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Safe autologous rib harvest in patients with breast implants; technique and review

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ABSTRACT

Introduction: Autologous rib harvest is a useful technique for rhinoplasty when septal cartilage is inadequate. For patients who have previously undergone augmentation mammoplasty, however, there is theoretical concern about the risk to breast implant integrity during costal cartilage harvest. The true risk to patients and their implants from autologous rib harvest is poorly studied. Herein, we review our technique and experience with autologous rib harvest after augmentation mammoplasty.

Method: We performed a retrospective review of patients who underwent autologous rib harvest after augmentation mammoplasty between February 1998 and February 2017 at a tertiary care hospital and private practice. We identified basic demographics, implant type, approach to implantation, and any post-operative complications following rib harvest. Surgery was performed using an inframammary approach with a boat-technique for cartilage harvest.

Results: A total of 109 individuals, aged 19-64, were included in our study. There was a 2% rate of post-operative seroma development; no patients developed long-term complications. There was a 5% rate of incidental intraoperative discovery of implant dehiscence or implant entry, all of which were repaired primarily at the time of surgery, and none of which developed post-operative sequelae.

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There were no cases of pneumothorax, post-operative breast malposition, or other major complications.
Conclusion: Herein, we present the largest cohort of patients to undergo autologous rib harvest after augmentation mammoplasty. Routine intra-operative drain placement and perioperative imaging is unnecessary. Our technique allows harvest of a suitable amount of cartilage, is very cosmetically acceptable to this cosmetically-conscious population, and is safe for patients and their implants.

Introduction

Breast augmentation, either for reconstructive or cosmetic purposes, is the most commonly performed cosmetic surgical procedure in the United States.[1] As such, it is frequently encountered among patients undergoing evaluation for other surgical procedures. Rhinoplasty is the third most commonly performed cosmetic surgery,[1] though it is also frequently performed for functional reasons too, and autologous harvest of rib cartilage is often useful in cases of rhinoplasty where native septal cartilage is inadequate. There is theoretical concern about the risk to breast implant integrity and surrounding tissues during harvest of costal cartilage, which may cause some surgeons to shy away from this procedure. Surgery near a breast implant may result in bacterial contamination and infection of the implant and surrounding tissue. This may result in biofilm formation and subsequent chronic infections that necessitate implant removal. Rib harvest may also result in trauma to the implant with subsequent rupture. Other risks of costal cartilage harvest near an implanted breast include formation of a silicone granuloma (and subsequent palpable mass), a change in breast shape, or a softening of the breast.

Overall, the true risk to patients and their implants from other surgical procedures, such as autologous rib harvest, is poorly studied and inadequately understood. Herein, we review our experience with autologous rib harvest for rhinoplasty in patients who had previously undergone augmentation mammoplasty. We further describe a safe and effective costal cartilage harvest technique that we believe minimizes the risk to implants and patients.

Method

We performed a retrospective review of autologous rib harvest for rhinoplasty in patients who had previously undergone augmentation mammoplasty. We received IRB approval for this retrospective review. All cases of rib harvest were performed or overseen by the senior author. We reviewed cases performed between February 1998 and February 2017 to identify demographics, type of implant, method of implantation, and any complications at the harvest site or breast after surgery. We included cases of autologous rib harvest that occurred in individuals who had breast implants at the time of surgery. We excluded those who had previously undergone augmentation mammoplasty but did not still have implants at the time of our surgery.

Preoperatively, we ask patients about recent changes in their breasts, specifically if they have experienced new pain, a change in implant position, or a change in breast shape, all of which can be signs of a leak and should be evaluated before we proceed with rib grafting. On physical exam, we also palpate the breast to ensure that the implant and capsule are both smooth and intact. We delay our surgery for at least one year following breast augmentation to allow the capsule around the implant to develop and for the breast to settle. We have observed that, as the breast settles after augmentation, the mammoplasty scar typically migrates upward, such that its final resting position

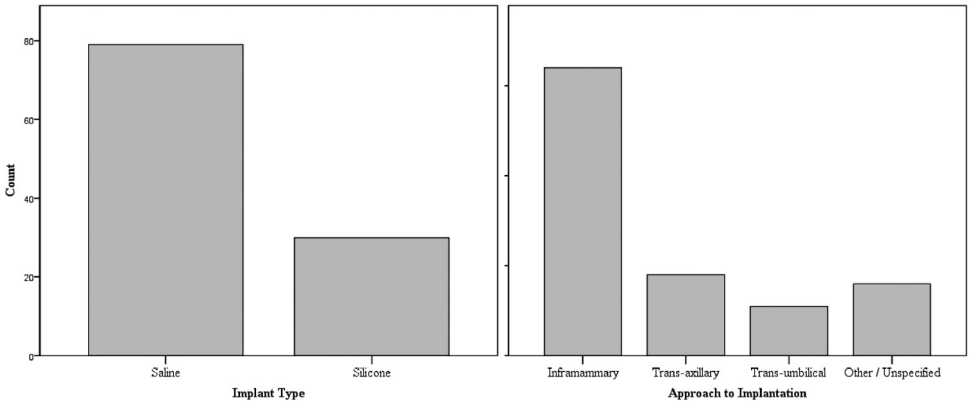

Figure 1. Type of implant and approaches to augmentation mammoplasty. Seventy-nine (72%) had received saline implants, and 30 (28%) had received silicone. An inframammary approach had been used in 64 (59%) patients, a trans-axillary approach in 18 (16%), a trans-umbilical approach in 11 (10%), and a different or unspecified approach in 16 (15%).

is on the underside of the breast rather than in the true inframammary crease. We do not routinely perform preoperative imaging of the implant of any kind. We discuss the possible risks of injury to the implant capsule with patients, including injury that can occur during the operation and the discovery of preexisting defects and irregularities. We advise patients that the discovery or creation of minor defects in the capsule typically does not preclude continuing with rib harvest, though it may increase the risk of early implant failure and the need for removal at a future date. We discuss how intraoperative damage to the implants themselves is rare.

Our method of autologous rib harvest has been previously published.[2] In brief, a 3 cm incision in the inframammary crease of the right breast is carried deeply through subcutaneous tissue, adipose, and external oblique musculature. Our incision is made separate from the implantation scar and truly in the inframammary crease, inferior to the implant and its capsule. Patients are advised beforehand that they will have a second scar. As the incision proceeds medially it takes a tangential, inferior course, while the capsule is retracted superiorly by the opposite hand of the operating surgeon. We are mindful of feeling for a filling port that some implants have. Ports can usually be palpated and, when necessary, displaced away from our cuts. Occasionally, initial incision and dissection can cause minor defects to the implant capsule, though generally this can be avoided with appropriate retraction and incision placement. When defects in the capsule are discovered incidentally or created, we close the defect primarily with vicryl sutures and continue with the operation. Our method of creating a separate incision from the one used originally for mammoplasty guides dissection away from the capsule and minimizes the risk to the implant.

The straightest rib, usually the 7th rib, is identified by palpation and is exposed from the lateral osseocartilaginous juncture to the medial junction of cartilage and rib. Next, cartilage is removed in a central boat harvest technique, taking care to leave cartilage intact on three-sides of the harvested portion. Valsalva is performed to evaluate for leaks. The perichondrium and muscle are then closed in layers with vicryl, and a subcuticular monocryl is used for skin closure. No drains are placed, and post-operative imaging is not performed. We recommend patients avoid lifting, straining, and exercise for two weeks following surgery, after which they can begin light activity and advance as tolerated. Patients are followed with in-clinic history and physical post-operatively for one year.

Results

A total of 109 patients were included in our study including 107 females and 2 transgender males. Patient age at the time of surgery ranged from 19 to 64 years (mean 38.5 years). Seventy-nine (72%) patients had saline implants, and 30 (28%) had silicone implants (Figure 1). Sixty-four (59%) patients had undergone an inframammary approach to implantation, 18 (16%) had undergone a trans-axillary

Table 1
Rates of observed complications after autologous rib harvest.

Complication	Number observed (%)	Comments
Intraoperative Implant Dehiscence	6 (5%)	No postoperative changes or complications observed.
Seroma	2 (2%)	One resolved with in-clinic aspiration, one required IR drain placement.
Pneumothorax	0 (0%)	
Breast Malposition	0 (0%)	
Postoperative Capsular Contracture	0 (0%)	
Other Major Sequela	0 (0%)	

approach, 11 (10%) underwent a trans-umbilical approach, and 16 (15%) underwent a different approach or their records did not indicate the method of implantation (Figure 1). Twelve (11%) implants were placed in conjunction with a breast lift, and four (4%) were placed following total mastectomy. All implants placed following mastectomy were placed at least 5 years after the original surgery. None of these patients showed evidence of disease recurrence at the time of placement, and none had undergone radiation as part of their treatment.

Two (2%) patients developed post-operative seromas. Of these, one patient underwent needle aspiration in clinic three times until resolution. The second patient required IR-guided drain placement (to avoid implant puncture) for one week. Both patients ultimately healed well and without long-term sequelae at one year follow-up. Six patients (5%) were found intraoperatively to have a preexisting dehiscence or had their capsule entered during surgery, with minor leakage of material into the operative field. In these cases, the dehiscence was repaired with vicryl. All of these patients healed well without the need for re-operation or long-term sequelae. There were no cases of pneumothorax. There were no cases of major implant injury. There were no cases of post-operative breast malposition and there was no need for reoperation to resolve a change in the implants (Table 1).

Discussion

Our data support the conclusion that autologous rib harvest using our technique is safe in a previously implanted breast, with a minor complication rate of 2% and a major complication rate of 0% in our cohort. While our technique is safe, the operating surgeon should nonetheless be aware of the many risk factors for implant failure previously demonstrated in the literature.

First, surgery near a breast implant carries the risk of implant bacterial contamination if the implant is exposed during dissection. In general, capsular contracture is estimated to have an incidence of 5–8% after 3 years, and 11–19% after 10 years.[3] Previous studies have demonstrated that bacterial contamination, and specifically biofilm formation, increases the risk of capsular contracture and the need for revision surgical procedures.[4–6] A Cochrane review of breast implants following breast reconstruction further suggested that textured implants and silicone or PVP-hydrogel implants carry a higher risk of capsular contracture than smooth and saline implants, respectively.[7] None of the patients in our cohort developed post-operative breast malposition or other changes suggesting capsular contracture.

Next, surgery near a breast implant may increase the risk of implant failure by causing trauma to tissues. Manufacturer analysis of ruptured implants has suggested that trauma at the time of surgery, including excessive manipulation, application of pressure, and needle pokes, contribute to implant failure. Post-surgical trauma, such as that from motor vehicle accidents, falls, and even excessive pressure from mammography has also been implicated in implant failure.[8] In our cohort, 5% of patients were found to already have a ruptured implant, or their implant was entered during surgery. All of these cases were repaired primarily at the time of surgery, however, and none had long-term sequelae.

Other factors associated with implant failure include having a palpable mass (which typically represents a silicone granuloma), and a change in breast shape or softening of the breast. We question patients about these symptoms pre-operatively, and if positive, we have them evaluated by a plastic surgeon before proceeding with rib harvest.

Increasing time since implantation is associated with implant failure.[4,8] Previous studies have estimated implant failure rates to be around 8% for implants in place for less than 4 years.[8] After 10 years, however, the rate of implant failure rises to an estimated 63–100%.[8–10] Implant type can also play a role in implant failure; saline implants, for example, carry a 5% risk of spontaneous deflation.[3] Silicone implants do not have a risk of spontaneous deflation, but they do have a risk of silent rupture that is not always known before reoperation or other surgical procedures.[3]

Finally, the method of implantation has been shown to affect reoperation rates and may cause implants to respond differently to autologous rib harvest. The most common approach to augmentation mammoplasty is through an incision in the inframammary fold. Incisions range in size from roughly 3–6 cm; a smaller incision can be used for saline implants, but a larger incision is needed to accommodate a silicone implant.[11] Dissection after an inframammary fold incision is typically carried deeply either to a subglandular or submuscular plane and then proceeds medially to (but not over) the sternum. A peri–areolar approach, alternatively, dissects through glandular tissue to reach its subglandular or submuscular plane, and some studies suggest that a peri–areolar approach has a 2.5 times higher re-operation rate in the first 3 years after implantation than an inframammary fold approach.[4,11] An axillary approach has also been described. An incision hidden in the axilla is made, and a submuscular plane is developed from the lateral border of the pectoralis major medially to the sternum with muscular release extending inferiorly to 1–1.5 cm above the inframammary crease.[12] Previous studies have suggested a 5.5 times higher reoperation rate within the first 3 years after implantation with the axillary approach compared to the inframammary fold approach.[4] Implantation through a trans-abdominal or peri-umbilical approach has also been described, but these are used very rarely today.[3]

Cases of silent rupture and other damage to implants that are not externally definitive can often be identified with imaging pre-operatively. MRI is the gold-standard evaluation of breast implant integrity with a near 100% sensitivity.[13] Mammography is also useful, with an estimated sensitivity of 67%, and subtle implant changes on ultrasound have also been identified. When pre-exististing microtears were identified intra-operatively in our cohort, they were repaired primarily, and no patients experienced complications post-operatively. Thus, we feel pre-operative imaging is unnecessary, and would not affect the decision for surgery.

Conclusion

Herein, we present the largest cohort of patients to undergo autologous rib harvest after augmentation mammoplasty. Routine intra-operative drain placement and pre- or post-operative imaging is unnecessary. Our technique allows harvest of a suitable amount of cartilage, is very cosmetically acceptable to this cosmetically-conscious population, and is safe for patients and their implants.

Declaration of Competing Interest

The authors have no financial or other interests to disclose.

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Ethical approval

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jpra.2020.01.001.

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