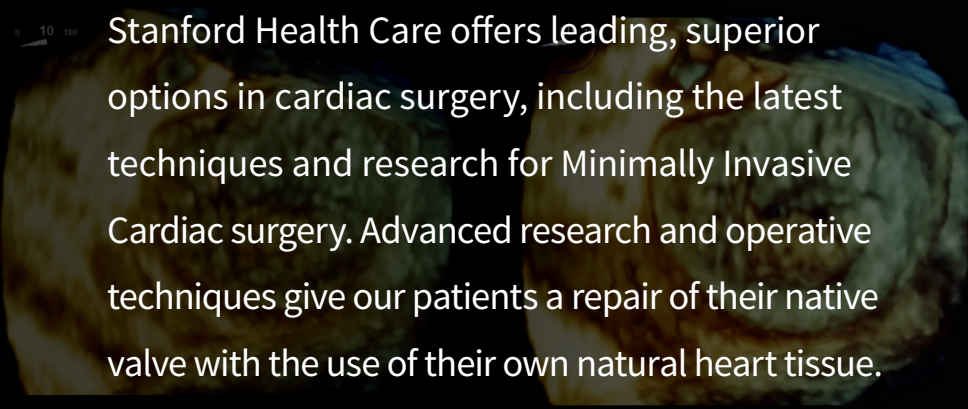




Minimally Invasive Mitral Valve Surgery



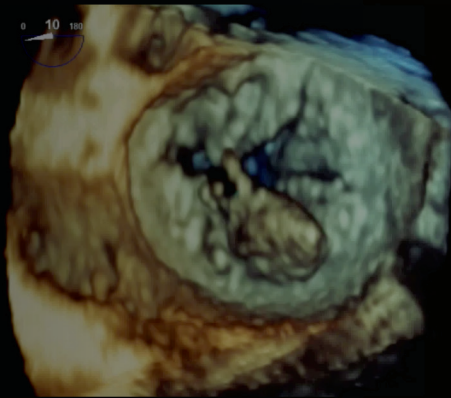
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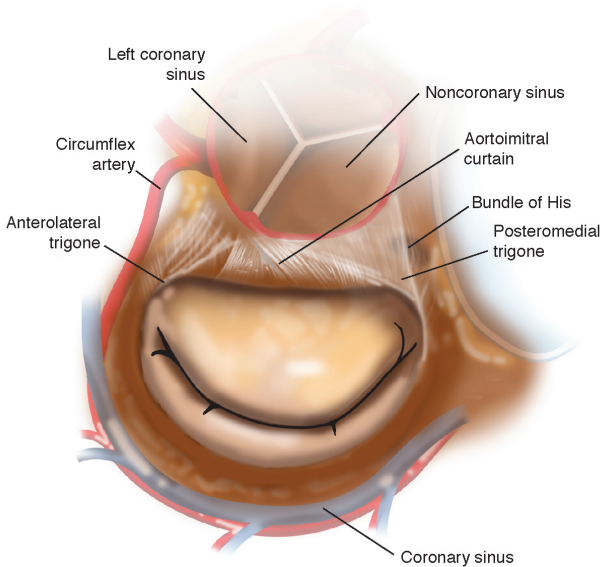
Stanford Health Care offers leading, superior options in cardiac surgery, including the latest techniques and research for Minimally Invasive Cardiac surgery. Advanced research and operative techniques give our patients a repair of their native valve with the use of their own natural heart tissue.

Long-standing or chronic mitral valve disease or insufficiency causes backwards flow of blood into the left atrium (LA) and destructively increases pressure on the left ventricle and heart. Over time, the left atrium dilates as a response to the larger volume. This remodeling produces an increase in LA and LV pressures. Current guidelines recommend early surgical intervention to prevent these detrimental effects on the heart. Such early intervention is key, even for asymptomatic patients with severe MR.

For decades, the standard approach for mitral valve repair has been a median sternotomy. Minimally invasive approaches are now increasingly sought by patients. A minimally invasive approach provides many benefits, including one supported by our research: intraoperative repair that is more immediate and effective, and highly durable. A small, right-sided incision also provides a more useful and direct view of the mitral valve. Robotic surgical techniques, pioneered by our surgeons, can also be utilized. Because the mitral valve lies anatomically in



an annular plane that nearly approximates the sagittal plane of the body, this right lateral approach also provides an en face view of the valve that surpasses that available in a median sternotomy, providing less pain and quicker recovery time.



Normal Mitral Valve Anatomy

ABOUT MINIMALLY INVASIVE VALVE SURGERY

The patient is pre-operatively evaluated with standard echo and coronary catheterization. Associated comorbidities should be considered, including disease process, height, weight and body habitus. This information will confirm if the patient is a good candidate for minimally invasive mitral valve surgery. During the minimally invasive surgery, all mitral valve repairs or replacements are done under direct vision. This clear view allows the surgeon access to the entire surgical field and to visually test and confirm a competent valve, after a repair or replacement is completed. Advanced techniques of leaflet repair and annuloplasty are all accomplished within the small incision. Throughout a patient's surgical procedure

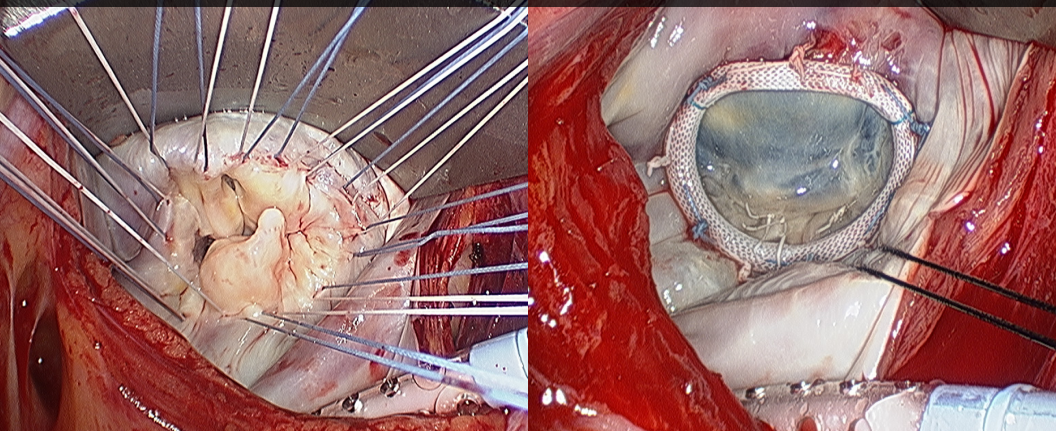


and hospital stay, our multidisciplinary cardiac surgery team provides highly skilled care rooted in our expertise and experience in minimally invasive surgery.

Procedure details

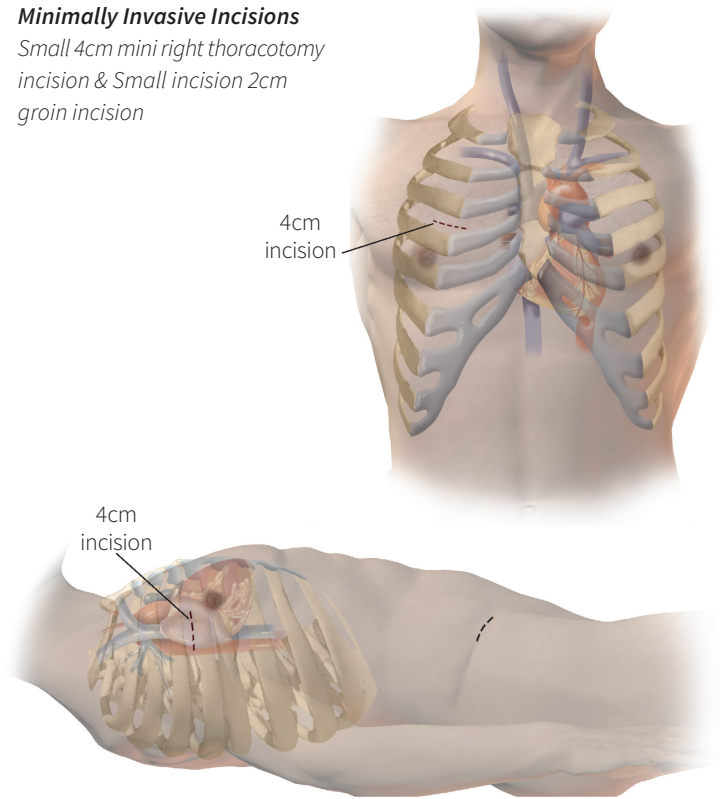
- Standard arterial and internal jugular vein lines
- Double lumen endotracheal tube, for single lung ventilation
- Right internal jugular venous cannula inserted for SVC drainage (removed at completion of surgery, leaving a small .5mm stab incision)
- Femoral arterial and IVC venous cannulation (removed at completion of surgery, leaving a small 2 cm incision)
- Three to four 0.5-1cm ports for docking ports for minimally invasive instruments
- Access to mitral valve via a 4cm right sided mini thoracotomy:
 - Infra-mammary groove between the 3rd or 4th intercostal space depending on whether male or female patient
- Post-operative TEE valve repair confirmation

Left: operative view of the mitral valve in a minimally invasive approach, with ring repair sutures in place. **Right:** operative view of the mitral valve in a minimally invasive approach, with ring in place, exceeds that of a standard sternotomy.



Minimally Invasive Incisions

Small 4cm mini right thoracotomy incision & Small incision 2cm groin incision



Candidates for Minimally Invasive Surgery

- Patients with mitral valve disease, including mitral regurgitation or mitral stenosis; for advanced technique repair or replacement
- Patients with concomitant atrial fibrillation, requiring a MAZE procedure
- Patients in need of atrial septal defect (ASD) repair or tricuspid valve disease



Minimally Invasive Surgery Incision

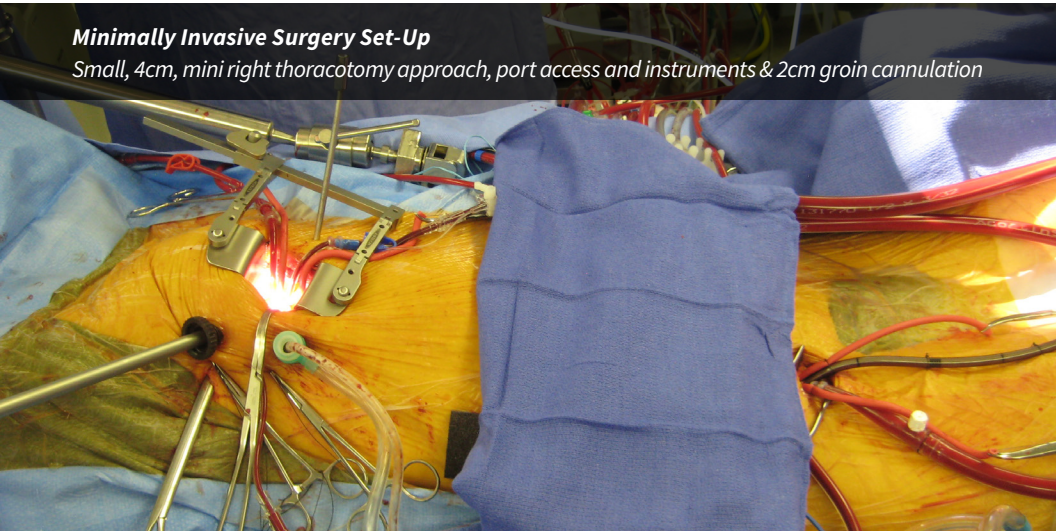
Close up of small, 4cm, mini right thoracotomy incision, with retractor in place

Potential Benefits of Minimally Invasive Surgery

- Facilitates a more effective immediate repair
- Avoids full sternotomy
- Small, right-sided, 4cm mini-thoracotomy incision
- Shorter ventilation time
- Lower incidence of post-operative atrial fibrillation
- Reduced transfusion rate and reduced post-operative bleeding
- Shorter ICU stay
- Shorter hospitalizations stay
- Lower risk of complications
- Improved cosmesis with minimal incisions and scarring, especially for women's scars that can be hidden in the inframammary crease
- Eliminates risk of sternal wound complication
- Reduction in post-operative pain
- Faster return to active life
- Long-term durability of mitral valve repair and freedom from re-operation
- Concomitant procedures are possible

Minimally Invasive Surgery Set-Up

Small, 4cm, mini right thoracotomy approach, port access and instruments & 2cm groin cannulation



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