Sticking to What Matters: A Modern Approach to Split-thickness Skin Graft Fixation With Fibrin Glue

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INTRODUCTION: Split-thickness skin grafts (STSGs) remain a valuable tool in the reconstructive surgeons armamentarium. Various surgical techniques exist for fixation of STSG. Traditionally, staple or suture fixation serves as the gold standard of care; however, these techniques are often associated with increased pain and numerous office visits. Fibrin glue (FG), a widely used surgical adhesive, has key components which directly impact adherence and hemostasis. In this study, we aim to compare clinical outcomes of STSGs following FG versus mechanical fixation (MF).

METHODS: All patients who underwent a STSG performed by 2 plastic and reconstructive surgeons from January 2016 to March 2018 were retrospectively analyzed. The two cohorts consisted of patients undergoing a STSG with FG or MF (suture or staple). Cohorts were matched by wound according to wound size, wound location, and body mass index. Operative and outcome data were analyzed and compared.

RESULTS: A total of 56 patients with 66 wounds were included (FG: n = 23, 34 wounds, MF: n = 33, 34 wounds). Demographic information was similar between both cohorts including body mass index (FG: 28 kg/m²; MF: 29 kg/m²; P = 0.254), diabetes mellitus (P = 0.155), smoking history (P = 0.768), and wound size (FG: 280.6 cm²; MF: 241 cm²; P = 0.754). Grafts were applied to the lower extremity (85%), upper extremity (6%), scalp (6%), and perineum (3%). There was no significant difference between the groups regarding time to 100% graft take (FG: 30.1 days; MF: 39.9 days; P = 0.220), length of stay (FG: 3.16 days; MF: 3.62 days; P = 0.700), or graft complications at 180 days (FG: n = 3; MF: n = 6; P = 0.476). A 42% difference in wound-adjusted operative time (FG: 46.0 minutes; MF: 71.0 minutes; P = 0.080) was identified with FG fixation, however, not statistically significant.

CONCLUSION: FG for the adherence of skin grafts remains largely unexplored, specifically in a general wound reconstruction population. The use of FG for STSG fixation shows comparable clinical outcomes to MF, with a decrease in wound-adjusted operative time. This study highlights the safety and efficacy of FG for STSG fixation in a matched controlled cohort of diverse wounds. The implementation of FG for STSG has the potential to benefit practice workflow, by minimizing healthcare resources and operative time, in addition to providing successful clinical outcomes.

Reconstructive Algorithm of Oncologic Resections of the Upper Torso and Shoulder Girdle

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PURPOSE: Oncologic resections of the upper torso and shoulder girdle are rare but are sometimes required for aggressive cancers such as sarcoma. Extirpative defects frequently include exposure of major neurovascular structures, bone, and viscera that significantly impact patient function. Due to the rarity of these resections, an advanced reconstructive algorithm has yet to be defined. We present the largest series to date of oncologic reconstructions in this region, including massive defects due to shoulder disarticulation and forequarter amputation. Our reconstructive algorithm includes local, regional, and microvascular free flap options for reconstruction.

METHODS: A retrospective chart review of all plastic surgery reconstructions performed for malignant tumor extirpation of the upper torso and shoulder girdle from January 2008 to January 2018 at the University of Texas MD Anderson Cancer Center. Data collected include patient details (age, sex, body mass index, and comorbidities), oncologic history (tumor type and status, neoadjuvant and adjuvant treatment), surgical detail (resection size and components, services involved, reconstruction type performed), and outcomes (complications, length of follow-up, patient status).

RESULTS: A total of 262 procedures in 230 patients were identified which met inclusion criteria. Fifty-nine percentage of patients were male with an average age of 55 years (range, 6 months to 89 years). Most patients were treated for a primary tumor (51%), although 32%, 9%, and 8% were treated for recurrent, metastatic, and radiation-induced tumors, respectively. The most common tumor type was sarcoma (77%). Defect size averaged 182 cm² with a range of 4–1,350 cm² (20.2% measured 0–50 cm², 26.0% measured 51–100 cm², 25.2% measured
101–200 cm², 17.2% measured 201–400 cm², and 11.5% measuring >401 cm²). Exposed structures included bone in 62.2%, major vessels in 43.1%, major nerves in 37.4%, and viscera in 11.5%. Endoprostheses were present in only 4%. Amputations occurred in 15% of patients, including forequarter with or without chest wall in 10% and shoulder disarticulations with or without chest wall in 5%. Other large bony resections occurred in 23% of patients, including total humerus, scapulectomy, chest wall, and/or a combination of these bony deficits. Thirty-seven percentage of extirpative defects were closed with local tissue rearrangement only, whereas 47% required a pedicled flap, and 16% required a free flap. Latissimus dorsi and pectoralis major pedicled flaps were most commonly performed. Anterolateral thigh (7.6%) and fillet of forearm (2.7%) were the most commonly performed free flaps. As the size of the defect grew, so did the need for advanced reconstructive techniques. Of the 30 patients who had defects >401 cm², 11 (37%) required a pedicled flap, 8 (27%) required a free flap, and 3 (10%) required both a pedicled and free flap.

CONCLUSION: Exirpative defects of the upper torso and shoulder girdle are rare but serious resections that require dependable reconstruction. In our series, approximately one third of patients were treated with complex closure or local tissue rearrangement, whereas the remaining two thirds required pedicle or free flap reconstruction. In particular, as defect size and exposed structures increased, the necessity for advanced reconstruction also grew. We propose a reconstructive algorithm to guide the reconstruction of these difficult defects.

Nipple Autograft: External Scaffolding Preserves Projection of Minced Costal Cartilage

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INTRODUCTION: Nipple reconstruction is an essential last step of breast reconstruction after total mastectomy, bearing psychological significance for cancer patients, resulting in improved general and esthetic satisfaction. However, most techniques such as local tissue flaps and engineered tissue substitutes such as the Cook Biodesign nipple reconstruction cylinder are limited by secondary scar contracture and loss of neonipple projection leading to inconsistent results and increased patient dissatisfaction. Approximately 30,000 patients undergo deep inferior epigastric perforator flap breast reconstruction annually, during which the excised costal cartilage (CC) is normally discarded. Herein, we propose utilizing minced CC as a highly incorporative viable graft. Furthermore, we have previously shown that biocompatible, biodegradable, 3-dimensional (3D)-printed scaffolds maintain the volume and contour of engineered auricular cartilage in the setting of auricular scaffold fabrication. In this study, we hypothesize that incorporating biodegradable, 3D-printed external scaffold in our nipple constructs will further augment preservation of neonipple projection and contour.

METHODS: Custom external scaffolds were designed with inner dimensions matching the Cook Biodesign nipple reconstruction cylinder (interior volume: ≈900 mm³), then 3D-printed using polyactic acid. Patient-derived CC was minced in sterile fashion, and half of the samples were packed into 3D-printed polyactic acid scaffolds; in the remainder, an equal volume of minced cartilage was wrapped in Surgicel only. The constructs were implanted into nude rats by creating a subcutaneous pocket using a CV flap technique. After 3 months, histologic, topographic, and gross analysis were performed. To measure volume and topography, constructs were imaged via computed tomography with an animal computed tomography scanner and then digitally reconstructed.

RESULTS: After 3 months in vivo, gross analysis showed improved preservation of contour and projection of the “scaffold protected” construct as compared to the “unprotected” implant. Hematoxylin and eosin staining in both groups showed the presence of healthy and viable cartilage after 3 months in vivo which was confirmed by LIVE/DEAD assay. Formation of fibrous tissue around the minced CC was noted in both groups and resulted in consolidation of the minced cartilage into a nipple-like shape. Preservation of neonipple projection was significantly improved in the scaffold-protected group in comparison to unprotected group (91.6% versus 64.1%; P = 0.045). Similarly, volumetric analysis showed superior preservation of volume in the scaffolded group in comparison to the unprotected group (895.5 versus 607.8 mm³; P = 0.019). Further, the resultant tissue was spongy and compressible much like a native nipple.

CONCLUSIONS: We demonstrate that minced autologous CC, which is usually discarded during a deep inferior epigastric perforator procedure, can be used as a viable implant for nipple reconstruction with favorable biomechanical qualities. Our 3D-printed biocompatible/biodegradable external scaffolds significantly mitigate loss of projection and contour of the constructs. This allows for custom design of desired shape and size of the nipple enabling the immediate fabrication of individualized engineered autologous implants tailored to patient desire (different sizes/levels of projection), without