Mitral Regurgitation After MitraClip: Impact of Mitral Regur- gitant Orifice Morphology Evaluated by Three-dimensional Echocardiography

Insuficiencia mitral tras MitraClip: impacto de la morfología del orificio regurgitante mitral evaluado mediante ecocardiografía tridimensional

To the Editor,

Percutaneous treatment of mitral regurgitation (MR) is an
option for high risk patients who are not candidates for mitral
valve surgery because of ventricular dysfunction, or comorbid-
ities. It has been shown to be a safe and effective technique.

Patients selected for this procedure should fulfill certain
anatomical criteria, which can largely be assessed by
2-dimensional transesophageal echocardiography (TEE). However,
3-dimensional TEE makes it easier to assess the complex morpho-
logical and functional parameters of the mitral valve, as well as
changes after mitral valve percutaneous repair.

Anatomical mitral valve requirements for MitraClip deployment
are quite strict and include central regurgitant jet origin
(scallops A2-P2). Two-dimensional TEE is not always able to
precisely identify the originating location.

The aim of our study was to analyze mitral valve anatomic
regurgitant orifice (ARO) using 3-dimensional TEE and its
association with reduced regurgitation following MitraClip im-
plantation.

The study design was a case series. Patients with significant MR
were consecutively enrolled from November 2011 to September
2013 if they fulfilled anatomical criteria assessed by 2-dimensional
TEE for MitraClip (Abbott Vascular) implantation. We excluded
patients with an eccentric origin of regurgitant jet. We studied ARO
morphology using 3-dimensional TEE (Philips iE33), classifying
cases as purely central (C) if A2-P2 was affected alone, or central-
eccentric if the segments adjacent to A2-P2 were affected, in which
case they were subclassified as central-medial (CM) or central-
lateral (CL) (Figure).

We assessed the association between ARO morphology and MR
reduction (grades 1–4) and the absence of immediate reduction
following device deployment. An optimal result was considered as
a final MR grade of 2 or less.

All variables were collected prospectively. Our series consisted of
20 patients. The device could not be deployed in 1 patient due
to severe mitral stenosis. Two other patients were excluded due to
organic MR and eccentric location of the regurgitant jet. Finally,
17 patients were included (mean age, 61 [SD, 16] years, 70% men;
59% functional class III according to the New York Heart Association;
mean logistic EuroSCORE 14.78 [SD, 12]; mean left ventricular
ejection fraction 28%; 88% had pulmonary hypertension). All
patients had functional MR. The procedure was successful in all
patients; 1 device was implanted in 14 patients and 2 were
implanted in 3 patients. A complete 2- and 3-dimensional TEE
study was performed pre- and postimplantation, and MR encom-
passed 4 grades. Informed consent was obtained.

Qualitative variables are expressed as an absolute number and
percentage. Quantitative variables are expressed as mean (stan-
dard deviation). Student’s t test was used to analyze the association
between variables for independent or paired data, as appropriate.
We used the software package PASW v.18. Significance was
defined as P < .05.

Figure. Types of mitral regurgitant orifice by three-dimensional Echocardiography. A: Central-lateral. B: Central. C: Central-medial.
After analyzing the results, we found that there were no significant differences between patients when grouped by baseline echocardiographic parameters (Table).

The ARO was purely central in 6 patients (group A) and was central-ecentric in 11 (group B). Mitral regurgitation was significantly reduced throughout the series ($P < .0001$) when assessed using both the semiquantitative method (reduction in MR grade) and the quantitative method (reduction in effective regurgitant orifice). When analyzed by group, the reduction was greater in group A ($P < .0001$), although there were no differences in the number of devices (1 patient in group A had 2 devices and 2 patients in group B had 2 devices; the remaining patients had 1 device).

As far as we are aware, there is no study in the literature that has analyzed MR reduction after MitraClip deployment using 3-dimensional TEE-assessed ARO morphology. Our results suggest that 3-dimensional TEE may well play a fundamental role in selecting ideal candidates for MitraClip treatment, at least in patients with functional MR. Furthermore, knowledge of ARO morphology may lead to changes in the location of device implantation (usually in the medial region between A2-P2), which may in turn improve outcomes. Similarly, other authors have found that 3-dimensional TEE contributes to a lower rate of postimplantation complications and an improved outcome.6

The results of this study should be interpreted with caution because of the small sample size. However, they show that regurgitant orifice morphology analyzed with 3-dimensional TEE is associated with a reduction in the degree of functional mitral regurgitation in patients treated with MitraClip.

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<tr>
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<td>3D-VC baseline, mean (SD), cm²</td>
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<td>Change in MR grade, mean (SD)</td>
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<td>Change in ERO, mean (SD), cm²</td>
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3D-ARO, anatomic regurgitant orifice measured by three-dimensional echocardiography; 3D-VC, vena contracta measured by three-dimensional echocardiography; AP, anterior-posterior; Dd, diastolic diameter; EDV, end-diastolic volume; ERO, effective regurgitant orifice; ESV, end-systolic volume; IC, inter-commissural; LVEF, lower ventricular ejection fraction; MR, mitral regurgitation; PASP, pulmonary artery systolic pressure; Sd, systolic diameter; SD, standard deviation; TAPSE, M-mode tricuspid annular plane systolic excursion.