

# Progressive Tension Sutures to Prevent Seroma Formation after Latissimus Dorsi Harvest

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The latissimus dorsi muscle flap is a versatile flap used in a variety of reconstructive procedures. The major complication reported with its use is donor-site seroma, reported to occur in 20 to 79 percent of cases. A retrospective review of 47 patients undergoing latissimus dorsi muscle harvest from April of 1998 through May of 2002 was performed. Progressive tension sutures were used during donor-site closure in 22 patients from March of 2000 through May of 2002. This group was compared with historical controls from April of 1998 through March of 2000 ( $n = 23$ ) who underwent latissimus dorsi harvest without use of the technique. Seven of 23 controls (30 percent) developed seromas at the donor site, compared with 0 of 22 (Fisher's exact test,  $p = 0.0092$ ). The authors conclude that use of progressive tension sutures placed at the time of donor-site closure is an effective method to reduce or eliminate the most common complication associated with latissimus dorsi harvest. Technique recommendations are reviewed. (*Plast. Reconstr. Surg.* 112: 1779, 2003.)

The latissimus dorsi flap has long been used as a workhorse flap for reconstructive surgery of the head and neck,<sup>1-6</sup> breast,<sup>7-10</sup> extremity,<sup>11-16</sup> and thoracic regions.<sup>17-23</sup> Muscle size, wide arc of rotation, reliable cutaneous paddle, and an excellent vascular leash for microvascular transfer make the latissimus dorsi an extremely versatile flap.

The most common complication associated with the use of the latissimus dorsi flap is donor-site seroma. Although rates as low as 1 percent have been reported,<sup>24</sup> recent publications continue to report rates in the range of 20 to 79 percent.<sup>25-28</sup> Large postoperative seromas can be a source of significant patient discomfort and anxiety and often require repeated aspirations during their management.

Seromas have also been implicated in wound infection, dehiscence, and flap necrosis.<sup>29-30</sup>

One of the authors (Pollock) has previously reported on the use of progressive tension sutures to eliminate postoperative seroma formation—and suction drain use—in abdominoplasty patients.<sup>31</sup> The purpose of this study was to evaluate the effectiveness of progressive tension sutures in eliminating postoperative donor-site seromas after latissimus dorsi muscle harvest.

## PATIENTS AND METHODS

The study was designed as a retrospective review of 47 patients who underwent harvest of the latissimus dorsi muscle between April of 1998 and May of 2002. The control group consisted of 25 patients who underwent latissimus dorsi harvest between April of 1998 and March of 2000. Indications for the muscle harvests were breast reconstruction (20 patients), coverage of an extensive calvarial defect (one patient), coverage of an above-knee amputation stump (one patient), closure of a chest wall defect after open drainage of an empyema (one patient), and coverage of open sternal wounds (two patients). The data for two of the patients (sternal wound coverage) were unavailable and thus not included in the study.

The experimental progressive tension suture group consisted of 22 patients who underwent latissimus dorsi muscle harvest from March of 2000 to May of 2002. Indications were breast reconstruction (22 patients) and coverage of a

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chest wall defect secondary to radiation therapy (one patient).

Muscle harvest was performed in the standard fashion in both study groups. This included the use of electrocautery during dissection. The investing fascia of the latissimus dorsi muscle was left on the back flap to aid in closure.

In the control group, closure of the incision was achieved in layers using 2-0 Vicryl fascial sutures, 3-0 dermal sutures, and 4-0 subcuticular sutures. The experimental group had several rows of 3-0 Vicryl progressive tension sutures placed at regular intervals. As described by Pollock and Pollock,<sup>31</sup> the progressive tension sutures were placed from the superficial to deep fascia/chest wall in rows while the flap was advanced (Fig. 1). Normally, two to three rows are needed. The deep sutures at the wound margins were 2-0 Vicryl three-point sutures, including fascia on both sides of the incision, to the chest wall (Fig. 2). The skin

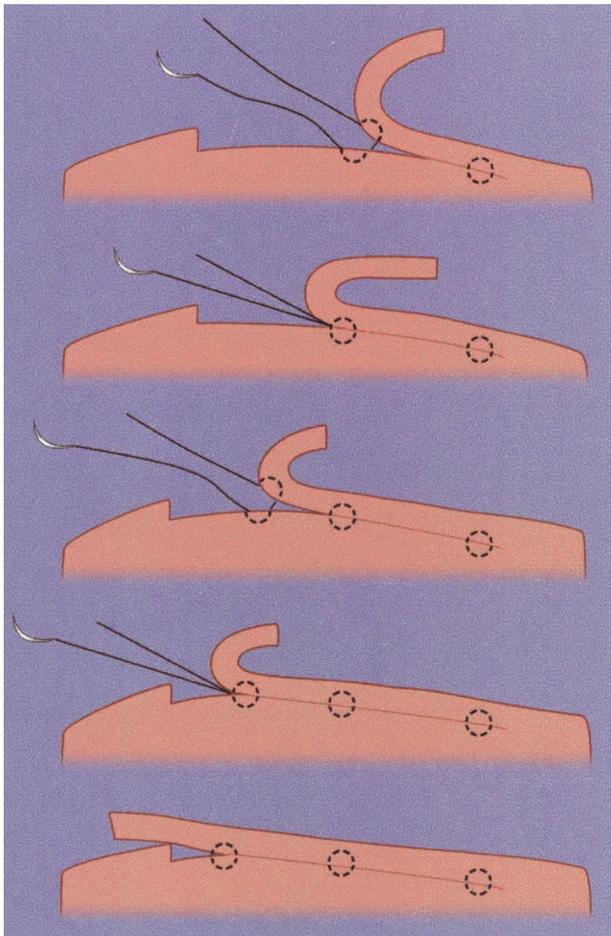


FIG. 1. As the flap is advanced, multiple rows of sutures are placed from the superficial to the deep fascia. Dead space is obliterated, and there is no tension at the flap margins.

incision was closed in layers, as in the control group.

Patients in the control group had two suction drains (15 French) placed in the donor sites, whereas the experimental group had a single drain placed. Drains were removed when drainage was less than 30 cc during a 24-hour period.

All patients had weekly follow-up with physical examination. Seroma noted by physical examination was documented.

## RESULTS

Seven of the 23 patients (30 percent) with the traditional layered closure developed donor-site seromas. None of the patients in the progressive tension suture group developed a postoperative seroma. Statistical evaluation with Fisher's exact test revealed a significant difference between the groups ( $p = 0.0092$ ). If the patients excluded from the control group were assumed to have not developed seroma, the seroma rate would be 28 percent, statistically significant by Fisher's exact test ( $p = 0.0104$ ).

All seromas were treated with aspiration and compression with successful resolution. The mean number of aspirations was 1.57 (range, one to four). There were no other untoward sequelae in the patients who developed seromas.

The number of days until drain removal could be firmly established in 12 of the 23 patients in the control group and 20 of 22 patients in the experimental group. The available data, although insufficient for statistical analysis, did reveal a positive trend. The control group had drains removed at a mean time of 13.9 days (range, 2 to 43 days), whereas the experimental group averaged 7.5 days (range, 2 to 44 days).

## DISCUSSION

The latissimus dorsi muscle is arguably the most versatile flap in reconstructive surgery. Applications have included reconstruction of the breast, head and neck, trunk, and extremities. The most frequently reported complication of the procedure has been seroma formation at the donor site. Some reports document seroma rates as high as 79 percent.<sup>28</sup>

Schwabegger et al.<sup>32</sup> attempted to define some of the probable causes of seroma formation and strategies for prevention. The authors cite "friction of the wound layers" and fat ne-

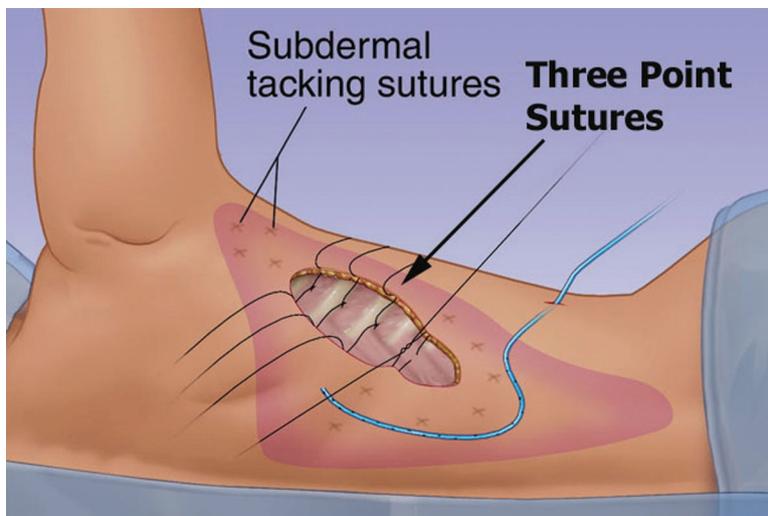


FIG. 2. The wound margins are closed with three-point sutures from the superficial fascia on either side of the incision to the deep fascia of the chest wall.

crosis “from liberal handling of the electrocautery knife” as major causative factors in the formation of seromas after latissimus dorsi harvest. They were able to decrease their seroma rates from 80 percent (electrocautery dissection) to 38 percent (scalpel dissection). Although not the focus of their study design, they did note a decrease in seromas to 9 percent with scalpel dissection and “quilting.” Given their findings, the authors abandoned the use of electrocautery for dissection and routinely placed tacking sutures to the underlying structures. No patient underwent electrocautery dissection with subsequent tacking suture placement. However, given the authors’ assumption that trauma from electrocautery is a major contributor to seroma formation, one would expect a rate greater than 9 percent.

Titley et al.<sup>33</sup> described a quilting technique in 10 patients undergoing latissimus dorsi harvest. They “quilting” the skin flaps to the underlying tissue with 2-0 polydioxanone sutures every 3 to 4 cm. In their study, seroma rates dropped from 56 percent to 0 percent after they adopted the quilting technique.

Pollock and Pollock<sup>31</sup> have previously reported on the use of progressive tension sutures during abdominoplasty to eliminate seroma formation in that population. The purpose of this study was to evaluate the effect of the progressive tension suture technique on donor-site seroma formation after harvest of the latissimus dorsi flap. Our results revealed a statistically significant decrease (elimination) in the rate of seroma formation in our patients.

Unlike the observations of Schwabegger et al.,<sup>32</sup> the use of electrocautery in our patient population did not seem to adversely affect the rate of seroma formation in the progressive tension suture group.

The shearing effect of skin flaps against the underlying structures has been implicated by several authors.<sup>33-35</sup> Although shearing may have a role in seroma formation, we believe elimination of dead space is the key. In our study, a patient in the experimental group had a back drain that was inadvertently removed 36 hours after the operation with an output in excess of 30 ml/day. The factors present in seroma formation, whatever they may be, during the formation of greater than 30 ml/day of serum would presumably be present after drain removal. Despite the increased output, no seroma was noted on follow-up examinations. We believe that some amount of serum must have been deep to the flaps, but accumulation in the form of a seroma was not possible because of the obliterated dead space. A similar scenario was seen in the series by Titley et al.<sup>33</sup> after premature removal of a high-output drain.

Seroma complicating latissimus dorsi harvest is a significant problem, given the widespread use of this flap for reconstructive purposes and the reported incidence of seroma formation. Whether or not progressive tension sutures eliminate dead space and/or shear forces, their use reduced the seroma rate in our series from 30 percent to 0 percent.

Furthermore, the technique permitted the use of one drain with quicker removal. The

ability to minimize back-drain dwell time in our patients has had an extremely positive effect on our patient population. We have found a much higher comfort level in patients undergoing latissimus dorsi reconstruction postoperatively with earlier drain removal. Furthermore, the elimination of seroma with this technique has minimized the use of physician and nurse resources required for repeat aspirations. The only drawback is the time added to the procedure for placement of the sutures during wound closure; however, once the surgeon has become familiar with the technique, the sutures can be placed in approximately 5 minutes.

The fact that a patient in our study and a patient in the study by Titley et al.<sup>33</sup> did not form seromas despite inadvertent early removal of their drains leads to the obvious next question: Is a drain necessary after the placement of progressive tension sutures? Although we have not taken this step, we intend to do so in the near future. Pollock and Pollock<sup>31</sup> have already described the elimination of drains after abdominoplasty, a procedure in which the majority of plastic surgeons continue to use postoperative drains.

#### CONCLUSION

Use of this technique could result in significant reductions in complications, patient discomfort, time to recovery, and costs. We recommend its implementation by all reconstructive surgeons.

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