Case Report

Temporary vascular shunt for damage control surgery: case report

Abstract

Background: Although rare, arterial limb injuries are cause of massive hemorrhage and consequently hypovolemic shock. Temporary vascular shunts have many benefits: not only do they allow for reperfusion, but they also afford time to transport a patient to a higher level of care.

Methods: Case report

Results: The authors present a case report of a 35-year-old man brought to the emergency department one hour after suffering a penetrating injury to the anterior right thigh. In the operative room a complete superficial femoral artery transection was detected so artery shunt was performed. In the immediate post-operative period, the patient was transferred to a specialized center where the final revascularization was accomplished by interposition of the contralateral great saphenous vein in reverse. Patient was discharged after a seven day hospital stay and follow up demonstrated viable and functional limb.

Conclusions: Vascular shunt seems a good option in the early approach of arterial injuries in the absence of resources for definitive care, as it allows early revascularizations without compromising subsequent definitive revascularization after transfer to a specialized department.

Keywords: Vascular surgery, damage control surgery, arterial trauma, vascular shunt

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Introduction

Arterial limb injuries can cause massive hemorrhage and consequently hypovolemic shock and death. In these cases, surgery with temporary vascular shunt allows bleeding control and early reperfusion, both essential for patient survival and limb preservation.[1] Damage control surgery combined with damage control resuscitation with reduced crystalloid fluid administration and early initiation of blood product transfusions pretends to avoid the trauma triad of death: acidosis, hypothermia and coagulopathy.[1,2]

Material and methods - Case report

A 35-year-old man was brought to the emergency department one hour after suffering a penetrating injury to the anterior right thigh. The patient was hypotensive with a blood pressure of 58/32 mmHg and tachycardic with a pulse of 131 bpm. He had a 4cm thigh wound with active bleeding. After manual compression he was promptly taken to operating room for exploration of the right thigh wound. Laboratory studies demonstrated hemoglobin 5.7 g/dL and hyperlactacidemia 9mmol/L so massive transfusion protocol was started.

In the operative room a horizontal groin incision was performed with dissection to the right femoral artery and vein to allow vascular clamp (Figure 1). After proximal control was achieved, the exploration of the thigh wound reveal a complete superficial femoral artery and vein transection. Femoral vein ligation and artery shunt was performed with a silicone tube of an esophageal stethoscope. The shunt was inserted into the proximal and distal vessel and secured with thick silk tie (Figure 2). Hand-held Doppler evaluation of flow confirmed the patency two hours after damage control surgery.

Figure 1 Identification and clamping of femoral vessels

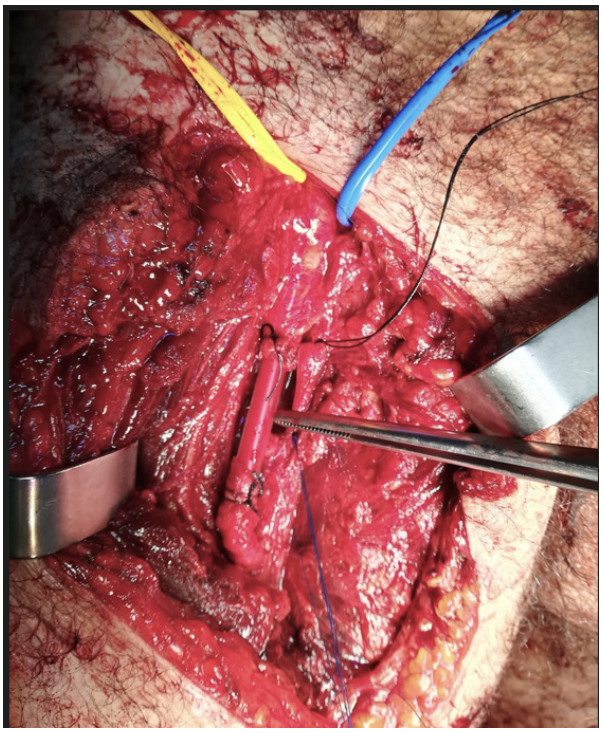

Figure 2 Superficial femoral artery shunt

In the immediate post-operative period, the patient was transferred to a specialized center where, only four hours after the injury, the final revascularization was accomplished by interposition of the contralateral great saphenous vein in reverse. Post-operatively, Doppler evaluation confirm shunt patency and distal flow.

Results

Patient was discharged on the seventh day of hospital stay and follow up demonstrated viable and functional limb after four years of surgery.

Discussion

Vascular injuries of the extremities are rare and their incidence is estimated to be between 1 and 4% of trauma patients.[1] The main causes are traffic accidents, penetrating wounds or iatrogenic injuries.

Vascular injuries have as main complications hemorrhage and limb ischemia, which compromise both patient survival and limb functional outcome. The management of extremity arterial injuries should be based on damage control techniques as the main goals are to quickly obtain hemostasis and reestablish peripheral arterial flow.[1]

The management of multiple trauma complicated by hemorrhage focuses on avoidance of the trauma triad of death, composed by acidosis, hypothermia, and coagulopathy, with initial performance of rapid surgical hemostasis combined with damage control resuscitation, followed by a secondary definitive surgical procedure.[1,2]

Temporary vascular shunts have many benefits in the multiply-injured patient: not only do they allow for reperfusion, but they also allow time to transport a patient to a higher level of care.[3] The use of temporary shunts is not applicable to all limb injuries and should be limited on larger more proximal vessels. Injuries in these locations have higher impact on the limbs because these are often the axial vessels on which the extremities or end-organs depend.[3] In contrast, injury to small or distal arteries in anatomic locations where there is often duplicate circulation is of less significance to the extremity.[3]

A key technique for vascular damage control is the use of temporary vascular shunts.[1] The injured blood vessel should be carefully dissected to allow vascular clamp application. Once controlled and opened, the vessel should be subjected to thrombectomy with a Fogarty balloon catheter. Selection of an appropriately sized shunt is required and it should be carefully inserted into the distal vessel, secured with thick silk tie and allowed to back-bleed. The proximal end is then inserted and also secured with a silk tie and antegrade flow reestablished. Hand-held Doppler evaluation of flow should be performed to confirm patency.[3]

A retrospective study at level I trauma centers of United States of America demonstrated that shunt allows limb preservation in 96% of vascular injuries patients. Complications included shunt thrombosis in 5.6% and dislodgement in 1.4%.[4]

Conclusions

Vascular shunt seems a good option in the early approach of arterial injuries because allows early revascularizations without compromising subsequent definitive revascularization after transfer to a dedicated center.

Acknowledgments

i. Arterial limb injuries have as main complications hemorrhage and limb ischemia, which threaten both patient survival and functional outcome of the limb.

ii. The management of extremity arterial injuries should be based on damage control techniques as the main goals are to quickly obtain hemostasis and restore peripheral arterial flow.

iii. Vascular shunts have many benefits in damage control surgery: not only do they allow for reperfusion, but they also afford time to transport a patient to a higher level of care.

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Informed consent was obtained from this patient for the publication of this case report.

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Competing interests

The authors declare no competing interests.

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