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# MitraClip: Catheter-based treatment of mitral regurgitation

Tomas Ondrus<sup>a,b,\*</sup>, Martin Penicka<sup>b</sup>, Martin Kotrc<sup>c</sup>, Marc Vanderheyden<sup>b</sup>, Jozef Bartunek<sup>b,\*\*</sup>

<sup>a</sup>Department of Internal Medicine and Cardiology, Medical Faculty of Masaryk University and University Hospital Brno, Jihlavska 20, 625 00 Brno, Czech Republic

<sup>b</sup>Cardiovascular Center Aalst, OLV Clinic, Moorselbaan 164, 9300 Aalst, Belgium

<sup>c</sup>Department of Cardiology, Institute for Clinical and Experimental Medicine (IKEM), Videnska 1958/9, 140 21 Prague, Czech Republic

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ABSTRACT

Mitral regurgitation (MR) is the second most prevalent heart valve disease requiring surgery. Despite the evidence of unfavourable prognosis, around half of patients with severe MR are not referred for surgery due to high per-operative risk. MitraClip (Abbott Vascular-Structural Heart, Menlo Park, California, United States) implantation is an emerging percutaneous technique with edge-to-edge MV repair inspired by the Alfieri surgery. Favourable safety profile together with improvement of functional status and decrease of MR severity in high-surgical-risk patients have been demonstrated in randomized clinical trials and “real-world” registries for both primary and secondary MR. Our own data confirmed its safety and efficacy comparing to minimally invasive MV surgery in treatment of functional MR in population with severe systolic heart failure.

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\* Corresponding author at: Department of Internal Medicine and Cardiology, University Hospital Brno, Jihlavska 20, 625 00 Brno, Czech Republic. Fax: +420 53 223 2611.

E-mail addresses: [ondrus.tomas@fnbrno.cz](mailto:ondrus.tomas@fnbrno.cz) (T. Ondrus), [martin.penicka@olvz-aalst.be](mailto:martin.penicka@olvz-aalst.be) (M. Penicka), [martin.kotrc@medicon.cz](mailto:martin.kotrc@medicon.cz) (M. Kotrc), [marc.vanderheyden@olvz-aalst.be](mailto:marc.vanderheyden@olvz-aalst.be) (M. Vanderheyden), [jozef.bartunek@olvz-aalst.be](mailto:jozef.bartunek@olvz-aalst.be) (J. Bartunek).

\*\* Co-corresponding author at: Cardiovascular Center Aalst, 9300 Aalst, Belgium. Fax: +32 5372 4550.

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## Introduction

Mitral regurgitation (MR) is the second most prevalent heart valve disease requiring surgery with a prevalence of 1.7% increasing to 10% in older population [1,2]. The European Society of Cardiology (ESC) guidelines classify this disorder as either primary (organic, degenerative) or secondary (functional, ischaemic). Primary MR is caused by a morphological abnormality of one or more components of a complex mitral valve (MV) apparatus, i.e. leaflets, chordae tendineae, papillary muscles or mitral annulus. In secondary MR, anatomically normal MV fails to coapt adequately because of left ventricular (LV) remodelling, papillary muscle displacement and annular dilatation. Thus, secondary MR is more disease of the LV myocardium than MV itself with implications to therapeutic options: while severe organic MR is a clear indication to MV surgery (class Ia), management of functional MR (without concomitant revascularization therapy) is multifactorial and interventional options remain matter of discussion [3].

Nevertheless, both organic and functional MR are linked with unfavourable prognosis in the absence of intervention [4–6]. Surgical treatment is the approach with defined clinical success, providing sustained relief of symptoms or heart failure and valve repair should be the preferred mode of surgical correction [7]. However, around half of patients with severe MR (both organic as well as functional) are not referred for surgery because of high per-operative surgical risk mainly due to advanced age, frailty, comorbidities or severe LV dilation and dysfunction [8].

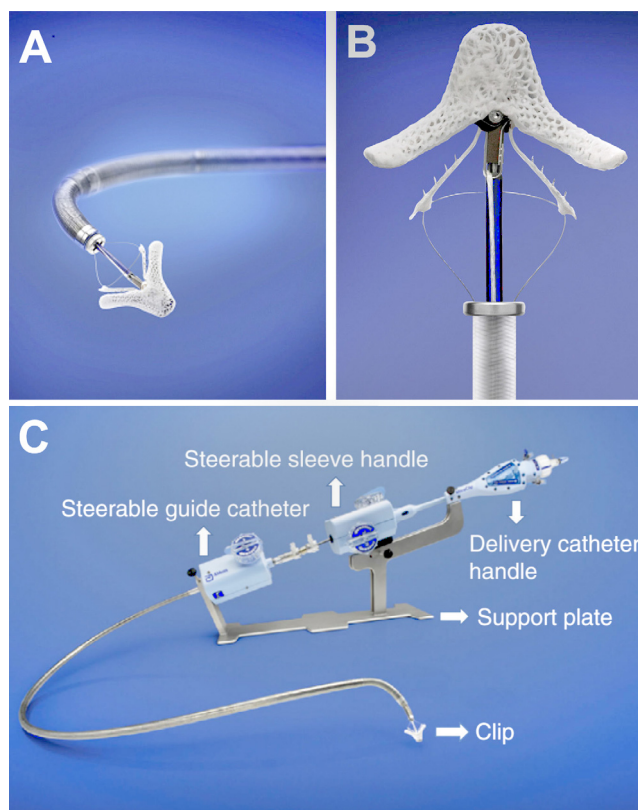
## MitraClip

MitraClip (Abbott Vascular-Structural Heart, Menlo Park, CA, United States) therapy is an emerging approach for treating MR in high-surgical-risk patients providing significant reduction of MR severity with favourable safety profile. The principle of this percutaneous technique is based on a technically simple surgical method first described by Alfieri in the early 1990s consisting of MV leaflets central suture [9]. MitraClip therapy provides mechanical edge-to-edge grasping of the anterior and posterior leaflets using a small clip device and thereby restoring MV coaptation.

**MitraClip device.** The MitraClip device is a 4 mm wide chrome-cobalt clip with 2 mobile, polyester covered arms. On the inner portion of the clip there are 2 “grippers” stabilizing the leaflets from the atrial site. After grasping, the leaflet tissue is secured between the arm and gripper. The MitraClip device is delivered using a 24-Fr steerable catheter guidewire and a sophisticated clip delivery system (Fig. 1). The system has knobs that allow the antero-posterior and medio-lateral steering of the catheter tip and control the opening, closure,

and detachment of the clip. The clip is magnetic resonance conditional to 3 tesla (T).

**Implantation procedure.** Implantation procedure is performed under general anaesthesia using fluoroscopy and transesophageal echocardiography (TEE) navigation. Left atrium (LA) is reached via right femoral vein access and transseptal puncture (Fig. 2A and B). Maximal postero-superior puncture position should be attempted to allow sufficient clip mobility inside the LA and optimal distance to the line of coaptation. After reaching the mitral orifice, MitraClip perpendicularity has to be set up using 3D TEE navigation (Fig. 2C). Then, the clip is advanced through the MV into the LV with slightly closed arms. The system is withdrawn until both mitral leaflets have been grasped under continuous TEE guidance. Careful TEE evaluation of the clip position, its stability with sufficient tissue being grasped and residual MR is of the outmost importance. If the result is suboptimal (only one leaflet capture, presence of significant residual MR or stenosis), the clip may be reopened with repeated grasp



**Fig. 1 – The MitraClip device. MitraClip attached to the steerable guide catheter (A). MitraClip in detail (B). MitraClip delivery system (C).**

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