



June 2023

Successful Latissimus Dorsi Free Flap Salvage using Intraoperative Vasopressors: A Case Report

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Recommended Citation

Ford A, Palacios Vazquez H, Figy S. Successful latissimus dorsi free flap salvage using intraoperative vasopressors: A Case Report. Graduate Medical Education Research Journal.

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Abstract

Arterial thrombosis is a rare, but dreadful complication in microvascular surgery. Here we report on a case of recurrent arterial thrombosis in a latissimus dorsi (LD) free flap used for scalp reconstruction in an 18-year-old woman who sustained a gunshot wound (GSW) to the head. In the immediate postoperative period, internal and external doppler signals to the flap were lost. Emergent surgical exploration revealed arterial thrombosis, which was emergently explored and successfully repaired. Doppler signals were again lost and the flap was emergently explored for a second time. Following revision of the arterial anastomosis, flap perfusion decreased and appeared to correlate with the patient's blood pressure. After administration of vasopressors to increase the Mean Arterial Pressure (MAP) to a goal of 70 or greater, flap perfusion and doppler signals were consistent. Here we describe a case of successful free flap salvage using both intraoperative and postoperative vasopressors for recurrent arterial thrombosis. Furthermore, vasopressor administration may be beneficial in select patients to maintain adequate flap perfusion in those who demonstrate intraoperative hypotension and no other identifiable causes of flap compromise, as in the present case.

Keywords

Microsurgery, Free flap salvage, vasopressors, latissimus dorsi free flap, arterial thrombosis

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Cover Page Footnote

Acknowledgments I would like to express my appreciation to Dr. Sean Figy and Dr. Hugo Palacios Vazquez for their valuable and constructive suggestions during the development of this work.

Successful Latissimus Dorsi Free Flap Salvage using Intraoperative Vasopressors: A Case Report

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<https://doi.org/10.32873/unmc.dc.gmerj.5.1.005>

Abstract

Arterial thrombosis is a rare, but dreadful complication in microvascular surgery. Here we report on a case of recurrent arterial thrombosis in a latissimus dorsi (LD) free flap used for scalp reconstruction in an 18-year-old woman who sustained a gunshot wound (GSW) to the head. In the immediate postoperative period, internal and external doppler signals to the flap were lost. Emergent surgical exploration revealed arterial thrombosis, which was emergently explored and successfully repaired. Doppler signals were again lost and the flap was emergently explored for a second time. Following revision of the arterial anastomosis, flap perfusion decreased and appeared to correlate with the patient's blood pressure. After administration of vasopressors to increase the Mean Arterial Pressure (MAP) to a goal of 70 or greater, flap perfusion and doppler signals were consistent. Here we describe a case of successful free flap salvage using both intraoperative and postoperative vasopressors for recurrent arterial thrombosis. Furthermore, vasopressor administration may be beneficial in select patients to maintain adequate flap perfusion in those who demonstrate intraoperative hypotension and no other identifiable causes of flap compromise, as in the present case.

Introduction

Free tissue transfer with microvascular anastomosis is a widely accepted method of reconstruction in the field of Plastic Surgery and has shown to have favorable outcomes and flap survival rates as high as 95%.¹⁻³ The latissimus dorsi (LD) flap is one of the most commonly used flaps for scalp reconstruction as it has many advantages.⁴⁻⁵ The LD flap provides a large amount of tissue for larger defects, has a long pedicle with large caliber vessels, and has acceptable cosmetic results.⁵ In this case, the LD flap was chosen due to the amount of tissue needed for reconstruction and the ability to access the donor and recipient sites in the right lateral decubitus position.

Flap failure is a rare, but serious complication. Factors contributing to potential flap failure include technical errors resulting in inadequate anastomoses, insufficient venous outflow, prolonged operative times, and patient age or comorbidities (diabetes,

obesity, vascular disease, etc.).⁶ The majority of flap failures occur in the first 48 hours postoperatively and flap salvage rates are highest when rapid re-exploration is pursued.⁷ Successful salvage of free flaps have been reported as high as 60-80%.⁸ Therefore, there should be a low threshold for reoperation and timing of exploration is critical.

Flap salvage techniques are widely documented in the literature; however, the use of intraoperative vasopressors remains controversial.⁹ In prospective studies, both dobutamine and norepinephrine has been shown to improve free flap cutaneous blood flow postoperatively.¹⁰⁻¹¹ Ibrahim et al. have claimed that there are no absolute contraindications for the use of pressors during microvascular surgery.¹² Furthermore, a randomized controlled trial showed that goal-directed intraoperative vasopressor use in head and neck free flap reconstruction does not appear to increase the rate of flap failures or complications.¹³ However, a gap in the literature exists regarding the use of intraoperative vasopressors for flap salvage. Here we describe a case of successful free flap salvage using both intraoperative and postoperative vasopressors for recurrent arterial thrombosis.

Case

We report on an 18-year-old female who sustained a gunshot wound to the head

and subsequently underwent a left-sided decompressive craniectomy with resulting flap failure (Figure 1). She was referred to us for scalp reconstruction and underwent delayed reconstruction seven months after the initial injury with a left latissimus dorsi free flap, saphenous vein grafting, and split thickness skin graft (STSG) from the left thigh to the left scalp (Figure 2). Neck dissection was performed to access the facial vessels using a modified facelift incision. The saphenous vein grafts were used in the neck to complete the proximal anastomosis using a 2.0mm vein coupler and interrupted 8-0 nylon sutures for the arterial anastomosis. The left latissimus dorsi flap was successfully harvested, and inset was completed following distal anastomosis with a 2.5 mm vein coupler and interrupted 8-0 nylon sutures for the arterial anastomosis. A patent artery and vein were observed with excellent perfusion of the flap. An implantable doppler was placed on the flap side of the arterial anastomosis and a drain was placed. The scalp was closed in a layered fashion and the skin graft, meshed at 2:1, was inset on the scalp with a tie over bolster in place.

Postoperatively, the external and internal doppler signals were lost. Surgical exploration was performed 1 hour postoperatively, where an arterial thrombosis was identified at the proximal anastomosis. The arterial anastomosis was taken down and successfully revised using interrupted 8-0 nylon sutures.



Figure 1. One month status post left sided decompressive craniectomy complicated by flap failure with superior wound dehiscence (right) and large posterior eschar (left).

Pulsatile flow was observed and the distal signal to the flap returned. Three hours later, the patient once again experienced loss of internal and external doppler signals and emergently returned to the operating room. Intraoperatively there was no pulsatile flow in the vessels and a recurrent arterial thrombosis was visualized. The anastomosis was again revised, and the flap demonstrated excellent flow once again.

Despite successful re-anastomosis, the doppler signals began to decrease and the anastomosis was taken down and explored again. Following revision of the arterial anastomosis, the doppler signal returned but began to decrease. The venous system was explored, and the flap showed an intermittent signal, which appeared to correlate with the patient's pressures. When the MAP was increased to greater than 70, flap perfusion and signal returned to normal. The venous outflow was allowed to drain liberally for one hour and Alteplase was directly injected into the arterial inflow of the flap. Additionally, the inflow pedicle was bathed in papaverine and allowed to settle for 1 hour. The venous graft was treated with valvulotomy to ensure there were no obstructions for outflow. The anastomoses were completed for a final time once adequate arterial inflow and outflow were confidently achieved. Throughout the second emergent procedure, the patient received a 1 L infusion of Lactated Ringers and a total of 634 mcg norepinephrine and 700 mcg of phenylephrine. Anticoagulation was used intraoperatively and in the postoperative period and hypercoagulability workup was found to be unremarkable.



Figure 2: Intraoperative photo of left sided scalp wound prior to LD free flap (left). Schematic depiction of the surgical plan (right) with left LD free flap and overlying STSG to the left scalp, distal thoracodorsal artery and venae committans (A), saphenous vein grafts (B), and proximal branches of the facial artery and vein (C).

Postoperative flap perfusion was monitored hourly with internal and external dopplers, which showed triphasic signals consistently. The patient was placed on IV norepinephrine to maintain a MAP goal >70 and was weaned off vasopressors on postoperative day 2. The patient recovered appropriately and there was no evidence of flap ischemia, thrombosis, or necrosis throughout the remainder of the patient's hospitalization (Figure 3). The patient was discharged on postoperative day 7, and the outcome remains favorable 16 months postoperatively (Figure 4).



Figure 3: Left LD flap on postoperative day four with viable muscle under the skin graft and triphasic internal and external doppler signals on exam.



Figure 4: Progression of successful left LD free flap take to left scalp one month (left), three months (middle) and nine months (right) postoperatively following.

Discussion

Free flaps are a well-accepted reconstructive approach with success rates over 95%.¹⁻³ Flap failure is generally a result of microvascular or peri-anastomotic thrombosis, with venous thrombosis being more common than arterial occlusion.¹⁴ Among salvage techniques for free flap compromise, the administration of vasopressors remains controversial. Out of concern for vasoconstriction and ultimate flap failure, vasopressors are commonly avoided during microsurgical procedures.¹⁵ However, to date, there have not been any studies to provide reliable evidence to contraindicate the use of vasopressors in microvascular surgeries.¹² Several studies have sought to further evaluate the use of intraoperative vasopressors and the effect on free flap outcomes. Previously, norepinephrine has been reported as the most appropriate pressor to use in patients with intraoperative hypotension undergoing microvascular surgery.¹⁰ In a prospective study of 169 free tissue transfers, Monroe et al. found no significant difference in flap survival or complication rates in patients who received intraoperative vasopressors compared to those who did not.¹⁶

Conclusion

As in the present case, we demonstrated that intraoperative administration of norepinephrine was not detrimental to flap survival, but likely contributed to successful salvage. While recurrent flap compromise is an uncommon and dreaded complication in microsurgery, early operative intervention was likely crucial for flap salvage in this case. Furthermore, we believe vasopressors were an appropriate flap salvage technique in this case. Our approach toward continued vasopressor use was largely supported by the observed increase in flap perfusion intraoperatively following norepinephrine administration. Through this case, we have found that vasopressor use may be an appropriate strategy for flap salvage in patients with hypotension who otherwise have no easily identifiable etiology for flap compromise. ■

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