-SAPIEN XT EB-type valves (Figure C), with a 0 to 5 mmHg reduction in the systolic gradient of the LV and aorta and no regurgitation (Figure D and video of the supplementary material). In our series, there was 1 incident of complete atrioventricular block that required pacing via the 0.035" guidewire during the time required to implant a temporary pacemaker through a jugular approach to the RV; the patient subsequently required a permanent pacemaker.

We believe that rapid pacing should not be used when there are predictors of atrioventricular block after TAVI, self-expanding valves are used, or the center has limited experience.[5] We have evidence from only 2 publications[4,6] that used TAVI guidewire-driven rapid LV pacing. Faurie et al.[4] did not report the number of TAVIs with EBs and self-expanding valves but reported an intraprocedural temporary pacing rate due to post-TAVI blocks of 13.8%, estimating a predominance of the self-expanding valve, which does not necessarily involve rapid pacing. In the series by Hilling-Smith et al.,[6] permanent pacemaker implantation was required after TAVI in 21.2% of patients, and an EB was used in only 6% of patients. In our prospective and consecutive series, all prostheses used had EBs, and the rapid pacing mode allowed the implantation of valves with EBs, elimination of potential complications due to the need for additional venous punctures, and

Table
Patients' Characteristics, Surgical Risk, and 30-day Results

Patients, n	25
Age, y	79.2 ± 4.6
EuroSCORE II, %	5.35 ± 3.9
STS, %	5.81 ± 4.2
Previous pacemaker	1 (4)
Previous percutaneous coronary intervention	6 (24)
NYHA class III/IV	11 (44)
Porcelain aorta	1 (4)
Chronic kidney disease stage IV/V	5 (20)
Edwards-SAPIEN 3	19 (76)
Edwards-SAPIEN XT	6 (24)
Direct implantation	23 (92)
Dysfunctional surgical aortic valve prosthesis	7 (28)
Pacing at 180 bpm	18 (72)
Pacing at 200 bpm	3 (12)
Pacing at 220 bpm	3 (12)
Pacing at 240 bpm	1 (4)
Pacing failure	0
Pacemaker 30 d after the TAVI	2 (8)
Tamponade	0
Vascular complication	1 (4)
Stroke	1 (4)
Periprocedural myocardial infarction	0
Death	1 (4)
TAVI procedure success	25 (100)
TAVI success with complications	24 (96)

EuroSCORE II, European system for cardiac operative risk evaluation; NYHA, New York Heart Association functional class; STS, cardiac surgery mortality risk score of the Society of Thoracic Surgeons; TAVI, transcatheter aortic valve implantation. Unless otherwise indicated, the data represent No. (%).