



# Robotic mitral valve surgery in Latin America

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Rheumatic heart disease remains the leading cause of mitral valve (MV) disease in developing countries (1). In Latin America, with population aging and socioeconomical development in the past decades, degenerative disease of the MV has become increasingly prevalent (2). Both rheumatic and degenerative disease can lead to severe MV dysfunction, often requiring surgical intervention.

Treatment options include well established conventional and minimally invasive approaches and, most recently, transcatheter options. Within the range of minimally invasive procedures, robotic MV surgery has gained popularity since independently performed by Carpentier (3) and Mohr (4) in 1998. The operations were accomplished using the da Vinci Surgical System (Intuitive Surgical Inc., Sunnyvale, California, USA) which received FDA approval in 2002, quickly becoming the platform of choice for robotic-assisted cardiac surgery.

The use of robotics for MV surgery in North America and Europe is well documented. A review from Bonatti and colleagues (5) demonstrated 0.4% mortality rate, 2.1% conversion rate and high repair success rates in 4,106 patients undergoing robotic MV repair in the US, Europe, and Asia. Similarly, Murphy (6) demonstrated a 0.9% mortality rate and high repair success rates in 1,257 MV cases performed robotically. With a mean follow-up of 50±26 months, this series showed 3.8% reoperation rate for recurrent mitral regurgitation. Conversely, the shortage of publications from Latin America poses a challenge for obtaining updated information regarding volume and results.

Robotic cardiac surgery in Latin America started in 2010 with a series of successful cases performed at Hospital Israelita Albert Einstein in Sao Paulo, Brazil (7). The early

experience included 51% of MV procedures showing low mortality and high repair rates in MV degenerative disease (7), mirroring the international practice. From 2010 to present, the pioneer group performed 120 cases in four different centers in Brazil, representing the largest experience in Latin America. Preliminary data from their registry showed that 70% of patients had MV surgery. Of these, 75% underwent valve repair due to myxomatous degeneration with a repair success rate of 98%. There were no intra-operative complications or conversions to full sternotomy and early mortality was reported in one case. Long-term survival was 98% and there were no reoperations for recurrent mitral regurgitation at long-term follow-up.

Apart from the Brazilian data, Andrade and colleagues (8) recently published their experience with robotic cardiac surgery in Colombia, initiated in 2017. Of the six cases performed with the da Vinci Xi system, three had symptomatic severe mitral regurgitation secondary to P2 prolapse and underwent successful valve repair. At one-year follow-up, all patients were doing well, and no reoperations were required. Although many other countries in Latin America are known to have started their robotic programs, they are still in the beginning of their learning curve and have not yet reported early results.

There are major limitations for adoption of robotic cardiac surgery in Latin America. Firstly, dedicated programs for surgical training are scarce. It has been suggested by Suri and colleagues (9) that surgical training can be best achieved in an apprentice or fellowship setting, which remains challenging as robotic surgery is limited to few centers with highly competitive programs. Mastering robotic MV surgery requires not only knowledge on robotic

and endoscopic surgery, but also advanced MV repair proficiency. In that sense, robotic mitral surgeons would best conquer their learning curve in large institutions focused on MV disease with dedicated teams and equipment, and high volumes. For that reason, it is not uncommon to find Latin American surgeons pursuing further training in the US, Canada, or Europe, often without appropriate support.

Additionally, it is essential to develop and maintain the expertise of the robotic team. Multidisciplinary teams are vital for organising and managing complex cases undergoing robotic MV operations, hence public and private institutional initiatives for education and certification of teams are fundamental when initiating a robotic mitral program. Deficiencies in public health policies, including lack of investment in technology and education, may limit the use of robotic technologies, preventing patients from the public system from accessing the benefits of robotic mitral surgery. Finally, the involvement of cardiovascular surgery and cardiology societies and the industry in training and certification of surgeons and teams is also of great importance for fomenting new programs, supporting technological incorporation, and addressing the complexity of robotic MV treatment.

Unarguably, the high cost of technology has been associated with a slower pace in health care development in low and middle-income economies. Ongoing discussions on cost-effectiveness of robotic incorporation suggest that initial investments can be supplanted by incremental gains in volume, especially when the robot is shared with other specialties, creating a sustainable program. Furthermore, shorter hospital stays and expedited recovery of patients translate into reduced costs, which compensates for higher surgical expenses (5-8).

Nevertheless, with the transition from a fee-for-service to a value-based model, we believe insurance companies and the public system may reassess payment and reimbursement strategies for robotic cardiac surgery in Latin America. Additionally, it is of utmost importance to address the inequality in health care in Latin America and worldwide. It is our responsibility as care providers to advocate for equal access to advancements in technology and surgical performance regardless of socioeconomic influences. In minimally invasive cardiac surgery, initiatives for optimizing resources, reducing costs, research scaling, and facilitating public-private partnerships may reduce the gap between countries and ultimately result in equivalent standards of care. Combining forces in a coordinated effort can lead to accelerated development and cost reduction (10).

The era of questioning robotic surgery results, safety and durability is over as plentiful data have been gathered to support its use. However, we still perceive a hard-wearing resistance. Misinformation can be as harmful as disinformation, as it prevents patients from accessing the benefits of robotic mitral surgery and discourages technological acquisition and surgical advancement. We continuously motivate professionals treating cardiovascular disease to change their mindset and embrace newer and better possibilities of care.

In conclusion, the high burden of MV disease in Latin America has impacted the development of cardiac surgery in this vast and highly heterogeneous region. Initiated in 2010, robotic cardiac surgery for MV disease is a cost-effective innovative field which is constantly evolving. Despite the obvious challenges for its implementation in low and middle-income economies, we believe in the enormous potential for technological growth. Furthermore, robotic MV surgery is sustainable and can help reduce morbidity and mortality rates, disability, and healthcare costs. Therefore, we support the use of robotics in public and private settings in Latin America to maximize benefits while minimizing surgical risks and to help mitigate the impact of MV disease in developing countries.

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## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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