Comparison of minimally invasive cardiac surgery incisions: Periareolar approach in female patients

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Abstract

Objective: All innovations in cardiac surgery provide us with new techniques to perform surgery through smaller incisions with less invasive and best cosmetic results. After promising results in minimally invasive cardiac surgery (MICS), pain and cosmetic appearance became important end points, especially for female patients. In the current study, we intended to evaluate the surgical results and cosmetic satisfaction with the periareolar and submammary incision types in cardiac surgery.

Methods: Ninety-four female patients underwent MICS between July 2013 and March 2018. MICS was performed in 62 patients via periareolar incision and in 32 patients via submammarian incision. We investigated the incision size, wound infection, pain levels by using a postoperative standard pain-level questionnaire, the postoperative scar size, and patient satisfaction using a postoperative patient questionnaire.

Results: Periareolar incision size was smaller than the submammary incision (Group A: 5.6±0.6 vs. Group B: 6.7±0.8, p=0.001). Four patients from Group B had superficial wound infection (p=0.01). Patients who underwent MICS via periareolar incision and submammary incision had similar pain level (p=0.2). The scar tissue was smaller in size and postoperatively healed better in the following days for the patients with periareolar incision due to the elastic structure of breast tissue. (Group A: 4.3±0.4 vs. Group B: 5.3±0.2, p=0.001).

Conclusion: Our study suggests that the periareolar approach would be more aesthetic, show better healing, and have a smaller scar size in female patients. *(Anatol J Cardiol 2018; 20: 283-8)*

Keywords: periareolar incision, submammary incision, minimally invasive cardiac surgery

Introduction

Minimally invasive techniques have been safely performed for over 20 years, just after Rao and Kumar (1) successfully performed a right anterior thoracotomy for the aortic valve replacement in two female patients. Because of good outcomes, minimally invasive cardiac surgery (MICS) is preferred in cardiac surgery (2). The procedure became more popular because it reduced the operative trauma, hospitalization stay, and hospital cost with less need of postoperative analgesics compared to conservative median sternotomy (3, 4). Although many diverse techniques and approaches were defined in the literature, right mini-thoracotomy is the most common access route for the mini mitral valve replacement/repair (MVR/R), tricuspid ring annuloplasty (TRA), and atrial septal defect (ASD) repair today (2). Due cosmetic appeal and desire, better appearance and maximum healing of the scar are more important for female patients than the male ones. Minimally invasive surgeries were compared with conventional surgeries, but different types of approaches in MICS have not been compared with each other so fat in the mean of pain and quality of life postoperatively. Being able to see that periareolar incisions have being used in breast reconstructive surgery leaded us to perform this incision as an alternative to type to right anterior mini-thoracotomy incision with excellent exposure used in MICS for female patients (5, 6). Here, we compared two-incision types in MICS for females with regard to postoperative cosmetic results and the level of satisfaction: periareolar incision or submammarial incision.

Methods

Study population

Our Institutional Ethical Committee obtained an approval for the use of these data. Data were collected prospectively for all

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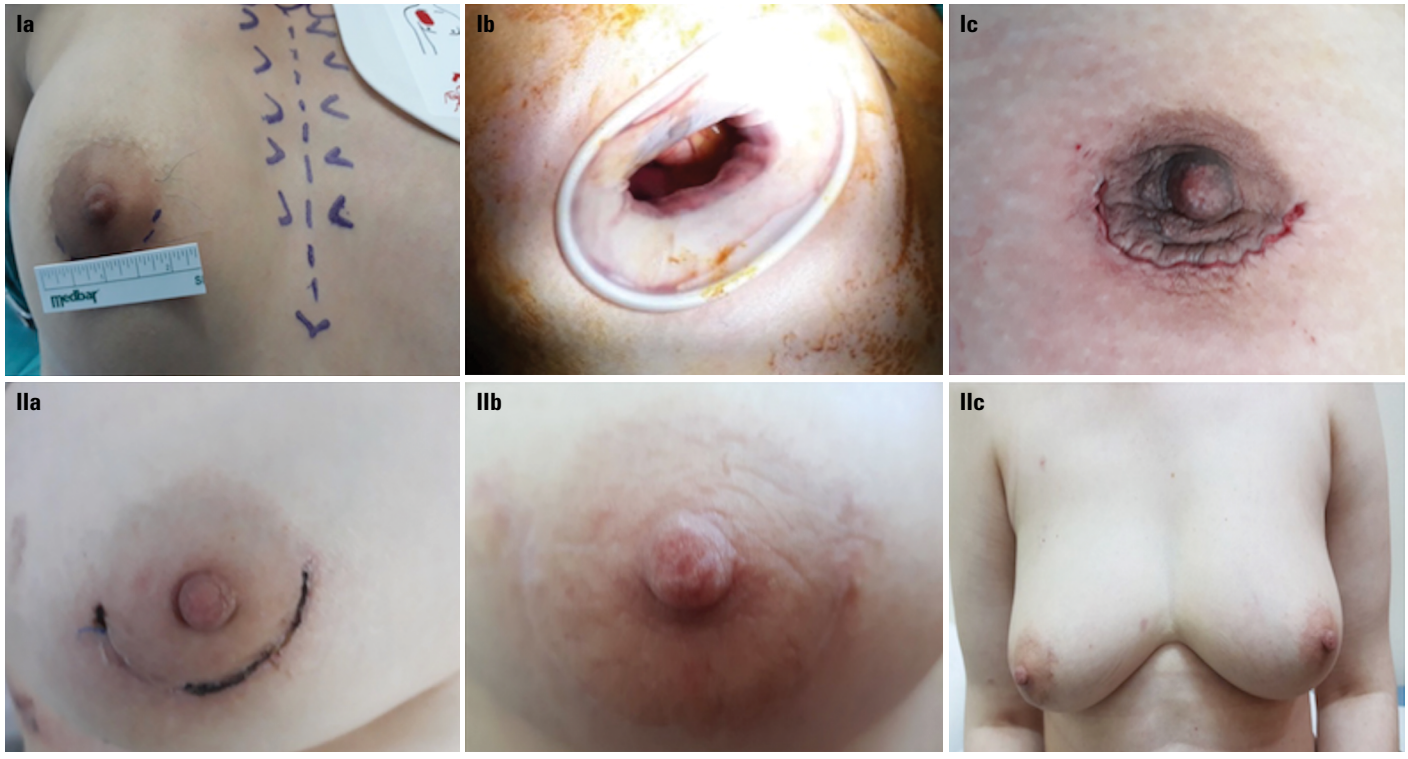

Figure 1. Preoperative surgical marks (Ia), external aspect of the operative field (Ib), postoperative periareolar closure view (Ic), wound aspect on the 7th postoperative day (IIa), the final aspect of the periareolar access on the 45th postoperative day (IIb, IIc)

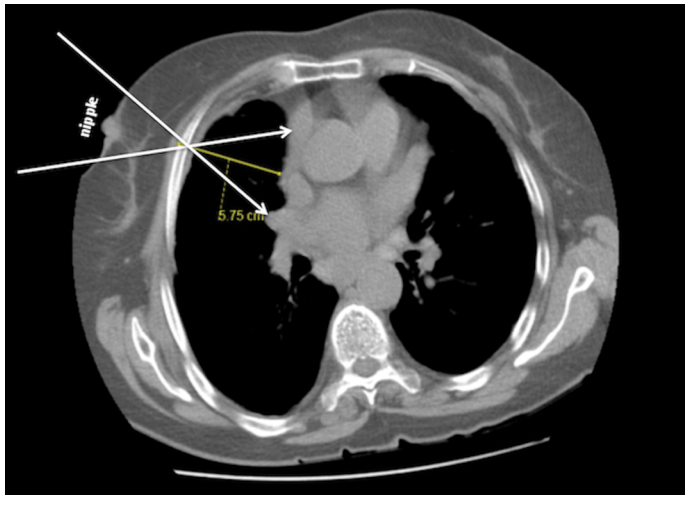

Figure 2. Preoperative evaluation of computed tomography

patients who underwent a type of cardiac surgery through periareolar or submamarian incision between July 2013 and March 2018 at the Department of Cardiovascular Surgery of Ankara University. Baseline clinical, demographic, and operative data were all recorded. In this prospective, observational cohort, we identified 94 female patients undergoing the cardiac surgery through periareolar or submammarian incisions performed in a single center. Two groups were included into this study depending on the type of surgical incision, which were periareolar (Group A) or submammarian (Group B). Each scar size and type of the postoperative wound infection was noted. Preparation of the periareolar incision and postoperative images were shown in Figure 1. All patients underwent a preoperative thorax computed tomography, and we measured the distance from each intercostal space to the related valve to be implanted (Fig. 2).

Evaluation the pain and cosmetic appearance

A standard pain questionnaire (7) was administered to each patient postoperatively in the hospital and 6 months after the discharge, and it compared two groups. A total of 94 questionnaires were collected and analyzed in total. We used a standard pain questionnaire created by Walther et al. (7), including the advanced information starting from the level of the pain up to recurrence and dosage of it. We also used the verbal and visual analog scale for describing the pain intensity from 1, which is no pain, up to 10, which is the highest pain level. Postoperative pain was assessed by performing a direct interview with patients in the first 7 days postoperatively. Patients using analgesic agents preoperatively were excluded from the study.

Cosmetic appearance was also evaluated with a visual analog scale ranging from 1, which meant the patient did not like the appearance of the scar and was not comfortable for caring the wound, to 10, which the patient found the most pleasing.

Surgical technique

Patients were placed in the supine position with the right side of the chest elevated at 30° by the placement of a roll or a bump under the back and the right arm was in 450 degrees of abduction and hold to stretch along the body. Initially, marks for surgical ac-

cess were drawn using a surgical pen. A surgical skin incision was applied starting from the point of 4 to 10 hours around the lower border of the inferior nipple-areolar complex in the right breast. After passing from the dermis and the tissue beneath, the glandular tissue clearly was seen (8). The glandular tissue was separated and marked to protect itself and surrounding as much as possible. After that, subglandular dissection was carefully performed to reach the right intercostal space (RICS), which was used for the surgery. Hemostasis was performed carefully between the layers concomitantly. The 3rd and 4th RICS is the most convenient area for performing the MVR, TRA, and ASD closure. To expand the surgical area, we mostly used a soft tissue retractor with the mini thorax retractor. After the surgical intervention, closing the periareolar space is very important to have the best cosmetic outcome. Periareolar tissue was closed in layers, first the muscle, fascia, and then the mammary tissue above it with polyglaction 2-0 coated vicryl (Ethicon, INC). After the edges of the wound were pulled up correctly, the skin was closed using mononylon 5-0 vertical-U sutures.

Statistical methods

The SPSS version 15.0 (SPSS Inc., Chicago, Illinois, USA) was used for data analysis. Continuous data were evaluated for nor-

Table 1. Baseline characteristics before minimally invasive cardiac surgery

Variables	Periareolar (n=62)	Submammarian (n=32)	*P* value
Age	41.23±12.2	40.5±11.63	0.712
BSA (kg/m²)	1.71±0.3	1.68±0.22	0.623
Smoking	19 (30.6%)	9 (28.1%)	0.818
Hypertension	26 (41.9%)	12 (37.5%)	0.514
Diabetes	3 (4.8%)	1 (3.1%)	0.924
Hyperlipidemia	8 (12.9%)	4 (12.5%)	0.876
Total cholesterol (mg/dL)	168.4±28.4	171.2±25.2	0.643
LDL cholesterol (mg/dL)	124.6±16.2	119.8±14.6	0.115
HDL cholesterol (mg/dL)	42.1±7.2	40.8±9.4	0.412
COPD	5 (8%)	3 (9.3%)	0.865
PVD	1 (1.6%)	-	0.792
C-reactive protein (mg/L)	2.1±1.2	2.3±1.1	0.445
LVEDD (mm)	46.3±3.5	45.8±3.2	0.552
LVESD (mm)	28.2±4.4	27.6±4.2	0.514
LVEF (%)	60.5±11	58.1±14	0.516
Systolic PAP (mm Hg)	35.8±17.8	37.2±18.1	0.719
LA diameter (mm)	44.2±8.2	43.8±6.8	0.819
AF	21 (33.8%)	9 (28.3%)	0.553
Tricuspid regurgitation >2	20 (32.2%)	10 (31.2%)	0.982
NYHA >Class 2	19 (30.6%)	9 (28.1%)	0.824
Euro Score II (%)	1.36±0.12	1.34±0.16	0.421
Medication			
Preoperative antiplatelet/warfarin	21 (33.8%)	9 (28.1%)	0.551
β-blocker	19 (30.6%)	9 (28.1%)	0.843
Ace inhibitor or ARB	20 (32.2%)	13 (40.6%)	0.443
Antihyperlipidemic	8 (12.9%)	4 (12.5%)	0.982
Digoxin	2 (3.2%)	2 (6.2%)	0.643
Diuretics	10 (16.1%)	8 (25%)	0.421
Thorax size (cm)	5.83±0.5	5.79±0.6	0.751

Continuous data are presented as mean±standard deviation and discrete data as percentage.
BMI - body mass index, AF - atrial fibrillation, ARB - angiotensin receptor blocker, COPD - chronic obstructive pulmonary disease, EF - ejection fraction, HDL - high-density lipoprotein, LDL - low-density lipoprotein, NYHA - New York Heart Association, LVEF - left ventricular ejection fraction

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mality, and between-group comparisons were performed using either the Student's t or the Mann–Whitney U test for normal and non-normal data, respectively. The Fisher exact test for 2×2 tables or Pearson chi-square was used for comparing categorical data. Statistical tests were two-sided, and p values less than 0.05 were considered statistically significant.

Results

Between the two groups, no significant difference was found in terms of demographic values, preoperative cardiovascular risk factors, dosage of the pain killer used in the intensive care unit as well as in the regular ward, the hospital stay, duration of the ventilatory support, and the need for blood and blood product transfusions (Table 1). The time to access the 4th intercostal space was available in the submammarial incision group (Group A: 6±2.8 min vs. Group B: 2±0.8 min, p=0.001) (Table 2). The patients with periareolar incision had less scar tissue and better cosmetic appearance due to better shrinking force in the skin of the superficial breast tissue. (Group A: 4.3±0.4 vs. Group B: 5.3±0.2, p=0.001; Table 3). In the patients with submammarian incisions, four patients had superficial wound infection (12.5%), and they were required wound revision and antibiotic regimen due to lower hygiene, excessive sweating, and massive breast tissue on the wound, whereas no infection were seen in the patients with periaerolar incision.

Patients suffered a similar level of pain in two groups (Group A: 3.2±0.7 vs. Group B: 3.4±0.9, p=0.221). Maximal pain levels were observed on the second or third postoperative days due to existing of the chest tubes. After the chest tubes removal, the pain level decreased in both groups. There was no significant difference in pain intensities and requirement of analgesic postoperatively during follow-up.

Discussion

MICS is becoming safer, easier to perform, and more popular day by day (9). Choosing the most suitable incision location depending on the patient's characteristics and the surgeon's preference is a very challenging issue. Every surgeon is more concerned about aesthetics when the patient is young and especially a female (1, 10). On the other hand, patients have more questions, such as "How the scars will look like when wearing a bra or being unclothed," for surgeons in preoperative discus-

Table 2. Operative procedural information

Variables	Group A (62)	Group B (32)	*P* value
Time to access 4th subcostal (min)	6±2.8	2±0.8	0.0001
MVR/R	24	14	0.621
MVR/R+TRA	20	10	0.976
ASD repair	18	8	0.824
RF ablation	21 (33.8%)	9 (28.1%)	0.556
CPB time (min)	75.1±9.3	72.6±8.7	0.267
Cross-clamp time (min)	31.4±3.7	30.8±4.2	0.443
Mortality	none	none	-
Bleeding/Revision	1	0	-

MVR/R - mitral valve replacement/repair, TRA - tricuspid ring annuloplasty, ASD - atrial septal defect, CBP - cardiopulmonary bypass

Table 3. Postoperative data

Variables	Periareolar (62)	Submammarian (32)	*P* value
Incision size (cm)	5.6±0.6	6.7±0.8	0.0001
Scar size (cm)	4.3±0.4	5.3±0.2	0.0001
Nipple numbness	3	2	-
Breast hematoma	1	none	-
Superficial wound infection	none	4	0.012
Discharge (day)	4.4	4.6	0.432
Pain level	3.2±0.7	3.4±0.9	0.221

sions. More patients choose a periareolar incision because of good outcomes and less scar size. The appeal of periareolar incision is clearly given by its improved cosmetics, potential for less scar tissue, and quicker recovery with the same pain level as in mammaplasty (5).

In addition to the advantages of the minimally invasive valve implantations, it should be noted that cardiac surgery is now competing with other practicing areas where an increasing number of valve procedures involving a transcatheter aortic valve replacement and promising valve in valve applications are being performed by cardiologists and interventional radiologists (11). Due to these concerns and competition, we, as minimally invasive surgeons, should exist in this important place by increasing therapeutic options with better surgical results and cosmetic outcomes. In previous studies, the plastic surgeons commonly discussed the periaoreolar and inframammarian approaches in breast implants, but never talked about them in cardiac surgery (12-16). Performing the valve implantation through passing the breast tissue by a periareolar incision is a new and challenging approach for cardiac surgery because we as specialists of cardiac surgery are not familiar with the anatomy of breast. However, this approach helps the surgeon have an expanded and safe surgical area with lesser incision due to the flexibility of tissue itself.

Performing the implantation of valves through the periareolar incision is relatively simple and feasible with a short learning curve. While performing, the surgeon must ensure that the valve, which will undergo implantation, should be under the most suitable intercostal space. It should be also clarified that there are also some disadvantages of performing the periareolar approach, such as the potential of losing the sensation in the nipple and losing the ability of breast feeding due to cutting of the breast tissue (5, 15). These factors should be also considered in the younger patients or patients not having children. This condition is unique for the periareolar incision due to the possibility of damaging the nerve endings close to the nipple area. The incision is within a few millimeters of the nipple. Thus, determining the anatomy before the surgery with the help of tomography and chest X-ray will help the surgeon avoid the extra surgical interventions and losing time. In the current study, hematoma occurred in 1.6% of all study patients, which is also consistent with the literature of the operation of breast augmentation performed by plastic surgeons (16, 17). No statistically significant difference was found for the incidence of hematoma among the two groups. Before applying a periareolar or inframammary incision, a surgeon should evaluate the patient's characteristics including the amount of the breast tissue, the accessibility of related cardiac structures, and conformity of the anatomy in advance. The surgeon also needs to consider the size of the areola as well. Skin color is another important point that should be kept in mind because patients with the dark-pigmented skin can potentially have a healing scar formed in the inframammary position. On the other hand, submammarian incisions may be preferred in younger female patients with less breast tissue and wearing a bikini or crop top for having unnoticeable scar under the breasts; however, primary concern about performing the submammarian incision is to be sure about scar healing and not having any wound infection depending on excessive sweating in the wound area.

The periareolar incision is a safe, less invasive, good alternative incision in cardiac surgery, and it could be considered a new standard approach for female patients undergoing the MVR/R, MVR/R-TRA, or ASD repair.

Study limitations

The study was performed in a single center. Another limitation of this study is the lack of a control group receiving conventional cardiac surgery via median sternotomy.

Conclusion

Performing the valve implantation through the periareolar incision is relatively simple and feasible surgical approach. Moreover, our study also confirms that this approach would be more aesthetic, show better healing, and have a smaller scar size in female patients.

Conflict of interest: None declared.

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