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Case report

Oncoplastic reconstruction of a large chest wall defect using dual fasciocutaneous flaps: A case report

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ABSTRACT

Introduction and importance: Large chest wall defects in the context of breast cancer or its sequelae can be challenging to address. Oncoplastic techniques have been demonstrated to be safe and feasible options for immediate reconstruction. We describe the use of dual fasciocutaneous flaps for coverage following resection of a large chest wall mass in an area with a remote history of radiation therapy.

Case presentation: A 67-year-old woman with a distant history of bilateral mastectomies and adjuvant chemoradiation for Stage IIB triple negative invasive ductal carcinoma presented with an enlarging left chest wall mass and chronic wound. The mass was excised with adequate margins, and the resulting defect was reconstructed with two locoregional fasciocutaneous flaps. Pathology returned negative for malignancy and follow-up demonstrated viable flaps that were healing well.

Clinical discussion: Fasciocutaneous flaps are one of many techniques for breast reconstruction and offer advantages of a relatively superficial dissection, shorter operative time, and decreased risk of functional impairment. They are consequently an attractive option for patients with multiple comorbidities and high risk of perioperative complications. Historically used for immediate reconstruction at the time of oncologic resection, we present its successful use decades after the index cancer operation to manage a chest wall defect secondary to radiation injury.

Conclusions: Oncoplastic reconstruction with dual fasciocutaneous flaps is a feasible option for a large chest wall defect in the setting of previous radiation.

1. Introduction

Tissue volume replacement of the chest wall following extensive resection remains a daunting reconstructive challenge for surgeons. Indications include invasive breast cancer, penetrating traumatic injury, tumors of the muscle, soft tissues, and ribs, or infrequently radiation-induced skin injury [1]. Primary goals of chest wall restoration include protecting underlying thoracic structures and preserving respiratory functionality while achieving aesthetic outcomes.

Fasciocutaneous flaps (FF) have been historically documented as a viable option for breast reconstruction, however very few have described their use for coverage of extensive chest wall defects. We uniquely present the use of dual FF at an academic hospital to reconstruct a full-thickness chest wall defect following extirpation of a large mass in a post-mastectomy patient with previous breast radiation. This case is reported in line with the SCARE 2020 criteria [2].

2. Presentation of case

The patient is a 67 year-old Caucasian female who had a previous diagnosis of T2N1M0 (Stage IIB) triple negative invasive ductal adenocarcinoma of the left breast in 2003 treated with bilateral mastectomies, left axillary lymph node dissection and adjuvant chemoradiation. Her past medical history also included atrial fibrillation, congestive heart failure with preserved ejection fraction of 55%, and morbid obesity with a BMI of 48. Her family history was significant for breast cancer in her mother and a maternal aunt, diagnosed at age 70 and 35 years respectively. The patient had undergone genetic testing, which returned negative for BRCA 1 and 2. Her social history was negative for alcohol, smoking, or illicit drug use. She presented to our breast clinic almost

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twenty years after her breast cancer diagnosis with complaints of a rapidly growing left chest wall mass and an overlying open wound in the region of previous radiotherapy. The mass had been present for three months with progressive growth and had been treated with local wound care using wet to dry dressings.

Physical exam demonstrated radiation-induced skin changes of the left chest wall with a 15 cm fixed mass and central draining wound (Fig. 1). One month prior computed tomography of the thorax demonstrated a circumscribed fluid collection in the left chest wall with a central opening, measuring 8.2 cm and extending posteriorly into the pectoralis muscles (Fig. 2). Given the physical exam and imaging findings, differential diagnoses included angiosarcoma versus local recurrence versus an unusual presentation of radiation necrosis.

The patient underwent resection of the chest wall mass and Pectoralis major, with a resulting defect measuring 19x10cm (Fig. 3 'yellow star'). The operation was performed at the academic hospital by the attending surgical oncologist, assisted by the breast surgery fellow and a general surgery resident. Frozen sections taken around the resection margin demonstrated atypical cells consistent with radiation damage. Reconstruction with a medially-based thoracoepigastric flap was performed first; the base of the flap was positioned medially at the subxiphoid region extending laterally to the anterior axillary line (Fig. 3 'green arrow'). After elevation of this tissue, superomedial rotation facilitated optimal positioning to cover the acquired defect (Fig. 4A 'blue arrow') and the resultant lateral defect was then covered with an intercostal artery perforator flap (Fig. 4A 'yellow arrow'). Three surgical Blake drains were left in place. The flap was then secured to surrounding tissue in multiple layers using 3-0 Vicryl and 3-0 Nylon (Fig. 4B).

The patient tolerated the procedure well and the flap maintained adequate perfusion perioperatively. Final pathological examination of the specimen demonstrated dermal hemorrhage and hematoma, superimposed with infection, fibrosis and necrosis. Muscle atrophy with severe radiation-associated changes, including reactive neovascularization, was also appreciated. There was no evidence of malignancy. Postoperatively, she was discharged home with home health for assistance with physical therapy and drain care. She received instruction to record daily drain outputs and return to clinic at two week follow up. At her follow up appointment, the patient's flap remained

Fig. 1. Physical exam findings of large left chest lesion with central draining opening and surrounding radiation-induced skin injury.

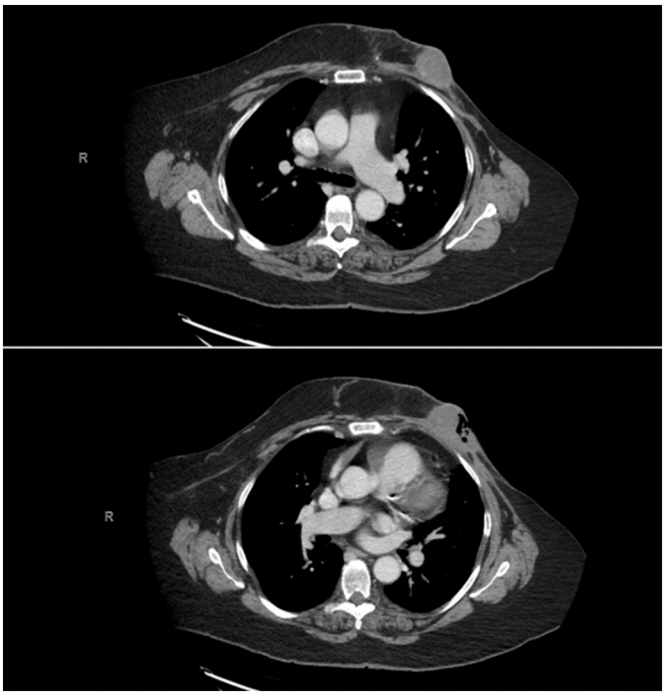

Fig. 2. CT scan findings demonstrating the complex chest wall mass, with central opening, and direct extension into the pectoralis major.

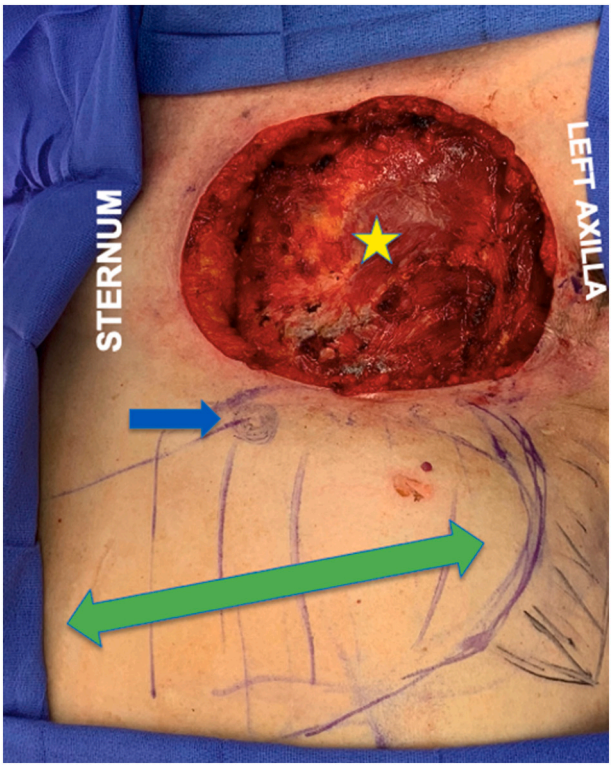

Fig. 3. Resultant chest wall defect after mass resection, measuring 19x10cm (yellow star); demarcation of planned thoracoepigastric flap (green arrow) with perforator location denoted (blue arrow).

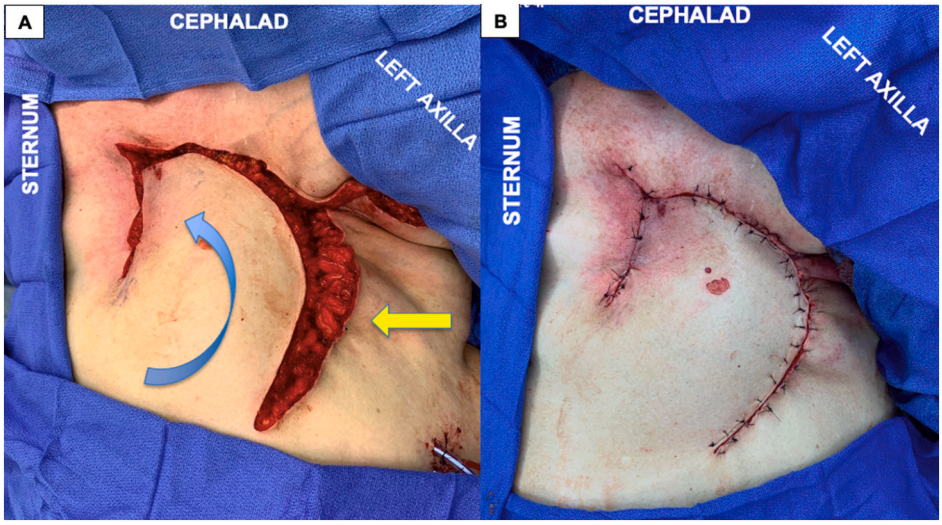

Fig. 4. (A) Superomedial rotation of the superior epigastric artery perforator flap (blue arrow) and medial rotation of the lateral intercostal artery perforator flap to provide defect coverage (yellow arrow). (B) Final inset of both flap with adequate perfusion at edges.

healthy and continued to heal well with no signs of hematoma, seroma or necrosis. All drains were removed after two weeks. Discussions with the patient revealed not only her satisfaction with the aesthetic outcome of the reconstruction, but also her markedly improved quality of life that no longer required frequent wound care appointments or procedures. Furthermore she expressed a feeling of veritable relief, now knowing she was truly cancer free without the looming fear of recurrent disease.

3. Discussion

Sequelae of radiation-induced injury to the chest wall have been well-documented in existing literature. In the context of breast cancer, dermatitis, telangiectasias, and chronic ulcers involving the chest wall have all been described [3,4]. Angiosarcoma is perhaps the most feared complication and thorough workup, including biopsy and imaging, must be performed. Although historically linked to chronic lymphedema and Stewart Treves syndrome following radical mastectomy, angiosarcoma has become increasingly associated with adjuvant radiation in the setting of breast-conserving therapy [5,6]. In the presented case, the tumor's rapid growth and chronically ulcerated appearance, in the setting of adjuvant breast radiation, led to concern for either a new primary malignancy or locoregional recurrence. Thus, intent to excise appropriate surgical margins was included when planning the operative approach.

Two frequently utilized options for chest wall reconstruction are fasciocutaneous and myocutaneous flaps. Both approaches offer robust tissue bulk (albeit myocutaneous flaps provide more), sufficient length to reach the upper quadrants of the breast, and optimal skin color and texture matches. However, myocutaneous flaps, such as the transverse rectus abdominis (TRAM) flap or latissimus dorsi flap, are associated with a more morbid dissection, longer operative time, and greater risk of functional impairment when compared to fasciocutaneous coverage [1]. The dissection for FF is more superficial, remaining fully subcutaneous, while maintaining a consistent vascular supply from medially or laterally based perforators [7,8].

The superior abdominal wall derives its blood supply from four main sources: perforators of the (1) epigastric arcade, (2) superficial inferior epigastric artery, (3) intercostal arteries and (4) lumbar arteries [8]. The first two pedicles generally supply medial-based flaps while the latter two supply lateral flaps. In our patient, a superomedially rotated thoracoepigastric flap, supplied by a superior epigastric artery perforator, covered a majority of the chest defect. A lateral defect remained after this initial flap, so a lateral intercostal artery perforator flap (LICAP) was mobilized to then ensure complete donor site coverage. The major advantage of the LICAP flap is its incorporation of the robust adipose content of the lateral chest roll [9]. Independent of body habitus, this region often holds redundant skin and subcutaneous tissue that promotes additional defect or donor site coverage.

Patient factors and comorbidities must also be taken into consideration when selecting a reconstructive approach. The planned resection for our patient encompassed a large surface area which included previously irradiated surgical scars, thus increasing the risk for flap ischemia and poor postoperative wound healing. Additionally, our patient's extensive medical history including atrial fibrillation, congestive heart failure, and morbid obesity warranted an approach that minimized operative time. Thus, combining medial and laterally based FF minimized overall donor site morbidity while limiting total anesthetic time.

Multiple variations of FF after resection of breast cancer have been described in the literature. Persischetti et al. utilized laterally supplied thoracoabdominal FF for immediate chest wall reconstruction at the time of oncologic resection [1]. This was limited to breast cancer patients with poor prognoses secondary to advanced stage, multiple or recurrent tumors, or radionecrosis. Despite the greater surgical risk in their selected patient population, there were no major complications, and the FF was deemed a relatively quick (operative time of 40 to 120 min) and safe operation. Sjoberg and De Weerd combined a LICAP flap with either a deep inferior epigastric perforator (DIEP) or muscle-sparing TRAM free flap for delayed autologous breast reconstruction [10]. Their findings demonstrated that this combined FF approach provided improved projection and ptosis of the breast without additional operative time or complications compared to a DIEP or TRAM flap alone. In comparison to these studies, our case differs in that FF were utilized for coverage of a full-thickness chest wall defect nearly two decades after initial surgery and adjuvant treatment, rather than for volume replacement in immediate breast reconstruction.

4. Conclusion

FF may be successfully used to reconstruct large surface area chest wall defects, even for patients with comorbid condition or those with previous breast surgery and radiotherapy who would not otherwise tolerate myocutaneous reconstruction. This is a safe and effective option with which general surgeons should be familiar, in order to minimize morbidity and achieve wound healing.

Abbreviations

FF	fasciocutaneous flaps
LICAP	lateral intercostal artery perforator
DIEP	deep inferior epigastric perforator
TRAM	transverse rectus abdominus myocutaneous

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Provenance and peer review

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Ethical approval

As a case report, this study is exempt from ethical approval at our institution.

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CRediT authorship contribution statement

Nikhil Shah: conception and design, writing, read and approved
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Rui-Min Mao: writing, formatting, revision, read and approved
V. Suzanne Klimberg: conception and design, formatting, revision, read and approved, guarantor of paper.

Declaration of competing interest

The authors have no financial or non-financial conflicts of interests to disclose.

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