

Successful Salvage of Pedicled Latissimus Dorsi Flap after Venous Thrombosis by Selective Thrombolytic Therapy

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Summary: While the use of free flaps has become routine and is associated with a low complication rate, pedicled flaps remain a solid reconstructive option in various clinical situations. Pedicled flaps provide a reliable vascular supply and involve a simple surgical procedure. Although the procedure is advantageous from the standpoint of a low rate of flap ischemia, thrombosis, and total flap loss, these complications are still occasionally observed due to intraoperative pedicle injury, postoperative torsion, or compression. Here we report on a case of severe venous thrombosis in a pedicled latissimus dorsi (LD) flap used for breast reconstruction. The patient was a 52-year-old woman who underwent mastectomy and immediate breast reconstruction with a LD flap for left breast cancer. Postoperatively, the color of the skin paddle became dark blue over time. Emergent surgical exploration revealed kinking and narrowing of the thoracodorsal vessels and extensive venous thrombi. The kinked pedicles were repaired and selective thrombolytic therapy was performed. A thrombolytic agent was administered through the serratus anterior branch of the thoracodorsal artery in retrograde fashion while the thoracodorsal vessels were clamped just cephalad to the bifurcation. This allowed for draining of the thrombolytic agent and thrombi through the serratus anterior branch of the thoracodorsal vein without flowing into the systemic circulation. To the best of our knowledge, this is the first report of selective thrombolysis using a pedicle branch to treat venous thrombosis in a pedicled flap. If major vascular branches are available in a pedicled flap, selective thrombolytic therapy may be possible without disconnecting the pedicle, as in the present case. (*Plast Reconstr Surg Glob Open* 2020;8:e3299; doi: 10.1097/GOX.0000000000003299; Published online 17 December 2020.)

Although the use of free flaps has now become routine and is associated with a low complication rate, pedicled flaps still remain a solid reconstructive option in various clinical situations. Pedicled flaps provide a reliable vascular supply and involve a simple surgical procedure. Although the procedure is advantageous from the standpoint of a low rate of flap ischemia, thrombosis, and total flap loss, these complications are still occasionally observed due to intraoperative pedicle injury, postoperative torsion, or compression. Pharmacological



Fig. 1. The color of the skin paddle of the LD flap turned purple and dark blue 14 hours postoperatively.

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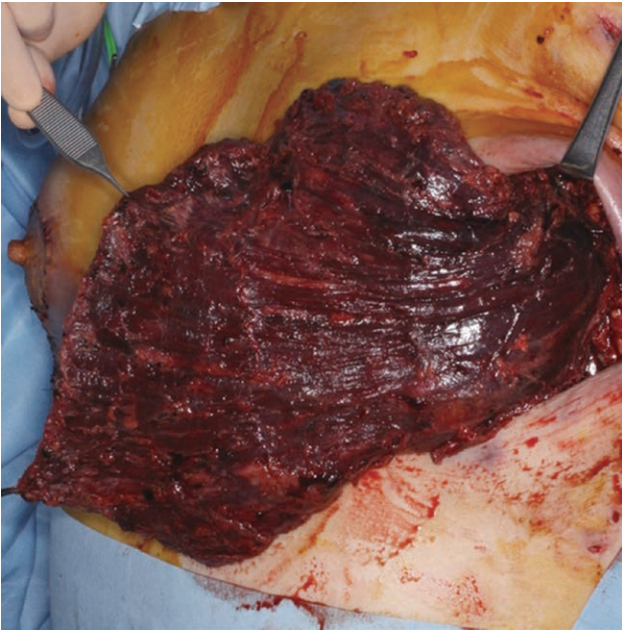


Fig. 2. Intraoperative findings revealed severe flap congestion with extensive venous thrombi.

pedicled latissimus dorsi (LD) flap after severe venous thrombosis. The serratus anterior branches were used as an inlet and outlet for administration of the thrombolytic agent so as to preserve the main pedicle and prevent the agent and thrombi from flowing into the systemic circulation.

CASE REPORT

A 52-year-old woman diagnosed with left breast cancer (cTisN0M0, cStage 0) underwent skin-sparing mastectomy and immediate breast reconstruction with an LD flap and immediate fat transfer. Postoperatively, the skin paddle took on a reddish color and gradually became dark blue over time. The amount of drainage also increased, and the color of fluid became cranberry. At first, temporary flap congestion with venous bleeding was suspected, and a watch-and-wait approach was taken. However, the progressive deterioration of flap color prompted us to perform surgical exploration 14 hours postoperatively (Fig. 1).

Intraoperative findings included kinking and narrowing of thoracodorsal vessels due to LD flap positioning and extensive venous thrombi within the flap, but no thrombi in pedicle vessels (Fig. 2). After correcting the kinked pedicles by repositioning the flap, we administered a thrombolytic agent. One serratus anterior branch of the thoracodorsal artery was identified and cut off, and thoracodorsal vessels were clamped just cephalad to the bifurcation. Before clamping, we confirmed that there were no other identifiable thoracodorsal vessel branches caudally from the clamp, such as other serratus anterior branches, teres major branches, or subscapularis branches. Urokinase (60,000 IU) was injected through the serratus

thrombolytic therapy to salvage free flaps after thrombosis was first reported in 1987.¹ Many reports of successful salvage of free flaps with thrombolytic agents have since been documented, with varying efficacies.^{2,3}

When thrombosis occurs in a pedicled flap, thrombolytic therapy is challenging in view of systemic effects, unless the pedicle is first disconnected. In this report, we used a thrombolytic agent to successfully salvage a

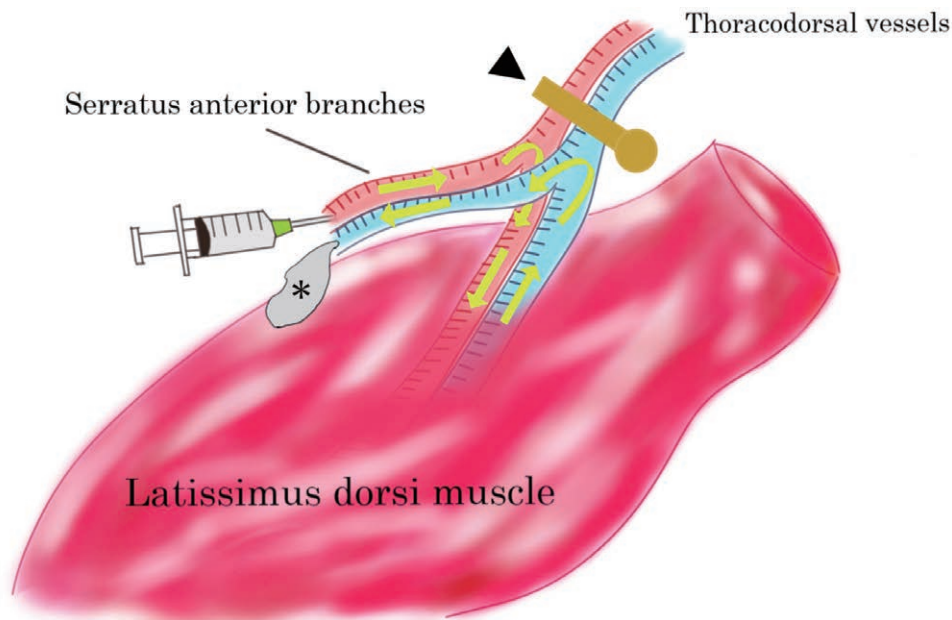


Fig. 3. After clamping the thoracodorsal vessels (arrowhead), 60,000 IU of urokinase was administered through the serratus anterior branch of the thoracodorsal artery. Arrows show the direction of thrombolytic flow, and the asterisk indicates the evacuation of the thrombolytic agent and venous thrombi.

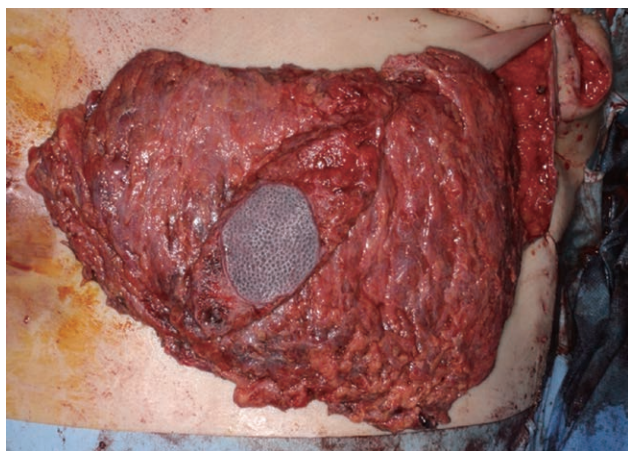


Fig. 4. The color and tenderness of the flap improved after selective thrombolysis.

anterior branch of the thoracodorsal artery, followed by irrigation with heparinized saline and evacuation of the thrombolytic agent and thrombi from the serratus anterior branch of the thoracodorsal vein (Fig. 3). The main pedicle was released from the clamp, allowing blood flow into the muscle flap and leading to a significant improvement of flap color (Fig. 4).

Postoperative monitoring did not show any signs of flap ischemia, thrombosis, or necrosis. The patient developed cellulitis in the left lateral chest 4 days postoperatively, which was successfully treated with antibiotics. The patient was discharged on postoperative day 22, and the outcome remains favorable 7 months postoperatively.

DISCUSSION

A transferred pedicled flap can occasionally exhibit temporary congestion despite sufficient patency. Kim et al. described this phenomenon as “initial temporary vascular insufficiency” and suggested that temporary flap congestion is difficult even for experienced plastic surgeons to distinguish from real venous congestion.⁴ LD flaps appear to be more susceptible to this phenomenon compared with other conventional flaps.⁴ Accordingly, from the clinical perspective, surgical exploration to salvage a failing LD flap may be delayed due to the failure to discriminate between temporary flap congestion and real venous congestion. Moreover, with respect to salvaging free flaps, delayed exploration is more likely to require additional interventions such as thrombolysis.⁵ In light of this, accumulating clinical experience on salvaging pedicled LD flaps with thrombolysis is important.

According to the Mathes and Nahai classification, the vascular anatomy of the LD muscle is classified as a Type V blood supply.⁶ The dominant pedicle is typically the thoracodorsal artery. As noted by Rowsell et al. and Jesus et al., the thoracodorsal artery has various branches, including serratus anterior branches, direct cutaneous branches, teres major branches, and subscapularis branches.^{7,8} Rowsell et al. also noted a single branch to the serratus anterior muscle in 72% of cases and 2 branches

in 24%.⁸ In the present case, before administering urokinase through 1 serratus anterior branch, we confirmed the lack of other thoracodorsal artery branches caudal to the clamp to prevent the thrombolytic agent and thrombi from flowing into the systemic circulation, thereby preventing severe bleeding complications.

Our method of selective thrombolysis in the pedicled flap could potentially be applied to other types of pedicled flaps as well. In addition to the LD flap, some flaps have major vascular branches in the pedicles, which can be used to administer thrombolytic agents (eg, flaps based on the deep inferior epigastric artery or the medial/lateral circumflex femoral artery). If venous thrombosis occurs in such flaps, selective thrombolysis, as in the present case, can be performed as part of the flap salvage strategy after thrombolysis.

CONCLUSIONS

Here we reported a case of successful salvage of a pedicled LD flap after severe venous thrombosis by selective thrombolysis. If a pedicled flap has major vascular branches in the pedicle, selective thrombolytic therapy may be possible without disconnecting the pedicle, as in the present case.

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All procedures conformed to the principles set forth in the Declaration of Helsinki. This study was approved by the Ethics Committee of Osaka University.

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