



## Case Report

# Circumferential intimal tear with thrombosis of right superficial femoral artery due to penetrating injury by bull horn: A case report

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## ARTICLE INFO

## Keywords:

Case report  
Doppler ultrasonography  
Femoral artery  
Thrombosis  
Vascular injury

## ABSTRACT

In agrarian countries where bulls are used for farming and stock breeding, bull horn injuries are common. Bull horn injuries range from blunt trauma to penetrating injuries, which can cause massive hemorrhage. Vascular injuries to the limbs by goring bull horn injury usually involve transection of vessels but rarely cause intimal tear with thrombus formation. Here, we report an unusual case of a 33-year-old male with circumferential intimal tear with thrombosis in the subintimal region of the right superficial femoral artery without transection of the vessel following penetrating injury to the right thigh caused by a bull's horn. There was a pulse deficit above the popliteal artery, and Doppler ultrasonography revealed decreased flow indicative of underlying femoral vessel injury for which the wound was surgically explored. It was followed by right superficial femoral arteriotomy at the site of the thrombus with the evacuation of a 6 cm long clot, revealing a 6 cm long endothelial injury in the same vessel. Next, an interposition reversed saphenous graft was placed in the same location. Following this, Doppler ultrasonography was done that revealed restoration of blood flow to the site of thrombosis. Thus, in a case of bull horn injury, thrombosis should be ruled out with prompt surgical wound exploration despite the presence of an intact vessel.

## 1. Introduction

Bull-horn injuries are common in countries where bulls are employed in sporting events and in areas where animal husbandry is done [1,2]. Bull horn wounds most commonly cause penetrating injuries, which have unique characteristics with a small entry point corresponding to the skin breach [3]. Penetrating injuries might result in total or partial transection, transfixion, longitudinal tear, intimal tear of vessels, or numerous lacerations [4]. Most commonly injured locations are the lower extremities and perineum [1,5]. Here, we present a case of penetrating injury to the right lower limb by a bull horn with a lacerated wound and circumferential intimal tear with subintimal thrombosis of the right superficial femoral artery. Intimal tear with thrombosis of the artery in an intact vessel is rare and can delay diagnosis, which is a peculiarity of our case. This manuscript has been reported in line with the SCARE 2020 criteria [6].

## 2. Case presentation

A 33-year-old male presented to the Emergency Department of Dhulikhel Hospital with a history of penetrating injury to the right thigh by the impact of a bull horn 6 hours prior. There was no history of significant bleeding and symptoms pertaining to ischemia in the calf and foot. However, the pulse was not palpable from the popliteal artery on the right side. On examination of the right thigh, a lacerated wound of 10 cm length, 5 cm width, and about 5 cm depth was noted (Fig. 1). Underlying fat and muscles were exposed, but no significant hematoma or clots were present in the wound. The temperature of the right lower limb was similar to that of the left lower limb. In addition, saturation could be detected in the right toes.

Following general examination, Doppler ultrasonography was done, which revealed good triphasic flow on the right superficial femoral artery, but only monophasic flow was noted in the right popliteal artery,

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<https://doi.org/10.1016/j.amsu.2021.103228>

Received 8 December 2021; Received in revised form 30 December 2021; Accepted 31 December 2021

Available online 3 January 2022

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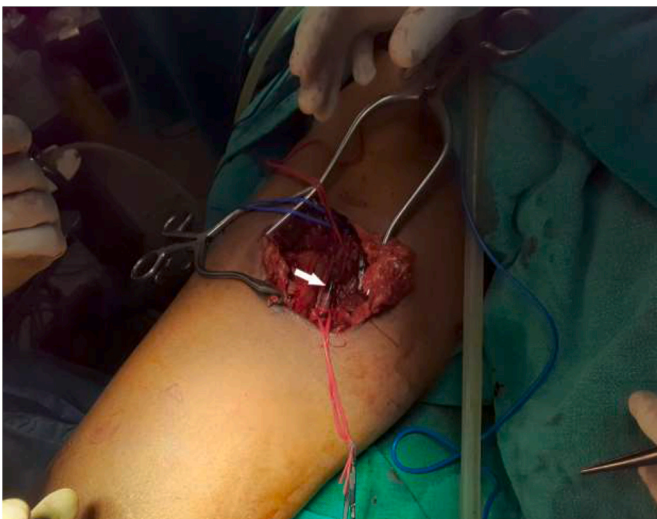
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**Fig. 1.** Penetrating injury in the right mid-thigh measuring 10 cm x 5 cm and depth of about 5 cm.

anterior tibial artery, and posterior tibial artery with peak systolic velocity of 25 cm/s. These clinical findings were suspicious of partial thrombosis of the distal superficial femoral artery underneath the puncture site. However, due to the unavailability of a Contrast-Enhanced Computed Tomography (CECT) scan because of technical issues, a decision to explore the wound site was made.

Under general anesthesia, the wound was explored from the puncture site extending the incision on both ends. Careful dissection revealed partial thrombosis of 5 cm length in the superficial femoral artery beneath the puncture site (Fig. 2). These features were typical of circumferential intimal tear causing occlusion. However, there was no



**Fig. 2.** Partial thrombosis of the right superficial femoral artery.

puncture on the femoral artery.

The proximal and distal control were taken, and arteriotomy was done at the site of thrombosis. About 6 cm long clot was evacuated using number 4 Fogarty catheter. Approximately 6 cm segment of the superficial femoral artery had injury to the intimal layer with subintimal thrombus. Following adequate dissection, the cut ends were tied for direct anastomosis but could not be done due to significant length of vessel loss. Thus, a decision on surgical repair by interposition reversed saphenous graft was made. Saphenous vein was taken from the same limb (above knee location), and end-to-end anastomosis was made in both ends of the superficial femoral artery (Fig. 3). Following bypass, the pulse could be noted immediately. Intraoperative Doppler ultrasonography revealed triphasic flow with peak systolic velocity of 60 cm/s in distal vessels. Although slight tortuosity was noted in the vein following anastomosis, reanastomosis was not done as adequate flow was present.

The patient's Polymerase Chain reaction (PCR) for Coronavirus Disease 2019 (COVID-19) came positive the next day. However, the patient recovered well with no features of ischemia or symptoms of COVID-19 and was discharged in two days with daily dressing, antibiotics, and aspirin. The patient was asked to continue aspirin for a month.

The patient is in regular follow-up and the current follow-up at six months shows no feature of ischemia.

### 3. Discussion

Penetrating Trauma of Extremities (PTE) accounts for 50% of all penetrating injuries [7]. It is one of the most common patterns of injury presenting to the emergency department [8]. These injuries can cause damage to major vessels and nerves and may be associated with limb fractures and soft tissue injury, thereby warranting a multidisciplinary approach [9].

Penetrating injuries are frequent amongst militarians attributable to high-velocity gunshot wounds, followed by stab wounds and shotgun injuries [8,10]. However, amongst civilians, especially in agrarian countries, penetrating wounds caused by animal horns like bull horns are typical [1]. The casualties include people practicing sporting events like bullfighting and professionals who handle bulls like cattle rearers [1–3]. These primarily affect lower limbs and the inguinal region followed by head and neck, abdominal organs, thorax, and pelvic floor [1–3]. All these findings were consistent with our study as the patient is a cattle farmer by occupation who presented with goring bull horn injury to right mid-thigh, probably as most people are right-handed, and they expose this side during self-defense [11].

PTE mainly involves lower limbs with injury to femoral vessels



**Fig. 3.** Bypass using interposition reversed saphenous vein following excision of the damaged part of the right superficial femoral artery.

accounting for nearly 70% of all injuries impacting the limbs [12,13]. They present with vasospasm, contusion, external compression, laceration, transection, and localized wall defects [13]. Less commonly, there can be intimal flaps in which there is a tear to the vessel intima without evidence of transection [13].

Initial evaluation and management of PTE is done based on Advanced Trauma Life Support (ATLS) protocol [7]. The vascular assessment starts with pulse examination (femoral, popliteal, posterior tibial, and dorsalis pedis arteries) to identify pulse deficit or asymmetry of pulse [7]. Additionally, the patient is evaluated for hard signs of injury (hemorrhage, expanding hematoma, palpable bruit, and classical signs of arterial occlusion like pulselessness, pallor, paresthesias, pain, paralysis) [9,14]. Over the past decades, this management protocol has been modified significantly [15]. Initially, arteriography was recommended to avoid negative wound explorations by surgeons, while recent literature vouch for physical examination alone to identify the underlying injury [7,15].

Frykberg et al. [10] in their large observational study of PTEs, suggested performing surgical repair almost all the time by taking patients with hard signs of arterial injury [9,14] directly to the operating room for surgical wound exploration [10]. When operated within 6 hours of presentation, limb perfusion is restored, thereby reducing the risk of neuromuscular ischemia [16].

In our case, the patient was hemodynamically stable, but a pulse deficit was noted from the right popliteal artery. Despite this, the limb was not cold, and saturation was detected on pulse oximetry, which caused a dilemma in clinical diagnosis. A study recommended computed tomographic angiography (CTA) as the initial diagnostic approach in penetrating extremity injury to confirm the diagnosis [16]. Due to the unavailability of CECT and CTA, Doppler ultrasonography was done, which revealed an adequate triphasic flow on the right superficial femoral artery but only monophasic flow in the right popliteal artery, anterior tibial artery, and posterior tibial artery with peak systolic velocity of 25 cm/s. All these findings were suggestive of underlying femoral vessel injury. Therefore, we opted for surgical wound exploration.

The intraoperative findings were suggestive of circumferential intimal tear in the right superficial femoral artery with partial thrombosis in the subintimal region occluding the detached intima. Circumferential intimal tear causing obstruction of the aortic arch [17] has been reported; however, a similar injury to the femoral artery has been less frequently mentioned in the literature [18]. It is assumed that injury to this vessel usually begins as a subintimal dissection with the development of thrombosis causing complete occlusion, thereby presenting with features of limb ischemia [18]. Interestingly, in our case, the circumferential tear causing partial obstruction might have occluded the transmission of pulse as noticed by the pulse deficit. However, the rapid opening of pre-existing collaterals of the femoral artery [19] might have possibly maintained the oxygen saturation in the toes distally. Therefore, it is essential to address this rarity of injury to avoid delayed diagnosis.

After identification of the injured vessel, operative repair is done either by open surgical repair or endovascular technique [20,21]. However, open surgical repair is preferred over endovascular technique as most injuries are readily accessible with open surgery [20,21]. The standard methods include thromboendarterectomy with graft interposition or patch repair and bypass grafting using synthetic or autologous grafts [18,20,21]. In the case described here; open surgical repair was done with right superficial femoral arteriotomy. It was followed by evacuation of thrombus and resection of the damaged vessel with reconstruction using an autologous interposition graft for revascularization. At the end of the reconstruction, Doppler ultrasonography should be done to assess the sufficiency of vascular repair [21]. In our case, intraoperative Doppler following bypass revealed adequate triphasic flow distally.

The postoperative course for patients with lower extremity injury

varies significantly with the nature and severity of the injury, associated injuries, and comorbidities [21]. In our case, the patient had no post-operative wound complications and other existing comorbidities. Therefore, the patient was discharged and advised for intake of aspirin for a month postoperatively, also recommended by Rasmussen et al. [21].

Although prompt intervention is warranted in penetrating trauma to rule out neurovascular injury, sometimes these injuries can be masked. In such cases, arterial blood flow should be evaluated by palpation of pulse, measurement of oxygen saturation, and radiological evaluation by Doppler ultrasonography, CECT, and CTA, whichever is available, to help in early diagnosis and management, thereby reducing the risk of limb ischemia and amputation.

#### 4. Conclusion

Penetrating injuries in the lower limb, e.g., by bull horn, can cause damage to major vessels. Hard signs of arterial injury like pulse deficit despite an intact vessel might suggest an intimal tear with thrombus formation and should be appropriately managed. For this, detailed clinical and radiological evaluation should be done with prompt revascularization surgery to reduce the risk of limb-threatening injuries.

#### Ethical approval

We have obtained written consent from the patient for the publication of this case report.

#### Sources of funding

No fundings were received to conduct this research.

#### Author contribution

SB: Concept, manuscript preparation, edit and review; SV: Concept, manuscript edit and review, performed the surgery; RMK: Concept, manuscript edit and review, performed the surgery and guarantor; AT: Manuscript editing and review; AM: Manuscript editing and review; MN: Manuscript editing and review.

#### Consent

Informed written consent was taken the patient for inclusion of the case details in this case report. We also ensured, none of the identifying characteristics were included in the case report.

#### Registration of research studies

NA.

#### Guarantor

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#### Patient perspective

After explaining to the patient about the entire project and its benefit for clinicians and patients globally, the patient was happy and gave us consent for the publication of this case report.



## Declaration of competing interest

There are no conflicts of interest.

## Acknowledgements

NA.

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