



Squamous cell carcinoma following multiple revision breast surgeries with massive chest wall reconstruction via flow-through double ALT free flaps

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Abstract

Implant-associated breast cancer is a well-described pathologic process that occurs in patients with breast implants. Anaplastic large cell lymphoma (ALCL), the most prominent malignancy associated with breast implants, has been extensively described, while literature regarding non-ALCL implant-associated cancers is limited. Here, we present a rare case of a 55-year-old female with squamous cell carcinoma (SCC) of the breast and chest following multiple breast revision surgeries who underwent tumor resection with a unique soft tissue reconstruction utilizing two anterolateral thigh (ALT) flaps in a flow-through manner.

Keywords Squamous cell carcinoma · Chest · Reconstruction · Anterolateral thigh · Free flap

Introduction

Breast implant placement is a common procedure with over one million implants placed a year [1]. Its use for breast augmentation or reconstruction does not come without complications, including infection, rupture, and capsular contracture. Although many of these complications are treated conservatively, recent studies have demonstrated a link between textured breast implants and a more serious disease process, anaplastic large cell lymphoma (ALCL) [2, 3].

While ALCL is the malignancy most frequently associated with breast implants, a few case reports have described the

development of squamous cell carcinoma (SCC) within breast capsules following implant placement [4–10]. It is unknown whether a true association exists between SCC and breast implants, but the chronic inflammation and irritation caused by breast implants may play a role in its development [9].

While previously described cases of SCC in breast implant patients all required surgical intervention for treatment, none have described the reconstructive methods utilized to reconstruct the chest wall. In this case report, we describe a patient that developed SCC of the breast and chest wall following multiple breast revision surgeries and report on an innovative reconstructive technique utilizing two ALT flaps placed in a flow-through pattern to reconstruct the soft tissue defect following surgical excision.

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Case report

This case involves a previously healthy 55-year-old female with history of multiple breast implant placements diagnosed with left breast implant infection with osteomyelitis complicated by SCC. The patient initially had breast implants placed at the age of 21. She experienced an implant perforation at age 40 with walling off, and proceeded to have 3 subsequent breast implants with perforations and exchanges, with the

Fig. 1 Open wound on the medial aspect of the left breast with exposed soft tissue and bone prior to complete surgical excision



most recent bilateral breast implant placement in July 2016. Following her most recent breast implant placement, an area of erythema developed on the medial aspect of her left breast that failed to resolve with appropriate treatment over the course of 5 months and was later diagnosed as SCC. The patient was transferred to our institution for a higher level of care where biopsy and immunohistochemical testing confirmed a diagnosis of invasive SCC which now demonstrated extension to the sternum. CT and MRI suggested bilateral level I axillary lymph node involvement.

The patient underwent surgical chest wall excision, completion mastectomy, and axillary lymph node dissection with

removal of both soft tissue and bone by the thoracic and breast surgery teams 22 days after being transferred to our institution (Figs. 1 and 2). The extent of surgical resection necessary to ensure negative margins was difficult to predict prior to tumor resection. Therefore, the plastic surgery team developed a surgical plan that would utilize both local flaps and distant free flaps to help fill various sized defects. An additional reconstructive surgeon was made available should assistance be needed for multiple flap harvests. Following resection, the plastic surgery team was faced with a 20 × 25-cm soft tissue defect (Fig. 3). An ipsilateral latissimus dorsi myocutaneous flap was first

Fig. 2 Post-resection of all infected and malignant tissue which required violation of the chest wall with removal of both soft tissues and ribs with exposure of the underlying organs

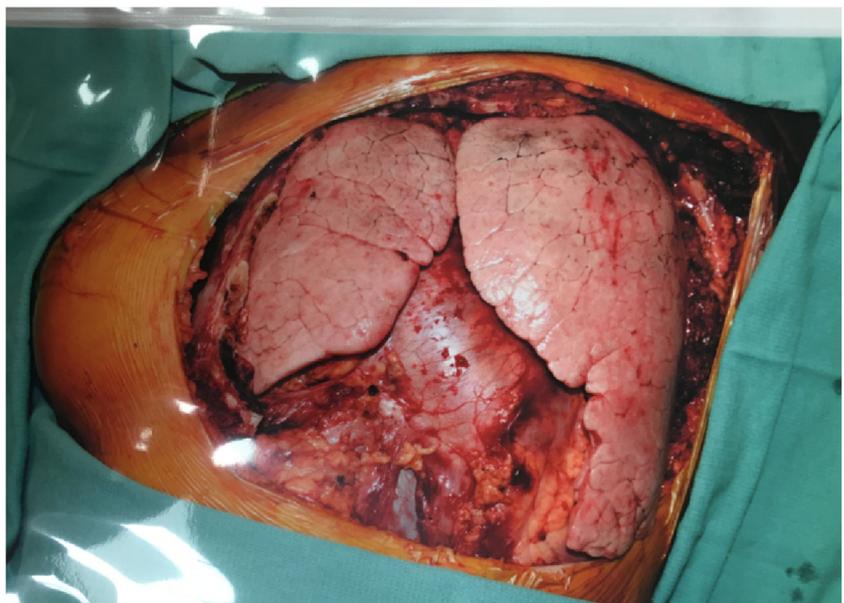
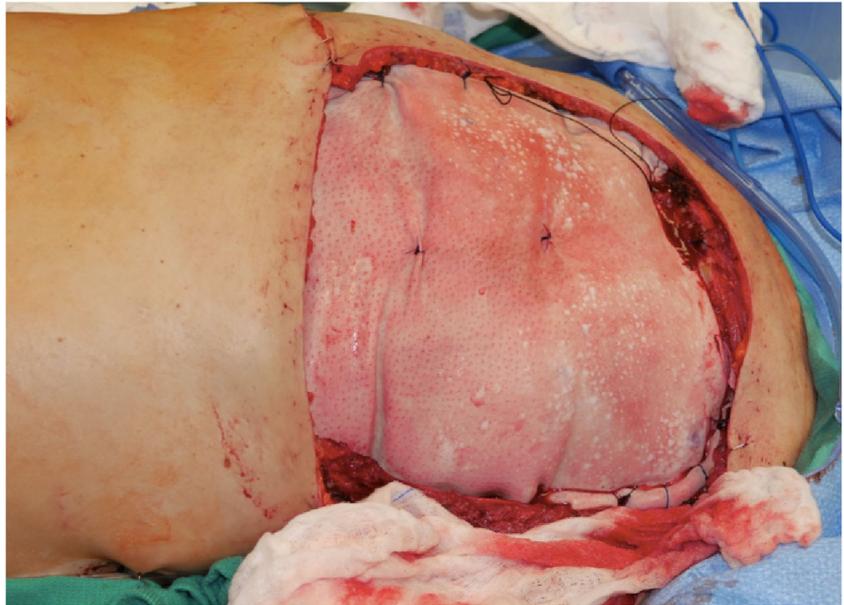


Fig. 3 Full-sized defect with bioabsorbable mesh in place for chest wall support and reconstruction



harvested based on its pedicle to assist in filling the dead space created by resection. At this point, the decision was made to proceed with bilateral anterolateral thigh (ALT) free flaps to provide the remaining coverage. A 10 × 30-cm elliptical incision was made on the left thigh, and the prominent proximal vascular pedicle was dissected out measuring 11 cm. The second ALT flap was harvested from the right-lower extremity concurrently in a similar manner with a resulting 12-cm pedicle. The left ALT flap pedicle was then cut, and the flap was transferred to the chest. And end-to-end anastomosis was performed with the right internal mammary artery and vein as these vessels would provide high perfusion pressure with sufficient venous outflow. Subsequently, the right ALT flap was transported to the chest and was anastomosed to the flow-through segment

and distal segment of the first flap to connect the flaps in series. Both flaps demonstrated good perfusion with audible venous doppler signals and presence of bleeding margins. Careful hemostasis was achieved, the left ALT flap donor site was closed primarily (Fig. 4), and the right was closed with a small skin graft from the previously harvested latissimus dorsi flap. The latissimus dorsi muscle was inset to seal off the inferior and lateral edges of the wound and to ablate the dead space left by the defect. The two ALT flaps connected in series provided coverage to the superior and medial aspect of the wound (Fig. 5). The patient tolerated the procedure well with no intra-operative complications. The patient will receive adjuvant radiation to the entire chest wall likely in combination with chemotherapy post-operatively.

Fig. 4 **a** Pre-operative marking of left ALT flap. **b** Post-operative donor site closed by primary closure with drain placed at the inferior aspect of the wound

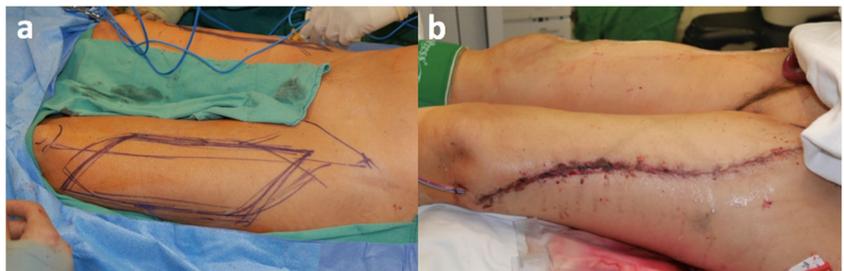


Fig. 5 Post-operative breast reconstruction with two ALT flaps connected in series by flow-through method



Discussion

Previous studies have demonstrated the toxic effect that implants and silicone degradation products have on the surrounding tissues causing inflammation and fibrosis [11–13]. These reactions are associated with mild to severe scarring leading to the development of a fibrous capsule [14]. Some hypothesize that SCC may arise from an epithelial lining which can form along the surfaces of the capsule. This hypothesis was supported by Kitchen et al. who first described this epithelialization process on the lining of the breast implant capsule [5]. Additionally, isolated cases of SCC have been previously reported to arise from foreign body reactions throughout the body [15, 16].

Non-ALCL breast cancers in implant patients are rare, with our search of the literature yielding seven previous case reports describing SCC in this patient population [4–10]. All these previous case reports shared a common clinical picture consisting of acute onset unilateral breast pain with associated enlargement, swelling, and induration [9, 10]. Our patient's presentation was unique in that the patient had a chronic ulcerated wound with superimposed infection for many months possibly delaying the diagnosis of the underlying malignancy allowing for disease progression to the surrounding tissues. Our patient, unlike previously reported cases in which mastectomy was sufficient for excision, required extensive chest

wall resection resulting in exposure of the thoracic content. Durable chest wall reconstruction was therefore required to ensure vital organs were appropriately protected.

Autologous breast reconstruction has become a popular method of reconstruction following mastectomy for breast cancer secondary to these tissues ability to mimic the appearance and consistency of natural breast tissue [17, 18]. Free flaps derived from the tissue of the abdomen are commonly used for chest wall reconstruction, but the amount of tissue required and the tension that the abdominal closure would create on the large chest defect located directly above it made this option less than ideal [19]. The ALT flap was therefore chosen for reconstruction in this case. The ALT flap has become a popular tool in the reconstructive surgeon's armamentarium due to its versatility and well-described vasculature [20–23]. Its advantages lie in its large size and ability to provide bulk for contour and support [24].

Utilizing a single ALT flap in a flow-through manner for reconstructions of various regions of the body has previously been described in the literature [22, 25–28]. But, utilizing two ALT free flaps in a flow-through manner is less commonly described, with only a single case report describing this method for abdominal wall reconstruction [29]. An additional case report by Gazyakan et al. describes the use of two ALT free flaps for chest wall reconstruction following oncologic resection of a breast cancer but these flaps were not connected in a

flow-through manner [30]. To the best of our knowledge, no other cases of a flow-through-based ALT flap with two ALT flaps connected in series has been described, with our case being the only example of using this technique for chest wall reconstruction.

Using two ALT flaps for immediate chest wall reconstruction is advantageous because this provides surgeons with a large volume of soft tissue [31]. Under ideal conditions, each flap would be anastomosed to its own independent recipient vessels. When there is limited availability of recipient vessels, either due to malignant infiltration or due to damage during dissection and ligation, reconstructive surgeons must recruit vascular support to ensure flap viability in other ways. The only viable recipient vessels in this case was the contralateral internal mammary and was therefore anastomosed to the first ALT flap. The ipsilateral internal mammary vessels could not be used as they were taken during the resection. Other recipient vessels for anastomosis of the second ALT flap may have existed, but the vessels from the first ALT were most accessible, had excellent flow, and demonstrated a good size match. The plastic surgery team therefore decided to utilize a flow-through ALT flap demonstrating the utility of this reconstructive option in situations where there is limited vascular support.

Conclusion

SCC is a possible complication of breast implants, although further investigation is needed to characterize the possible pathogenesis of this condition. Early diagnosis and surgical intervention are critical to prevent disease progression and provide plastic surgeons with less invasive reconstructive options. Should surgeons encounter a large defect of the chest wall from implant-associated tumor excision, we have successfully demonstrated that combining two ALT flaps in series utilizing a flow-through method can provide appropriate soft tissue coverage.

Compliance with ethical standards

Funding There were no sources of funding for this study.

Patient consent Patients provided written consent for the use of their images.

Conflict of interest Pedram Goel, Dan Gould, Anthony Kim, Julie Lang, Ketan Patel, and Joseph Carey declare that they have no conflict of interest.

Ethical approval Formal ethics committee approval is not required for this type of study.

Informed consent Informed consent is not applicable as no identifying photographs or information have been included.

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