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Breast

Prophylactic Buried Dermal Flap: A Simple Method for Axillary Reconstruction after Lymph Node Dissection

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Summary: Breast cancer–related lymphedema is characterized by progressive limb enlargement and occurs in up to 30% of breast cancer patients following axillary lymph node dissection (ALND). Immediate lymphatic reconstruction (ILR) is a preventative technique used to reduce lymphedema rates by performing lymphovenous anastomoses of disrupted afferent lymphatics. This study presents a novel method of axillary reconstruction following ALND using a buried dermal flap that provides local tissue with intact subdermal lymphatics to the axillary dead space. A single-center retrospective review was performed to assess breast cancer patients who underwent modified radical mastectomy without reconstruction between 2018 and 2023. Groups were divided into those who had ILR alone (group 1) and those who had buried dermal flap with attempted ILR (group 2). There were 31 patients included in this study: 18 patients in group 1 and 13 patients in group 2. Patient demographics, comorbidities, and breast cancer history were similar between the groups. There was no significant difference in the mean number of lymphovenous anastomoses performed (1.6 versus 1.7, $P = 0.84$). Mean operative time of 224.4 ± 51.9 minutes in group 1 was similar to 223.4 ± 30.4 minutes in group 2 ($P = 0.95$). We introduce a novel method of axillary reconstruction following ALND using a buried dermal flap that is inset into the axillary dissection space and over the area of ILR. We propose that it is an efficient accessory procedure to augment ILR by providing supplementary intact lymphatic channels to the area of lymphatic injury, while obliterating the axillary dead space. *(Plast Reconstr Surg Glob Open 2024; 12:e6166; doi: 10.1097/GOX.0000000000006166; Published online 12 September 2024.)*

AXILLARY RECONSTRUCTION USING THE BURIED DERMAL FLAP

Lymphedema is a chronic, progressive disease characterized by the accumulation of lymphatic fluid in the interstitial space from lymphatic dysfunction.[1] Lymphedema has been estimated to affect around 5 million individuals in the United States and over 200 million worldwide. The most common etiology is breast cancer-related lymphedema, which occurs in 30% of patients following axillary lymph node dissection (ALND).[1] Treatment options are variably effective.[2–4] There is no cure for lymphedema, as the inflammatory cascade leading to fibrosis is difficult to reverse.[5]

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Received for publication March 31, 2024; accepted July 26, 2024.

DOI: 10.1097/GOX.0000000000006166

Immediate lymphatic reconstruction (ILR) can be performed at the time of ALND to decrease the risk of lymphedema by microsurgically anastomosing disrupted, afferent lymphatics to veins in the axilla.[6,7] However, axillary dead space still exists, which can result in axillary tightness and seroma formation. This study presents a novel method of prophylactic axillary reconstruction following ALND using a buried dermal flap to reduce dead space and provide vascularized tissue with intact subdermal lymphatics.

A single-center retrospective review was performed for patients with breast cancer who underwent mastectomy (without immediate breast reconstruction) and ALND with attempted ILR between 2018 and 2023. Patients were divided into two groups: group 1 had ILR alone and group 2 had a buried dermal flap with attempted ILR. Variables of interest were patient demographics, smoking status, diabetes, and body mass index. History of chemoradiation,

Disclosure statements are at the end of this article, following the correspondence information.

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number of lymphovenous anastomoses, and operative time were assessed. Statistical analyses were conducted using RStudio statistical software (Boston, Mass.). Two sample *t* tests/chi-squared tests were performed for statistical analysis. *P* values less than 0.05 were considered statistically significant.

Buried dermal flap reconstruction was performed following the completion of mastectomy, ALND and attempted ILR (Fig. 1). [**See figure, Supplemental Digital Content 1,** which displays the operative technique of buried dermal flap following ALND and ILR. A, Flap markings are drawn (blue ink) before de-epithelialization. B, Flap is de-epithelialized and inset into axilla (yellow arrow), **http://links.lww.com/PRSGO/D497**.] [**See Video (online),** which displays the operative technique of buried dermal flap harvest and inset.]

The inferolateral edge of the mastectomy incision was the donor site to recruit superolateral thoracoabdominal tissue. A "random pattern" flap was de-epithelialized and raised from the inferolateral edge of the mastectomy incision with a 2:1 length-to-width ratio. Intraoperative indocyanine green (ICG) dye can be administered intradermally in the upper lateral trunk to visualize the subdermal lymphatic with a near-infrared laser camera.[8] The dermal flap was then inset to the axillary dead space over lymphovenous anastomoses if ILR was performed.

This study included 31 patients who underwent mastectomy and immediate ALND with ILR. Group 1 (ILR alone) had 18 patients and group 2 (buried dermal flap with attempted ILR) had 13 patients. Patients did not undergo immediate breast reconstruction in either group. The mean age in group 1 was 47.9 ± 10.6 years compared with 56.2 ± 11.5 years in group 2 ($P = 0.05$). Group 1 had a mean body mass index of 34.6 ± 11.2 kg per m^2 compared with 36.0 ± 9.7 kg per m^2 in group 2 ($P = 0.70$). Diabetes was present in 16.7% (3/18) of group 1 patients compared with 7.7% (1 of 13) in group 2 ($P = 0.46$). Smoking was present in 16.7% (3 of 18) of group 1 patients compared with 23.1% (3 of 13) in group 2 ($P = 0.66$). There was no difference in race ($P = 0.43$), type of breast cancer ($P = 0.81$), breast cancer stage ($P = 0.36$), or utilization of frozen intraoperative pathology ($P = 0.73$) between the groups. Group 1 underwent neoadjuvant chemotherapy compared with 61.5% (8 of 13) in group 2 ($P < 0.01$). Inflammatory breast carcinoma was the diagnosis in 83.3% (15 of 18) of patients in group 1 and 46.2% (6 of 13) in group 2 ($P = 0.03$). Group 1 underwent adjuvant radiation compared with 92.3% (12 of 13) in group 2 ($P = 0.23$). ILR was attempted in all patients, but in group 2, it was able to be performed in 69.2% (9 of 13) of patients. The mean number of lymphovenous anastomoses if ILR was performed was 1.6 ± 0.6 in group 1 compared with 1.7 ± 0.7 in group 2 ($P = 0.84$). The mean operative time was 224.4 ± 51.9 minutes in group 1 compared with 223.4 ± 30.4 minutes in group 2 when including patients that had ILR successfully performed ($P = 0.95$). The mean number of days to drain removal was 16.5 ± 9.7 in group 1 compared with 15.9 ± 9.0 in group 2 ($P = 0.87$). The mean follow-up in group 2 was 6.1 months (range: 2.2-12.6 months), and none of these patients have developed lymphedema.

Takeaways

Question: Axillary dissection results in lymphatic injury and a soft tissue dead space. How can reconstruction be optimized after axillary dissection?

Findings: A buried dermal flap using excess skin adjacent to the mastectomy incision adds minimal operative time while recruiting subdermal lymphatics and obliterating axillary dead space.

Meaning: We present a novel method of axillary reconstruction following mastectomy and axillary dissection using a buried dermal flap, which is an efficient accessory procedure to augment immediate lymphatic reconstruction and provide intact subdermal lymphatics, while obliterating axillary dead space.

DISCUSSION

Lymphedema is difficult to treat. There has been a focus on its prevention with ILR to reduce breast cancer-related lymphedema rates. Our study introduces prophylactic axillary reconstruction following ALND using a buried dermal flap. In 1962, Noel Thompson described a buried dermal flap in a limb with existing lymphedema.[9] A long strip of skin in the lymphedematous limb was de-epithelialized and buried into the ipsilateral affected limb, which was shown to improve lymphedema.[9] Unlike the buried dermal flap in a lymphedematous limb, the flap from the trunk has functional subdermal lymphatics. Pedicled flaps such as thoracodorsal artery perforator flaps have

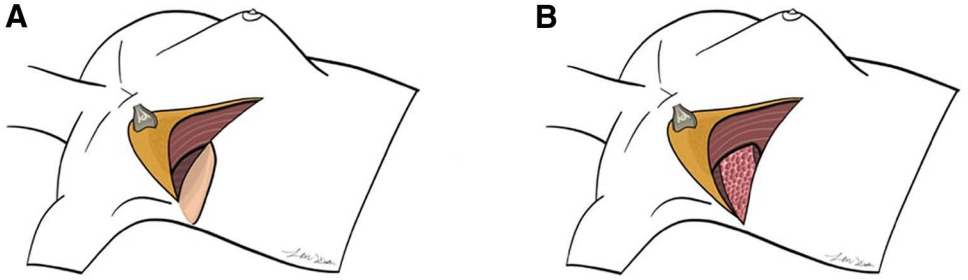

Fig. 1. Illustration of buried dermal flap following ALND and ILR. A, Flap markings before de-epithelialization. B, Flap is inset into axilla. Illustrations by Luci A. Hulsman, BS.

been used to treat lymphedema with lymph node transfer.[8] The buried dermal flap discussed in this study is prophylactic and harvest is simple. Patients who did not undergo breast reconstruction were chosen, as the axillary dissection was performed through the mastectomy wound with a long incision that could be incorporated into a flap with elimination of the lateral standing cone deformity. The flap can be performed in any patient undergoing mastectomy and ALND but is most easily designed without breast reconstruction because of the significant lateral standing cone deformity and long horizontal scar. An axillary dissection performed through a separate axillary incision would not be feasible for the same flap design.

The prophylactic buried dermal flap has several advantages. It fills the axillary dead space, a fundamental principle in soft tissue reconstruction. We demonstrated intact subdermal lymphatics in the dermal flap using ICG lymphangiography. This may theoretically allow for lymphangiogenesis from the disrupted afferent lymphatics to connect the flap, facilitating another outlet for axillary lymphatic drainage. Pedicled flaps have been shown to establish new lymphatic connections to recipient sites and prophylactically reduce lymphedema in animal models.[10] The flap also removes the subaxillary standing cone deformity of the mastectomy scar. Additionally, the flap added an insignificant amount of operative time when compared with the control group. Limitations include lack of long-term follow-up, as minimum follow-up of 1–3 years would be required to determine its effect on lymphedema incidence.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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