The Use of Dermal Autograft for Fascial Repair of TRAM Flap Donor Sites

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Abstract- Closure of fascia after transverse rectus abdominis myocutaneous (TRAM) flap has usually been performed with direct closure or synthetic material. The dermal autograft removed from zone IV of the flap is an alternative to reinforce fascial closure. Record of the patients who had been undergone breast and head and neck reconstruction by TRAM flap between 1998-2008 were retrieved. In 34 cases dermal autograft and in 42 cases a synthetic mesh was used for closure of the abdominal fascial defect. All patients were followed by physical examinations for a mean period of 24months.There were one (2.9%)bulging of the anterior abdominal wall and one (2.9%) wound infection in dermal autograft group and one(2.3%) true hernia in mesh repair group. Dermal autograft is a useful alternative to mesh repair of fascial defects after TRAM flap harvest.

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Key words: Transplantation; autologous; dermis; surgical flaps; reconstructive surgical procedures; head; neck

Introduction

The transverse rectus abdominis myocutaneous (TRAM) flap is now an accepted, reliable technique for breast reconstruction after mastectomy (1-6) and other soft tissue defects. The anterior rectus sheath is one of the major components maintaining the integrity of the abdominal wall and contour. TRAM flap leaves at least a segmental muscle defect and a variable defect of anterior rectus sheath in part of the abdominal wall where the posterior rectus sheath is deficient in lower part of arcuate line. Thus abdominal wall hernia formation is a risk unless the sheath defect is reconstructed. Closure of fascia has usually been performed with direct closure or synthetic material. An appropriate substitute for fascia should be inert, permanent, non allergic, sterile, and strong (7). The use of synthetic material is a well-established technique for the repair of abdominal fascial defects. However, this can bring its own set of complications, including infection, foreign body reaction, extrusion, and intestinal fistulization (8). The use of autologous material instead of a synthetic substitute could diminish these complications. Dermal autograft has all of above criteria for a fascial substitute and is available in the TRAM operation. The use of dermal autograft to reinforce fascial closure after TRAM harvest has been described, but has never been studied in a systematic way (9, 10).

This report provides a summary of our clinical experience and technical points in using dermal autografts for fascial repair of TRAM flap donor sites.

Patients and Methods

Record of the 76 patients who had been undergone breast and head and neck reconstruction by TRAM flap between 1998-2008 were retrieved .records of follow-ups were also obtained. All patients had history of mastectomy or advanced tumor of head and neck.

Patients categorized in dermal autograft group and in mesh group according to the type of abdominal wall reinforcement.

There were ten free TRAM flap and 24 unipedicled TRAM flap in dermal autograft group.

All patients in prolene mesh group had unipedicled TRAM including 36 ipsilateral and 6 contralateral.

Data concerning abdominal wall complications (bulging, true hernia and abdominal wound infection) were obtained and recorded. Then the patients were invited in our outpatient clinic and abdominal wall examination was done by another surgeon.

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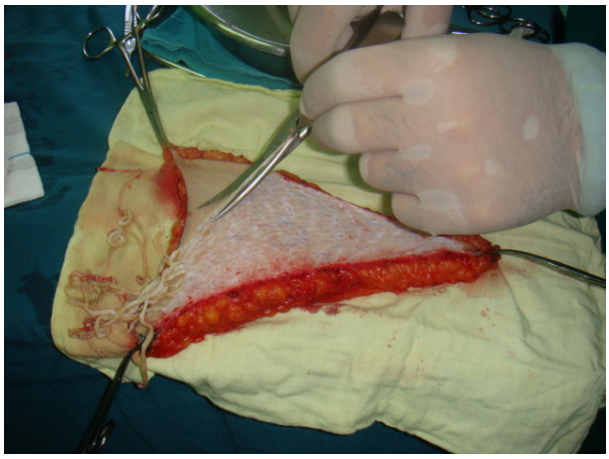
Abdominal bulging was recorded when anterior protrusion at the site of rectus harvest was more than 2 cm in front of the other side with the patient in the standing position. Abdominal wound infection was recorded from a review of the patient's notes when any two of the following three criteria were diagnosed: persistent abdominal wound discharge, growth of pathogenic organisms from the wound, or failure of the abdominal wound to heal at any point.

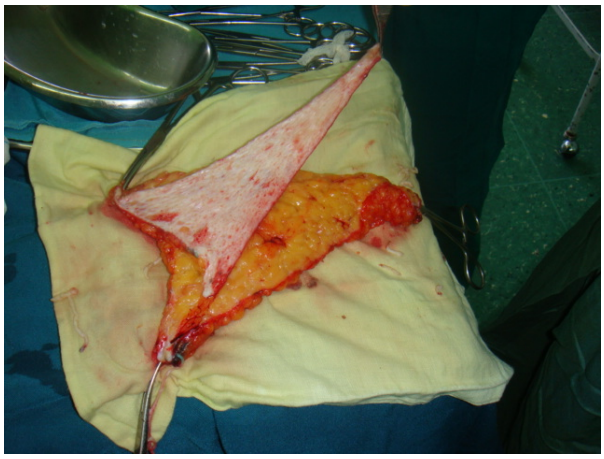
Comparison of abdominal complications in two groups was carried out with the Chi-Square test. *P*-value of < 0.05 was considered statistically significant. All statistical analyses were performed using SPS (version 11.5).

Surgical technique

After harvesting TRAM flap from abdominal wall defect of fascia was closed by prolene mesh or dermal autograft.for preparing dermal graft, deepithelization of zone IV was done by scissor(Figure 1A). The dermis overlying zone IV is then sharply removed from the underlying subcutaneous tissue (Figure 1-B). This dermal graft is stored in moist gauze until needed (Figure 1C).



(A)

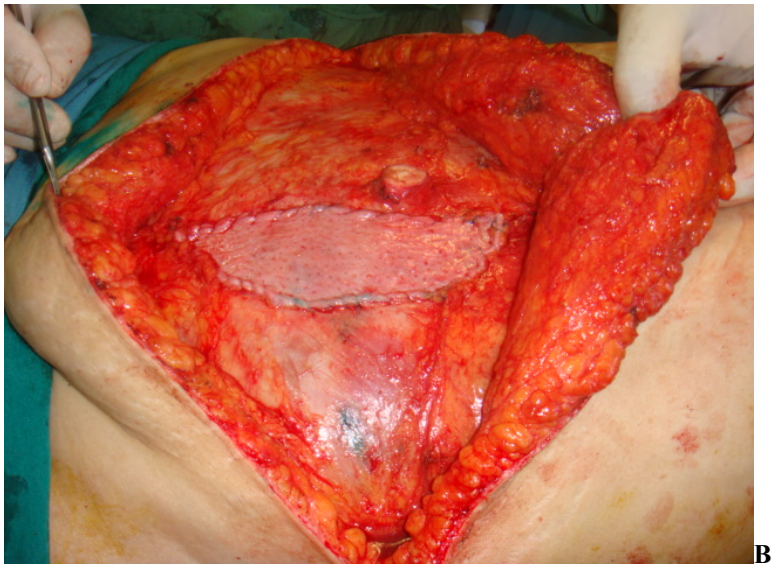


(B)

(C)

Figure 2. Preparing of the dermal auto graft. **A:** zone IV of flap is deepithelialized with a scissors**. B:** The dermis overlying zone IV is then sharply removed from the underlying subcutaneous tissue. **C:** Dermal graft is stored in moist gauze

A



B

Figure 3. Insert of the dermal autograft after right rectus harvest. **A:** Defect of right rectus muscle harvest. **B:** Insert of the dermal autograft.

Closure of the fascial defect is begun, using 2-0 Prolene to reapproximate the anterior rectus sheath, taking care to incorporate the fascia of both the internal and external oblique muscles. For closure of lower part of fascia and fascial defect of free flap, the dermal graft is trimmed to the appropriate size and is used to patch donor site defect under tension.. Closed suction drains are left subcutaneously. Then the subcutaneous tissue and skin are reapproximated.

Results

The dermal autografts were used to close anterior sheath defects in 34 patients and prolene mesh were used to close anterior sheath defects in 42 patients. Graft size ranged from 3 × 7 cm to 4 × 12 cm. Mean graft size was 34 cm^2. There were 5(14.7%) male and 29(85.3%) female in dermal autograft. Average age was 49.5 years (range, 38 to 60 years). Follow-up time ranged from 5 months to 5 years. After mean follow-up time 27.3 months one (2.9%) patient developed abdominal wall

bulging inferior to the arcuate line. None of patients developed a true hernia. One patient developed wound infection that requiring only local wound care.

All patients in prolene mesh group were female with an average age of 40.5 years (range, 24 to 56 years). Average follow-up time was 20.7 months (range, 6 months to 10 years). One patient (2.3%) developed true hernia.

There is no significant difference between abdominal complications in dermal autograft and mesh groups (P =0.5).

In 42 Prolene mesh group, average follow-up time was 20.7 months (range, 6 months to 10 years). These patients had an average age of 40.5 years (range, 24 to 56 years). 1 of 42 patients developed true hernia, an incidence of 2.3 percent. No abdominal infections occurred in patients. No patients had bulging.

There is not significant difference between abdominal complications in dermal autograft and mesh groups (P =0.5).

No patients require a second operation where the dermal graft was assessed after a period of time.

Discussion

The rectus abdominis muscle is now a commonly used carrier for both pediceled and free muscle flaps and myocutaneous flaps (1-6, 11, 12) based on the superior or inferior epigastric vessels, respectively. After flap harvest, a significant abdominal-wall muscle defect exists (13-17), which is smallest when the free-flap technique is employed (2).when primary closure of the abdominal fascial defect is not possible or is possible only with undue tension synthetic material have commonly be used. Lejour and Dome (15) recommend mesh reinforcement of the anterior rectus sheath. Others, such as Hartrampf (14), rely on meticulous sheath closure. Gore-Tex patch was used in Pennington et al. (18) study. *Buinewicz* et al described the experience with AlloDerm for incisional hernia and transverse rectus abdominis musculocutaneous flap reconstructions (19). Shafiqul *et al.* (20) have studied acellular dermal graft for duraplasty.

In this study, dermal autograft were removed from tissue to be discard and used for fascial closure.This technique was first described by Loewe in 1913 (21). He utilized the so-called cutis graft for herniorrhaphy, dura repair, arthroplasty, and other operations. The cutis graft appeared in the American medical literature in 1939, when Uihlein (22) described the biology and uses of dermis for surgical procedures. The advantages of dermis were its elasticity, biologic activity, and connective tissue fiber content.He also noted that dermis is more metabolically active, lives longer, and regenerates better than fascia after transplant(22). Marchac and Kaddoura (23) reported the use of nondeepithelialized skin strips for closure of abdominal wall midline hernias. Reith et al. (24) have studied dermal grafts for abdominal fascial repair in rats. Hein et al. (8) have studied dermal grafts for abdominal fascial repair of TRAM flap donor sites in 24 patients between 1995 and 1997. These authors document that the dermis is initially coated with fibrin, which brings about an inflammatory reaction with subsequent revascularization by 14 days. Lysis of dermal appendages then occurs, followed by proliferation of collagen and fibroblasts.

Postoperative bulge and hernia rates have been shown to be related to the quality of the abdominal repair (25) and failing to include all layers of the rectus sheath during direct closure will result in an increase in their incidence (26). In this study, rate of true hernia in mesh group was 2.3%. It was 10.2% in our previous report(27) which was the rate of abdominal wall bulging and true hernia together.In the current study Infection rate and bulging rate of dermal autograft group was 2.9% and 2.9% respectively and no true hernia occurred while in Hein et al's study (8), infection rate was 12.5 % and true hernia rate was 4.2 % and rate of bulging was 8.3 % in dermal autograft group. Other series using synthetic material also document infections, which required a second operation and mesh removal in all cases. In another study, polypropylene mesh was used on a routine basis to repair fascial defects after TRAM harvest in 65 patients(28). The rate of hernia was 1.5 percent; the rate of infection was 1.5 percent and one patient with infection also required mesh removal. In study of 54 patients undergoing abdominal wall donor site reconstruction following pedicle TRAM flap procedures following mastectomy, no infectious complications were reported (29). In the study of Pennington et al, 52 TRAM flap patients in whom the anterior rectus sheath was reconstructed with polytetrafluoroethylene (Gore-Tex) patch, no hernias were detected (follow-up period 3 months to 5 years) and the rate of abdominal wound infection was 5.8 percent that controlled by long-term antibiotic therapy (18). Elliott *et al.* (5) found a 2.5 percent incidence of hernia in their own series of pediceled TRAM flaps and no hernias among their free TRAM flaps. Preservation of lateral and medial strips of rectus muscle results to decreasing

the risk of bulging and produce aesthetically pleasing results.

Dermal autograft seems to offer several advantages over synthetic mesh. Biologic materials appear to be less susceptible to infection due to rapid vascularization. It is more economic than synthetic material. It is available and easy to insert. But despite successful results of this study we must consider our short follow up time and our few dermal autograft cases, so a larger study group which can be randomized in two group with longer follow up will be required. In conclusion, it seems that repair of the anterior rectus sheath with dermal autograft is a safe and possible alternative to prosthetic repair.

There is no conflict of interest in our study.

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