

Research Article

A STUDY ON MITRAL VALVE REPAIR WITH MITRA CLIPS AN ADVANCE CARDIAC TECHNOLOGY FOR MITRAL VALVE PROLAPSE PATIENTS

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Received 16th April 2026; Accepted 17th May 2026; Published online 30th June 2026

ABSTRACT

The Mitra Clip is a minimally invasive trans catheter edge to edge repair Teer procedure that valve leaflets to treat severe mitral regurgitation, alternative for high risk surgical patients. Proper patient selection, reduce mitral regurgitation in 95% cases and improves heart function, relieves shortness of breath and enhance the quality of life. However, it avoids, open heart surgery risks shortens hospital stay for 1-2 days and lowers complications, especially elderly and comorbid patients.

Keywords: Mitral valve, Regurgitation, Shortness of Breath, MitraClip and Teer.

INTRODUCTION

It is a minimally invasive procedure approved for treating patients with clinically significant mitral regurgitation due to either (a) a deteriorated mitral valve in patients who are deemed to be at prohibitive risk for surgery, or (b) a leaking (or regurgitate) mitral valve, due to heart failure and reduced pumping function, in patients who remain symptomatic despite maximally tolerated medications to treat their heart failure.

Moreover, Mitral regurgitation (MR) is one of the most common valvular heart diseases. It is associated with significant morbidity and mortality rates, particularly in critically ill patients such as those with hemodynamic instability in the setting of shock. Theoretically, severe MR can lead to left a trial and ventricular volume overload, progressive left ventricular dysfunction, and pulmonary hypertension, further complicating the clinical picture in this critically ill patient population. Acute primary mitral regurgitation, most often due to papillary muscle rupture, is traditionally managed with urgent surgical repair or replacement.

Despite being the guideline-directed approach, surgery in this context carries very high operative risk, with reported mortality rates approaching one in five in pooled analyses and nearly 40 % in some single-center experiences. For patients considered inoperable or extremely high-risk, transcatheter edge-to-edge repair has emerged as an alternative.

Data from a recent multicenter registry of patients with post-infarction papillary muscle injury showed procedural success in the majority (87 %), with most surviving to discharge and no additional mortality at one year, highlighting TEER as a realistic salvage or bridge-to-surgery strategy in this critically ill population. In contrast, secondary MR arises from ventricular remodeling and dysfunction, where transcatheter edge-to-edge repair (TEER) has increasingly emerged

as a preferred alternative in high-risk patients, with registry and trial data supporting its feasibility even in acute and unstable settings

Trancatheter edge-to-edge mitral valve repair (TEER) with the MitraClip system has emerged as a promising alternative for those with severe MR who are deemed high-risk for surgery. Studies like COAPT demonstrated the efficacy of MitraClip in improving survival and reducing heart failure hospitalizations in patients with functional MR, particularly in well-selected cohorts. However, the MITRA-FR study, which involved patients with larger left ventricular volumes and less severe MR, did not demonstrate significant clinical benefit, underscoring the importance of appropriate patient selection.

The use of Mitra Clip has also expanded to critically ill populations, including those with shock, showing promise in stabilizing hemodynamics and improving outcomes in certain high-risk groups. The RESHAPE Heart Failure (RESHAPE-HF2) trial demonstrated improved outcomes with MitraClip in patients with secondary (functional) MR, reinforcing the utility of TEER alongside optimal medical therapy in specific chronic heart failure populations.

Additionally, the ongoing REPAIR-MR (Randomized Evaluation of the MitraClip Device in Patients with Primary Mitral Regurgitation) trial specifically evaluates the role of MitraClip versus surgical repair in patients with severe primary MR at moderate surgical risk, potentially broadening indications for TEER. While TEER has proven effective in patients with severe MR

OBJECTIVE

To investigate the comparative effectiveness, harms, and cost-effectiveness of percutaneous mitral valve repair using mitral valve clips in candidates at prohibitive risk for surgery.

To evaluate the feasibility, safety, and clinical outcomes of MitraClip implantation in patients with severe MR

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SYMPTOMS OF MITRAL VALVE REGURGITATION

- Shortness of Breath (Dyspnea): Breathlessness upon exertion or when lying down, which may disrupt sleep.
- Fatigue: Feeling unusually tired or weak.
- Heart Palpitations: Sensation of a rapid, fluttering, or skipping heart rhythm.
- Swelling (Edema): Fluid retention in the ankles, feet, or abdomen.
- Cough: A dry, hacking cough.
- Light-headedness: Feeling faint.

INDICATIONS

General Indications for MitraClip (TEER)

Symptomatic Severe Mitral Regurgitation

MR graded $\geq 3+$ (moderate-to-severe or severe)

Indications in Primary (Degenerative) MR

Severe symptomatic DMR

Favorable valve anatomy

High or prohibitive surgical risk, due to- Severe co morbidities (e.g., COPD, CKD) Prior cardiac surgery Advanced age

Indications in Secondary (Functional) MR

This is the **most evidence-driven indication** today.

PATIENTS MEETING COAPT-LIKE CRITERIA

Indications include:

- Symptomatic (NYHA II–IV)
- Severe secondary MR despite:

Guideline-directed medical therapy (GDMT)

Cardiac resynchronization therapy (if indicated)

PROCEDURE

TEER With the MitraClip System

TEER with the MitraClip device is a less invasive treatment option for patients with MR. Performed in a cardiac catheterization lab or hybrid OR Patient is given **general anesthiatransesophageal echocardiogram (TEE)** probe is inserted to guide the procedure in real time,

The mitral valve clip procedure is a way to repair mitral heart valve without open heart surgery. Although this option was originally adopted for patients who were too sick or too high risk for open heart surgery, many people who are experiencing mild to moderate symptoms of mitral regurgitation choose to have this procedure.

The procedure is performed percutaneously, which means the healthcare provider accesses heart through a vein, usually the groin. A catheter is inserted into the **femoral vein** (in the groin) and the catheter is advanced up into the **right atrium** of the heart, the small hole will be created in the **interatrial septum** (wall between right and left atrium) this allows access to the **left atrium**, where the mitral valve is located A small metal clip coated in polyester fabric, the mitral valve clip device, is inserted in the leg and guided by a long, flexible tube called a catheter up to your mitral valve.

The clip is attached to two areas of the defective valve, in what healthcare providers call an 'edge-to-edge' repair. This allows for greater blood to flow in the right direction. Although a mitral valve clip may significantly reduce mitral valve regurgitation, sometimes called mitral valve

MITRA CLIP

Insufficiency, it rarely eliminates the condition altogether, although patients may report a significant reduction in their symptoms a few days after the procedure is performed.

The mitral valve clip procedure is usually scheduled and performed in an outpatient setting. The entire procedure usually lasts between 1 to 3 hours, although it can take longer depending on the complexity of the case.

COUNTRIES PERFORMING MITRACLIP PROCEDURES

The Mitra Clip procedure is widely available across North America, Europe, and Asia, including in countries such as the United States, Germany, France, Italy, Japan, and India. In India, Narayan Hrdayala. Bangalore Apollo Hospitals in Chennai has been a pioneer, performing multiple Mitra Clip procedures in a single day, making it one of the leading centers in Asia



BENEFITS OF MITRACLIP

Minimally invasive approach

Performed via catheter through a vein in the leg, avoiding open-heart surgery. Leads to **less pain, shorter hospital stays (1–2 days), and faster recovery**.

- **Symptom relief**
- Significant reduction in **shortness of breath, fatigue, palpitations, and swelling**.
- Patients often report **improved exercise tolerance and daily functioning** soon after the procedure.
- **Reduced hospitalizations & mortality**
- Studies show a **51% reduction in heart failure-related hospitalizations** and a **33% reduction in mortality risk** compared to untreated severe mitral regurgitation.

Improved quality of life

Patients experience better energy levels, reduced heart failure symptoms, and overall enhanced well-being.

Benefits can last for **at least 2 years**, with ongoing monitoring recommended.

Mitra clip procedure cost

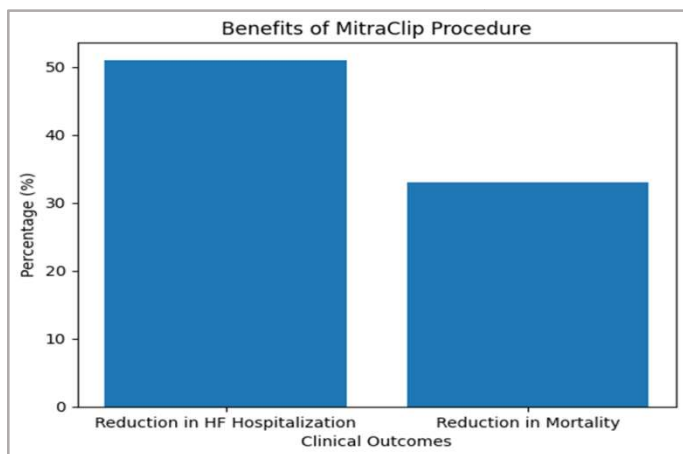
The common concern is the cost of the mitral valve clip procedure. Costs vary by region, hospital, and individual patient factors but typically include

- Device cost
- Hospital and operating fees
- Anesthesia and imaging
- Pre-and post procedure

In India, the total package for MitraClip may range from ₹12 lakhs to ₹18 lakhs, depending on the centre's accreditation, team expertise, and in-hospital services. Many hospitals offer financing plans or package deals that cover follow-up visits and medications.

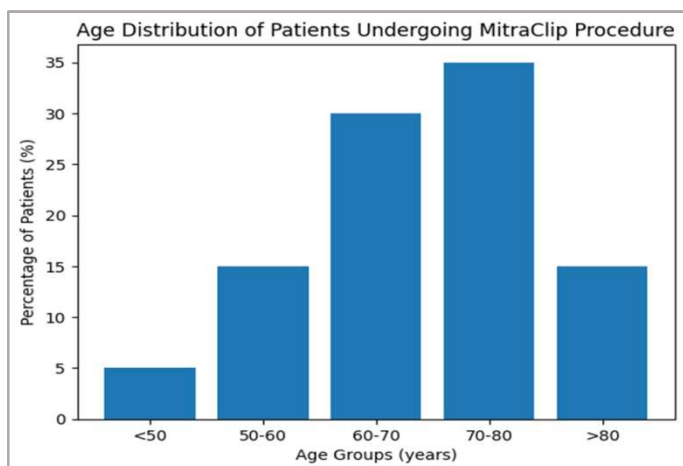
Clinical benefits of the MitraClip procedure:

- Reduction in heart failure hospitalizations: **51%**
- Reduction in mortality: **33%**

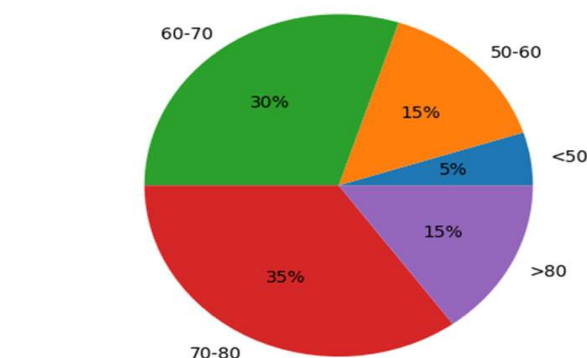


Age Distribution Graph for patients undergoing the MitraClip procedure.

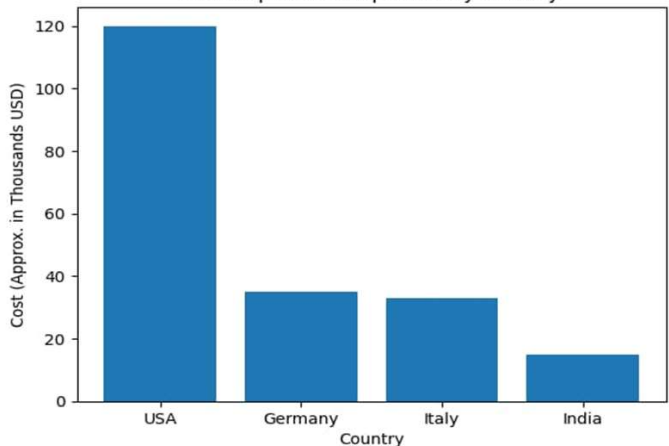
- Most patients are in the **70–80 years age group** (highest percentage).
- Followed by **60–70 years**.
- Very few patients are **below 50 years**.
- This shows that MitraClip is mainly used in **elderly, high-risk patients** who are not suitable for open-heart surgery.



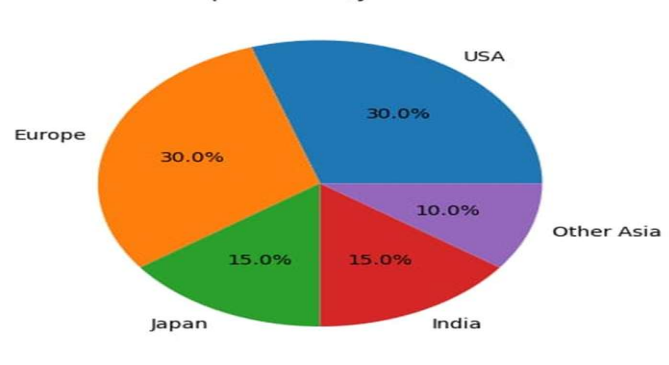
Age Distribution of Patients Undergoing MitraClip Procedure



MitraClip Cost Comparison by Country



MitraClip Availability Distribution



COMPLICATIONS AND RISKS

- **Clip-Related Issues:** Single leaflet device attachment (SLDA), where the clip detaches from one leaflet, is a known complication. Complete detachment and embolization are rare but severe, potentially requiring surgery.
- **Structural/Cardiac Damage:** Potential for cardiac perforation, tamponade, or the creation of an iatrogenic atrial septal defect.
- **Valve Dysfunction:** Development of relative mitral stenosis (pressure gradient >5 mmHg) occurs in up to 25% of patients.
- **Vascular/Procedural:** Major bleeding requiring transfusion, often at the vascular access site in the groin.
- **Systemic Complications:** Acute renal failure, cardiac arrhythmias, septic shock, and in-hospital mortality (0.9%)

CONCLUSION

It is one of the surgery is preventive life saving measure for mitral valve prolapse and regurgitation of blood to the lungs. This procedure is effective particularly when open heart surgery is not able to perform especially in elderly people 65yr and above for life sustainability, also it is done in the paediatrics patient with minimal invasive surgery.

RECOMMENDATION

Based on the available evidence, Transcatheter Edge to Edge Repair (TEER) with the mitra clip device can be considered an effective minimally invasive treatment option for selected patients with significant mitral regurgitation who are at high surgical risk.

Studies have demonstrated improvement in mitral regurgitation severity, functional status, quality of life, and reduction in heart failure related hospitalizations following the procedure.

ACKNOWLEDGEMENT

First of all my sincere gratitude to almighty god for his constant mercy and guidance in completing this study. My sincere and heartfelt thanks to my parents Mr Malakappa, mother Mrs Iramma, my sister Godavri and my friend Pooja Patil for their kind and support, inspiration, encouragement and concern during this project. I extended my thanks to Prof. RK Muniswamy, Principal, Shridevi Institute of Nursing. Dr T.S Bheemaraju, Prof, HOD. Department of Psychiatric Nursing Shridevi College of Nursing Tumkur, Lecturer Shilpa H.M, Lecturer & MR.Nagesh for their proper guidance, valuable suggestions and continuous encouragement from beginning to end of my study successfully.

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