Acta Medica Alanya

CASE REPORT

OLGU SUNUMU

Acta Medica Alanya

2021;5(2):205-209

DOI:10.30565/medalanya.882073

Can superficial veins be used as a drainage path in deep venous injuries?

Derin venöz yaralanmalarda yüzeysel damarlar drenaj yolu olarak kullanılabilir mi?

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ABSTRACT

Peripheral vascular injuries are frequently encountered traumas that require emergency intervention. Rapid recognition of vascular injury, fluid replacement, blood transfusion, and early revascularization are very critical in the potential prevention of mortality, extremity loss, and functional defect. In the present report, we aimed to emphasize the importance of arterial and superficial venous and also deep venous revascularizations on the mortality and morbidity of a patient with burts vascular injuries.

Keywords: Superficial veins; deep venous injuries; drainage.

ÖZ

Periferik damar yaralanmaları sıklıkla karşılaşılan ve acil müdahale gerektiren travmalardır. Vasküler hasarın, erken revaskülarizasyonu, sıvı replasmanının veya kan transfüzyonunun hızlı bir şekilde yapılması, mortalitenin, ekstremite kaybının veya fonksiyonel kusurun potansiyel önlenmesinde çok kritiktir. Bu raporda, damar yaralanması olan bir hastanın mortalite, morbiditesi üzerinde arteriyel, yüzeyel venöz ve ayrıca derin venöz revaskülarizasyonların önemini vurgulamayı amaçladık.

Anahtar sözcükler: Yüzeysel damarlar; derin venöz yaralanmalar; drenaj

Received: 17.02.2021 Accepted: 05.03.2021 Published (Online): 30.08.2021

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To cited: Etli M, Gürsu Ö. Can superficial veins be used as a drainage path in deep venous injuries? Acta Med. Alanya 2021;5(2):198-202 doi:10.30565/medalanya.882073

INTRODUCTION

Peripheral vascular injuries are frequently encountered traumas that require emergency intervention. Vascular injuries make up 2-3% of all traumas [1]. Treatment approaches for vascular injuries have been developed most commonly during wars. While, mortality rates were around 80%, in the era where ligation was accepted as the unique treatment option, developments in the field of vascular surgery, thanks to the successful anastomosis and revascularization techniques, nowadays mortality rate has decreased down to 1-1.5 percent [2]. Rapid recognition of vascular injury, fluid replacement or blood transfusion, and early revascularization are very critical in the potential prevention of mortality, extremity loss, or functional defect. Since injuries of neighboring venous, neural, bony structures, and other tissue traumas play an important role in morbidity and mortality, a comprehensive systemic evaluation and avoidance of focusing only on the arterial system carry vital importance. We present a case in a hypovolemic shock with major arterial and venous injury on his right lower extremity as a result of a mine explosion that occurred after a terrorist attack who was transported by a helicopter to the Emergency Service and operated rapidly.

In the present report, we aimed to emphasize the importance of arterial and superficial venous and also deep venous revascularizations on the mortality and morbidity of a patient with percutaneous penetrating vascular injuries.

CASE REPORT

A 16-year-old male patient whose bleeding was partially controlled by an external tampon packing applied on the right femoral region 2 hours after penetrating vascular injury, was brought to our emergency service by airway transfer. The patient, who received 2 units of erythrocyte suspension, 2 units of whole blood transfusion, and fluid replacement during transfer, had a GCS (Glasgow Coma Scale) score of 6-8 points when he was brought to the hospital. He was unconscious and in hypovolemic shock. In the emergency service, a jugular catheter was inserted to provide a rapid fluid replacement. At the same time, hemogram, blood typing, and biochemical tests were performed and he was transferred urgently to the previously prepared Cardiovascular Surgery Operating Room.

Under general anesthesia, the compressed tampon dressing 5 cm above the femoral region of the right lower extremity was opened. It was found that the right superficial artery, superficial femoral vein, and deep femoral vein had lost their integrity. Vascular clamps were rapidly applied to the superficial femoral artery, superficial and deep femoral veins. The open wound area was cleaned using povidone iodine and 100 IU/kg heparin was administered to the patient after appropriate draping. A tissue defect (10 x 10 cm) was found approximately 5 cm below the femoral region. The exploration field was widened up to the femoral region with the aid of a horizontal skin incision extended proximally. Then main femoral artery, superficial femoral artery, and deep femoral artery, superficial and femoral veins were encircled from their proximal parts and clamped. Afterward, free ends of the lacerated vascular structures were found and clamped. After hemostatic control, defective vascular segments were found between proximal and distal ends of femoral veins and superficial femoral artery, and primary end-to-end repair was not considered to be applicable. To repair femoral veins and superficial femoral artery of the same extremity using autogenous vascular graft, vena saphena magna was explored through a cutaneous incision over the vein course, then prepared for anastomosis with sharp dissection and excision. In consideration of the corrosive effect of the mine explosion, 1-1.5 cm sections were excised from distal and proximal ends of the superficial femoral artery and superficial femoral vein together with the distal end of the deep femoral vein. Then proximal and distal ends of vascular segments were trimmed and prepared for anastomosis. Before the anastomosis, an arterial embolectomy was performed using a 5F Fogarty catheter inserted into the distal end of the superficial femoral artery. Any thrombus material was not found after embolectomy and improved retrograde flow was achieves. The saphenous vein harvested from the right leg was reversed, the saphenous vein was end-to-end anastomosed firstly between distal and proximal ends of the femoral artery, and then between distal and proximal ends of the superficial femoral vein in the

direction of normal blood flow (Figure 1). Finally, a deep femoral vein was explored. The distal end of the deep femoral vein was appropriate for vascular repair, whereas the proximal end was damaged due to corrosive effect and any intact segment couldn't be explored through the bundle of deep muscles. Thus, it was decided to drain the deep femoral vein into saphenofemoral junction. The saphenofemoral junction was explored. Saphenous vein was prepared from its insertion point into the femoral junction (2 cm below saphenofemoral junction) preserving proximal venous valve. First, end-to-end distal anastomosis of deep the femoral vein was completed using a saphenous vein graft. Then, this saphenous vein graft was brought to the saphenofemoral junction through the tunnel created between groups of extensor muscles of the lower extremity. The Saphenous vein graft was end-to-end anastomosed 2 cm below the saphenofemoral junction and the procedure was completed (Figure 2). Since the distal segment of the deep femoral artery was destructed, it was ligated by 2/0 silk suture from its proximal segment. Peripheral vascular pulses were evaluated following the completion of all vascular repairs. All distal pulses were palpable. The patient had no symptoms of venous congestion. Following hemostatic control, two hemovac drains were placed. Regional tissue defect was closed primarily by liberating cutaneous and subcutaneous tissues and the operation was completed by the Department of Plastic and Reconstructive Surgery.

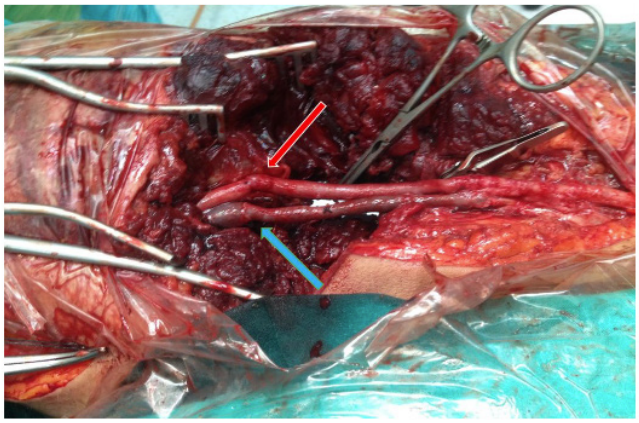

Figure 1. Femoral artery (red arrow) and femoral vein (blue arrow) following repair by saphenous vein graft

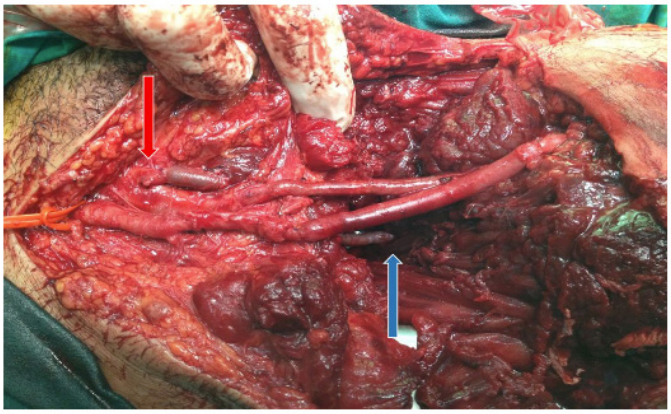

Figure 2. Drainage of the distal end of the deep femoral vein (blue arrow) through saphenous vein graft into saphenofemoral junction (red arrow)

The patient was administered to the postoperative intensive care unit and triple antibiotics, low weight heparin, acetylsalicylic acid, clopidogrel, and N-acetylcysteine. The patient was followed up for two days in the intensive care unit and seven days in the ward. There was no lower extremity edema or compartment syndrome during follow-up. The patient was discharged after anticoagulant, antiplatelet and venoactive drugs were administered. The 4th degree (strong) peripheral pulse was palpated in the postoperative 2nd month. Open superficial and deep femoral vessels were seen in control venography (Figure 3). During the lower extremity vascular examination in the follow-up of the patient, no sign of arterial or venous insufficiency was detected.

Figure 3. Control venogram obtained at the postoperative 2nd month

DISCUSSION

The most frequent cause of peripheral vascular injuries is penetrating traumas. Blunt traumas and iatrogenic causes are more common in the developed North European countries with a lower incidence of violence. In the USA, firearm injuries are more frequently seen, whereas penetrating stab injuries take the first place in our country [1]. Penetrating peripheral vascular injuries are more commonly found in the younger age group and male individuals [2]. Early diagnosis and surgical intervention shorten ischemia times and reduce mortality and morbidity rates in cases with penetrating peripheral vascular injuries. Physical examination is generally sufficient for diagnosis [3]. However, advanced diagnostic methods such as Doppler ultrasonography and angiography are required in suspect cases. In major arterial injuries, patients apply to the emergency services with externally compressed wounds and in hypovolemic shock [4]. In arterial injuries, the first prerequisite for successful reconstruction is performing a revascularization procedure within the first 8 hours after the traumatic incident [5]. Vascular defects due to smooth-edged partial and total cuts not exceeding 2 cm can be primarily repaired, whereas large defective segments may be found in the vascular structures because of the corrosive effects of firearm injuries. To ensure a successful arterial and venous revascularization in such traumatic wounds not amenable to primary repair, autogenous vein grafts are generally preferred for the high patency rates they provide. However, synthetic grafts are also used for revascularization if suitable autogenous vein segments are not available [6-7].

A considerable part of the peripheral arterial injuries is accompanied by venous injuries. It has been stated that repair of venous injuries accompanying arterial injuries has a favorable impact on the prognosis [8]. In venous injuries, ligation can be performed in cases of larger defects, prolonged shock picture, and multiple organ injury. In their study involving 322 patients with venous injury, Timberlake et al. performed ligations in 170 of 239 patients with arteriovenous and 54 of 83 patients with isolated venous injuries. During an average follow-up period of 32 months, any permanent edema was not found in the group with isolated venous injuries, whereas they detected the development of permanent edema in 4 patients of the group with arteriovenous injuries [9]. Skin, soft tissue (muscle/tendon), and/or nerve damage, and bone fractures are often complex limb injuries and carry a high risk of amputation. In such cases, the primary goal is to prevent functional loss by correcting vascular events that disrupt hemodynamics [10].

In the study examining the effect of repair time on the results in arterial injuries, if the patient is operated on and revascularized within one hour in extremity injuries, this time is defined as the optimal time to save the limb. The mortality and morbidity rates become lower when the limb perfusion is performed more planned and faster in arterial injuries [11]. Peripheral vascular injuries are usually emergency cases. Often life-threatening and urgent repair (revascularization) is required. These injuries are often life-threatening and require immediate repair(revascularization). The approach to cases with vascular injury should be multidisciplinary. Rapid interdisciplinary communication and coordination decrease the mortality and morbidity rates as well as the serious loss of function and amputation rates [12].

In our case, large defective segments were found in all arterial and venous vascular structures, because of the development of a corrosive effect developed due to firearm injury in the right lower extremity. First, the superficial femoral artery and the following superficial femoral vein were repaired using a saphenous vein graft to prevent extremity loss. In the patient; Symptoms of venous congestion persisted following vascular anastomoses performed in the lower extremity. Deep femoral vein repair was planned. The destructed proximal segment and the intact segment of the deep femoral vein couldn't be explored through the group of deep extensor muscles. Consequently, the conversion of the drainage of the deep femoral vein into the saphenofemoral region was decided. The completion of revascularization by only end-to-end anastomosis to the deep femoral vein preserving the proximal segment of the saphenous vein could be appropriate. Since in our case proximal segment of the saphenous vein was defective due to corrosive effect, end-to-end anastomosis to either a saphenofemoral junction

or deep femoral vein had to be performed for the repair of the deep femoral vein. As we discerned intraoperatively in our case, signs of congestion in the leg disappeared after repair of the deep femoral vein rather than the superficial femoral vein. Therefore, we think that in combined injuries of superficial and deep femoral veins, primary repair of the especially deep femoral vein or if not possible, drainage of this vein through saphenous vein graft has critical importance in preventing the development of postoperative permanent edema or compartment syndrome.

CONCLUSION

In peripheral vascular injuries, early vascularization, as well as rapid transport and fluid replacement is very critical with respect to the prevention of mortality and morbidity. We conclude that in cases where primary repair is not feasible, ensuring drainage of the deep venous system via superficial venous system would be a good alternative approach

Conflict of Interest: The author has no conflict of interest related to this article.

Funding sources: The author declared that this study has received no financial support

Peer-review: Externally and internally peer reviewed.

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