

Minimally invasive cardiac surgery on patients with breast implants

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The presence of breast implants can interfere with the surgical exposure for the completion of a minimally invasive heart procedure. We present a series of 7 patients with valvular heart disease with previous breast implant. We perform periareolar approach on the majority of cases, preserving the capsule and removing the implant. It is safe and feasible to perform a minimally invasive approach through periareolar approach in patients with breast implants without presenting complications and preserving the cosmetics.

Key words: Breast implant; Heart valve surgery; Minimally invasive cardiac surgery.

La presencia de implantes mamarios puede interferir con la exposición del cirujano para realizar una cirugía cardíaca mínimamente invasiva. Se presenta una serie de 7 casos de pacientes con patología valvular portadoras de prótesis mamarias. El abordaje es periareolar preservando la capsula y removiendo el implante. Se demostró que es seguro y reproducible realizar un explante de prótesis mamaria y abordaje de mínima invasión sin presentar complicaciones, preservando la cosmética.

Palabras clave: Prótesis mamaria; Cirugía cardíaca por mínima invasión; Cirugía valvular cardíaca.

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According with the American Association of Plastic Surgery, 300,000 breast implant surgeries were done in 2017 [1]. In the future, there will be even more patients that received breast implants with heart valve pathology in potential need of surgical intervention.

Minimally invasive cardiac surgery is a trend nowadays, because it possesses numerous benefits over conventional surgery such as: early extubation, short intensive care unit (ICU) stay, less surgical site wound infections and mediastinitis, less blood loss, short hospital stay, reduction in pain and better cosmetics [2,3]. However, the surgeon could think that the presence of breast implants would contraindicate the minimally invasive approach. There are very few reports on the literature about how to approach these patients with a minimally invasive technique [4-6]. We present a 7-case series of patients with breast implants operated on by minimally invasive surgery.

Surgical technique

During anesthesia, a double lumen endotracheal tube is used for single lung ventilation in all patients, to isolate the right lung. The patient is positioned inserting a roll or pillow vertically between the scapulae to elevate the right side of the chest between 15-30°. External defibrillator pads are placed.

The right femoral vessels are cannulated using the Seldinger technique, under TEE (transesophageal echocardiography) guidance. Arterial cannulation is done using an 18-20 Fr EOPA cannula (Medtronic Inc. Minneapolis, MN), venous cannulation is achieved using a 25 Fr Biomedicus cannula (Medtronic Inc. Minneapolis, MN). For those patients requiring right-sided extra procedure, a jugular cannula 5-17 Fr Biomedicus (Medtronic Inc. Minneapolis, MN) was inserted.

Once cannulation is completed, the approach is periareolar or submammary incision, depending on the previous incision on the breast surgery. The periareolar approach consists on performing an incision on the nipple going from 3 to 9 clockwise, making a 180° wound on the areola-nipple complex (Fig. 1). Glandular tissue is dissected with cautery until reaching the capsule of the prosthesis. With the presence of a plastic surgeon, the capsule is opened until reaching the pectoralis major muscle, which is divided. The prosthesis is placed in a mixed saline and antibiotic solution. The approach is through the fourth intercostal space (ICS). An Alexis soft tissue retractor (Applied medical, Rancho Santa Margarita, CA), and a thoracic retractor are applied to the wound to access the cavity. (Fig. 2) The pericardial fat is excised to improve visualization. The pericardium is incised 3 to 4 cm above the phrenic nerve. Two small incisions from 3 to 4 mm are done on the mid axillary line to insert silk sutures for pericardial retraction, this improves exposure of the heart to the incision site (Fig. 2). Cardiopulmonary bypass (CBP) is started. Both venae cavae are snared with umbilical tapes in case that opening of the right heart is needed. Next, a 1 cm incision is performed on the 5th to 6th ICS on the ante-

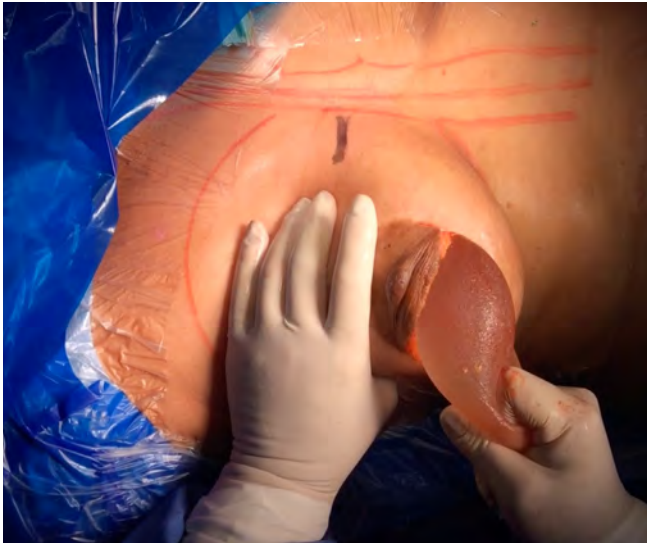


Figure 1. Incision and implant removal. The periareolar incision is noted. The capsule is open, and the prosthesis has been removed by the surgeon.

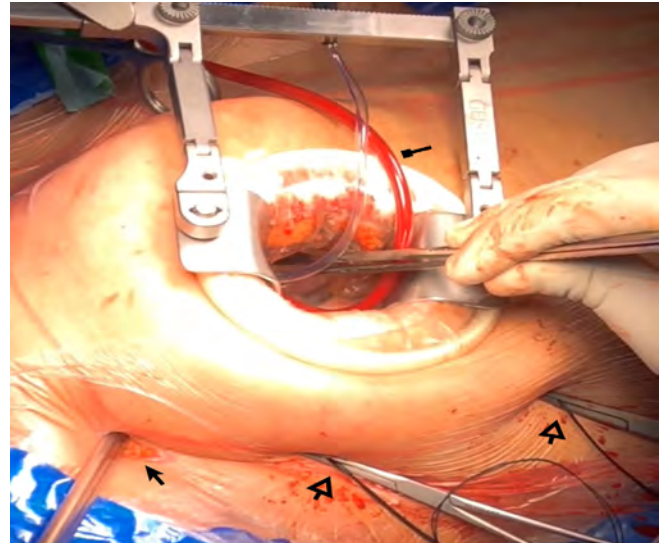


Figure 2. Exposure. Surgeon's view. The soft tissue and costal retractor are in place. The two hollow arrows represent the silk sutures retracting the pericardium. The black arrow shows the aortic clamp in position and the squared arrow points at the cardioplegia needle on the aorta.

rior axillary line to put the vent and another on the 6th ICS to put a 24 Fr chest tube and insufflate CO₂ (4 lt/min). A 1 cm incision is done between the 2nd and the 3rd ICS on the anterior the axillary line to insert the Chitwood aortic clamp. (Fig. 2) We administer cardioplegia through the aorta with a large one-way needle (Medtronic Inc. Minneapolis, MN) taken out by counter incision or directly by the surgical orifice. The aorta is clamped. After 2014, we utilize Del Nido cardioplegia. Once in cardiac arrest, if the right heart is needed for opening, we reposition the femoral venous canula up to the inferior vena cava and atrial junction, both cavas are snared. For mitral surgery, we perform left atrium opening by

the Söndergaard's groove. The repair or replacement is done with the conventional technique (Fig. 3) Upon the end of the surgery, the right atrium is closed with polypropylene 4-0 in continuous suture.

A TEE is realized to make sure that the repair or replacement is successfully done. For ASD or sinus venosus type ASD repair a transverse incision from the right atrial appendage through the inferior vena cava is done. After identifying the defect, a bovine pericardial patch is sutured using polypropylene 4-0 double running suture. The right atrium wall is closed. After right atrium wall closure, the cardioplegia is connected to

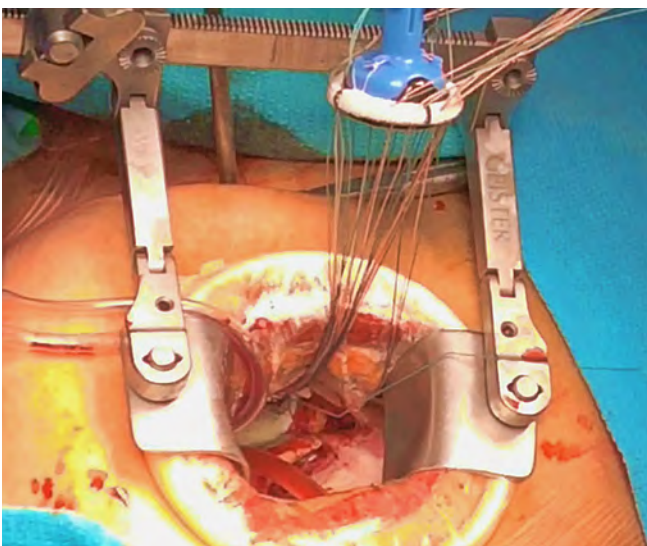


Figure 3. Procedure. This is a case of a mitral valve replacement. Surgeons view of the mitral annulus can be observed.



Figure 4. Closure. After the procedure is done, the prosthesis is reimplanted into the capsule and closed.



Figure 5. Wound. The periareolar incision is closed. Symmetry of the breast is noted.

the pump suction to deair cavities and aortic unclamping is done. Before unclamping it is recommended to place an epicardial pacemaker lead in the right ventricular free wall. CO₂ is taken out. The mediastinal chest tube is left by the same orifice it was placed at the beginning of the surgery where the CO₂ was connected. It is repositioned through the transverse sinus for drainage. Heparine is reverted with protamine. Hemostasis is done, cannulas are taken away. The groin wound is closed. The ribs are closed with a poliglactyn (Vicryl, Ethicon) suture in "X" fashion. The capsule is closed above the intercostal muscles with absorbable suture. The plastic surgeon proceeds to relocate the same breast implant or change it if necessary (Fig. 4) The prosthesis capsule is closed, and a drainage is left inside the cavity. The periareolar incision is closed. The nipple areola complex is closed by subdermal suture with poliglecaprone (Monocryl, Ethicon) (Fig. 5).

CLINICAL CASES

Case 1. A 42-year female with breast implant surgery 15 years before cardiac surgery. Echocardiographic study showed severe mitral insufficiency, with a mechanism of P1-P2 prolapse, and a left ventricle ejection fraction (LVEF) of 65%. Catheterization with no additional lesions. Interestingly, she had rupture of her right breast implant. With help of plastic surgeon, the breast implant is removed. The cavity is cleaned, and silicone debris are removed. The rest of the surgery went out with the technique described before. she had mitral valve repair with placement of 16 mm neochords of Goretex (Gore, Flagstaff, AZ) and a CG Future 34 annuloplasty ring (Medtronic Inc, Minneapolis, MN). Postoperative TEE showed absence of any leak and a successful repair with adequate coaptation. A new breast implant was placed. The other implant was done 7 months later. Endotracheal tube was removed 5 hours after surgery. Chest tube drainage during the first 24 hours was 230 mL. The length of stay at ICU was for one day, and discharged 4 days after operation. She referred no pain or loss of sensibility at the outpatient clinic follow-up.

Case 2. 40-year-old female with mitral valve insufficien-

cy. TTE reported prolapse of mitral valve on A2 and P2 segments, without alterations on the ventricular function. With previous plastic surgery, a periareolar approach was completed, and the breast implant was explanted. Mitral valve repair was done with reorientation of chordae tendineae. A CG future 34 ring was placed. After completion of surgery both breast implants were changed. The patient was extubated on the OR. Total ICU stay was 3 days, and patient was discharged 6 days later without complications. At one month follow-up at outpatient clinic, the patient referred with great improvement without pain. TEE reported successful repair, without insufficiency or stenosis.

Case 3. 25-year-old female with severe mitral insufficiency, in clinical surveillance since she was 18 years old. One year before her heart surgery she suffered a stroke that required craniectomy and ventriculostomy with prolonged length of stay in ICU. She had tracheostomy, left hemiparesis and other complications such as bowel perforation that required laparotomy. She presented chest pain and hemodynamic decompensation. We decided to perform minimally invasive mitral valve replacement. With assistance of the plastic surgeon, a periareolar incision was done, and the implant was taken off. The capsule was opened, and the chest was entered via the fourth intercostal space. We decided to make a valve replacement because the anatomy of the patient was not suitable for repair. The patient was extubated at 24 hours after surgery, without initial complications regarding the approach or the breast implants. She was discharged from ICU at 48 hours. However, she started to have fever and elevation of acute phase reactants. We started antibiotics. TTE, CT scan and blood cultures were negative. TEE 18 days after surgery shown an image suggesting a thrombus adhered to the valvular sutures and ring. The blood cultures were positive for *E. cloacae*. We decided to take the patient to the OR and reviewed the valve, finding a 3 cm vegetation that was partially occluding the valve, with an abscess and loss of tissue on the mitroaortic junction. The valve was explanted, the vegetations were taken off as well as the rest of the subvalvular apparatus. The cavity was washed with vancomycin solution. A new 29 mm mechanical mitral valve was implanted. The patient had a great hemodynamic course. Early extubation, free of fever. She received oral anticoagulation on therapeutic parameters. The patient was discharged home 7 days after the second surgery. TTE without any paravalvular leaks. The patient denies pain on surgical site. The last echocardiography was 6 years after operation, with LVEF of 60% and normal functioning mitral valve prosthesis.

Case 4. 55-year-old female with rheumatic mitral valve disease. NYHA functional class II, TEE revealed rheumatic mitral valve disease with stenosis and insufficiency and normal left ventricular function. We performed a mitral valve replacement with a 27mm mechanical valve without complications. The patient was extubated at the OR. Five hours later on the ICU she presented complete heart block and asystole requiring CPR during one minute; a pacemaker was connected, and the patient recovered without reperfusion. TTE ruled out cardiac tamponade, with adequate function of the prosthesis. Four days later she developed a new onset atrial fibrillation treated successfully with calcium channel blocker. She was anticoagulated with warfarin to therapeutic range and discharged 8 days after surgery. Postoperative echocardiography confirmed normal functioning prosthesis. The patient is asymptomatic, with episodes of paroxysmal atrial

fibrillation. No approach-related complications were seen. At the outpatient clinic, she was in NYHA functional class I, with normal TTE.

Case 5. A 52 year old female with mitral valve disease and clinical symptoms. TTE showed a myxomatous valve with severe prolapse. Inframammary approach was done. The patient had a 31 mm Mosaic mitral valve bioprosthesis (Medtronic, Inc, Minneapolis, MN), as leaflets were redundant and prolapsed with calcification and retraction of the sub valvular apparatus. Operation went free of complications. The patient was extubated 5 hours after operation and discharged from ICU 5 hours later. In-hospital discharge was on the fourth postoperative day. Normal TTE without evidence of paravalvular leak. On follow up consultation the patient referred asymptomatic without any problem on surgical incision.

Case 6. A 43-year-old female with past medical history of rheumatic fever. TEE shown severe mitral valve insufficiency, with LVEF of 60%. She had history of breast implants. We performed a right inframammary incision. The patient had pericarditis; adhesions were liberated. Operative findings were consistent for rheumatic characteristics. A 31 mm mitral bioprosthesis was implanted. A defect on the implant capsule was noted and closed with a 7x7 bovine pericardium patch. The breast implant was placed on the cavity. She was extubated 4 hours after surgery, ICU stay of 24 hours, and in-hospital stay of 3 days. TTE five months after surgery was normal, the patient referred asymptomatic and in functional class I of NYHA.

Case 7. 32-year-old female with mitral valve disease under medical treatment for 6 years until she started with dyspnea and clinical impairment. TEE revealed severe insufficiency, P2 prolapse and LVEF of 65%. We performed mitral valve repair. The approach was a periareolar incision with assistance of plastic surgery for the handling of the breast implants. She had P2 and P3 prolapse. We performed mitral valve repair with PTFE neo chords and a 36 mm CG Future annuloplasty ring (Medtronic Inc, Minneapolis, MN). Post-operative TEE with successful repair showing a good coaptation surface and area without insufficiency. The patient arrives to ICU extubated and without any medication. ICU stay for 24 hours; in-hospital stay of five days. TEE 10 months after surgery showed trivial mitral insufficiency. She referred just mild pain in the wound site and a little of numbness on the groin.

Table 1. Demographic and operative variables, n=7

VARIABLE	
Age, Mean (IQR)	41 (32-54)
Diagnosis, n (%)	
Severe mitral insufficiency, degenerative	5 (71.4)
Double mitral valve lesion, rheumatic	1 (14.3)
Severe mitral insufficiency, mixomatous	1 (14.3)

IQR: interquartile range

Table 2. Procedure related variables n=7

VARIABLE	
Surgery n (%)	
Mitral valve repair, Neo chords	3 (42.9)
Mechanical mitral prosthesis	2 (28.6)
Biological mitral prosthesis	2 (28.6)
Type of annuloplasty ring, n (%)	
CG future 34 mm	2 (28.6)
CG future 36 mm	1 (14.3)
Approach, n (%)	
Inframammary	3 (42.9)
Periareolar	4 (57.1)
Cross clamp time, median (IQR)	3 (72-90)
Cardiopulmonary bypass time, median (IQR)	111 (106-134)
Valve replacement, n (%)	4 (57.1)
Mechanical ventilation time, hours (SD)	7 (± 8.1)
ICU stay in days, mean (SD)	2.2 (±2.2)
Complication, n (%)	
Early prosthesis endocarditis	1 (14.3)
Arrythmia	1 (14.3)
Postoperative ecocardiography, n (%)	
Normal functioning valve	6 (85.7)
Change of breast implant, n (%)	4 (57.1)
In-hospital Length of Stay, mean (SD)	9,8 (±12.9)
Operative mortality	0 (0)

ICU: Intensive care unit; IQR: Interquartile range; SD: Standard deviation

COMMENT

There are very few published data about how to approach a patient with breast implants in a minimally invasive cardiac surgery. To our knowledge, we are presenting the biggest series of cases of patients (Table 1). Baker et al. [4] presented a 5-patient series operated through minimally invasive approach, by using an inframammary incision. On our series, the most common approach was by performing a periareolar nipple incision from 3 to 9 clockwise in 57% of the cases. The rest was done via inframammary because this was prior incision performed on the breast implant surgery. The periareolar approach is utilized commonly by the plastic surgeons. It gives good exposure of the surgical field as well as cosmetic scar without losing sensitivity or vascularity of the skin. It is of vital importance to include the plastic surgeon from the presurgical assessment. In order to evaluate the time of the breast implants, the nature of the implants (saline or silicone based), the status of the implant (broken or not) and to assess the necessity of changing the contralateral implant. During the surgical procedure, the plastic surgeon can take out and preserve the capsule and the implant. Some of the implants can be with severe adhesions and fibrosis. If the dissection is not correctly performed, the capsule might develop fibrosis and eventual further breast deformities.

The periareolar approach through the capsule and by the fourth intercostal space allows to perform the procedure ad-

equately with no additional exposure troubles. In our series, there were no complications related to the incision (bleeding, capsular hematoma, deformities of the breast, loss of sensitivity or infection), all of them previously reported in the literature [4-7] (**Table 2**). One patient had early onset of endocarditis; however, she had past medical history of bowel perforation. Other of our patients presented an acute AV complete block and required ICU resuscitation, resolved with a temporary pacemaker. These complications are not attributed to the surgical exposure. We performed mitral valve repair in 42% of the cases, with implantations of polytetrafluoroethylene (PTFE) neo chords and mitral annuloplasty ring. The median of aortic cross-clamping time was 83 min. The immediate postoperative course was satisfactory. The mean of mechanical ventilation was 7 hours. The mean ICU stay was 2.2 days. There were no deaths. At the follow up, there were no problems related to the approach or the incision.

Gong et al [8]. described a capsular preservation technique. They used an inframammary approach and electro-

cautery dissection beneath the capsule to enter the fourth intercostal space. However, we consider this is more dangerous because the capsule and the implant could be damaged, and the exposure can be compromised.

With this series of cases, we suggest that is safe and feasible to perform minimally invasive cardiac surgery with the periareolar or inframammary approach in patients with breast implants without presenting complications while preserving the cosmetics. We recommend the assessment of a plastic surgeon through all the process.

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