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# Axillary artery injury: Report of two cases and review of the literature

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**Summary**

These are the cases of two young men, 21- and 28-year old, who sustained penetrating stab injuries to their axillary arteries. Both patients presented initially with profuse bleeding and were in a state of shock. The first patient underwent initial emergency surgery to control his bleeding whereby deep stitches were inserted around the axillary vessels and nerves and ended up with permanent iatrogenic Median nerve palsy. The bleeding in the second patient was controlled initially by compression dressing and he underwent successful vascular repair of the axillary artery with full recovery of his upper limb function. In this paper, we are discussing the initial management problem of these cases and the results of similar injuries and their repair in the literature.

**Keywords:** *Axillary artery, penetrating injury, neurological deficit.*

**Résumé**

Voici les cas de deux jeunes de 21 et 28 ans, qui ont ete poignardes sur leur arteres axillaries. Les deux patients avaient initiallement un saignement abonolant et etait en etat de choc. Le premier malade a en une intervention chirugicale d'urgence por controller son saignement alors que des points de suture profonds etaient inseres tout autour des vaisseaux axillaries et des nerfs, se terminant par une bande iatrogenique du nerf palsie. Le saignement du second patient etait controle initiallement pas des compresses et il a subit avec success la reparation vasculaire de l'artere axillaire avec guerison complete du fonctionnement de son member superieur.

Dians cet article, nous discutons du problem de gestion initiale de ces deux cas et les resultants des blessures similaire et leur reparation dans la literature.

## Introduction

While injury to the axillary vessels is uncommon, ranging from 5% to 14% of peripheral vascular injuries, it carries serious risk to upper limb function[1,2]. Out of 45 vascular injuries over the last 4 years, we received only two such cases, at a rate of 4.4%. In this paper, we are presenting the cases of two young patients who sustained stab injury to their axillary vessels with emphasis on the management problems of these injuries.

## Case Report

*Patient 1*

A 21-year old man presented to a peripheral hospital in the Asir region (Saudi Arabia) in a state of shock due to profuse bleeding from a deep stab wound to the upper part of the left shoulder. At the referring hospital, the patient underwent an emergency operation to stop the bleeding, during which the entry wound was enlarged and deep haemostatic transfixion sutures by thick silk were placed. The depth of the wound was further packed with a large amount of Surgicel ® (Johnson & Johnson Intl., Brussels, Belgium) for better haemostasis. The skin was closed over a vacuum drain, which was brought out through a separate stab. Postoperatively, bleeding stopped but the brachial and radial pulses were absent distally, and the patient complained of progressive sensory and motor deficit in the territory of the median nerve.

Two days later at Asir Central Hospital (ACH), Abha, the patient was stable but febrile (38°C). Pre-operative ***Angiogram*** showed complete occlusion of the axillary artery distal to the inferior thyroid artery (ITA) with reconstitution of the brachial artery distally (Fig. 1). **Venogram** showed obstruction of the left axillary vein (Fig. 2). At exploration through an infraclavicular incision, there was a large amount of Surgicel ® ( ≃400 gm) and multiple thick silk stitches around the axillary vessels and nerves (lateral cord and branches of the medial cord). The stitches completely occluded the artery and partially occluded the vein. All the Surgicel ® and the sutures were removed from around the Axillary vessels and nerves. The damaged segment of the axillary artery was resected and replaced with an interposition reversed long saphenous vein (LSV) graft harvested from the left thigh. The tear in the axillary vein was repaired primarily with 6/0 Prolene suture. Postoperatively, there was no local swelling or bleeding. Both the brachial and radial arterial pulses were palpable and normal. Segmental pressures on both brachial arteries were equal at 120 mmHg, but the patient continued to have neurological deficit (median nerve palsy).

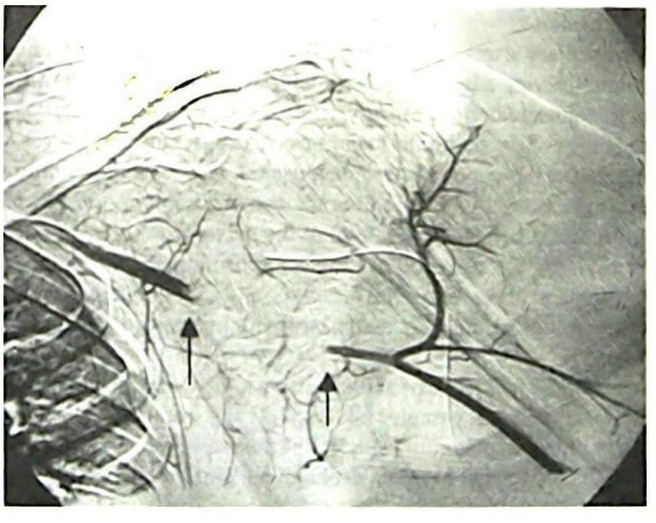

**Fig. 1:** Digital subtraction selective angiogram of the left axillary artery showing occlusion of the proximal axillary artery and reconstitution distally (arrows) through collaterals around the head of the humerus.

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*Patient 2*

A 28 year-old man was brought to the emergency room (ER) of ACH with a stab wound to the right shoulder. The patient was in shock with a BP of 90/60 mm Hg. On examination: there was a bleeding, oblique stab wound to the right delto-pectoral region. Brachial and radial pulses were absent distally. Bleeding was controlled by a compression dressing applied to the site of injury. In the resuscitation period, the patient received nine units of blood to restore his blood pressure back to normal. At exploration of the axillary vessels through an infra-clavicular incision, a lateral disruption injury to the axillary artery was identified with no other venous or nerve injury. The damaged segment of the artery was resected and replaced with an interposition reversed vein graft harvested from the neighboring cephalic vein, through the same incision. The patient had an uneventful postoperative period and the wound healed by primary intention with no neurological deficit. The right brachial and radial pulses were palpable and normal. Segmental pressures were equal on both brachial arteries at 130 mmHg.

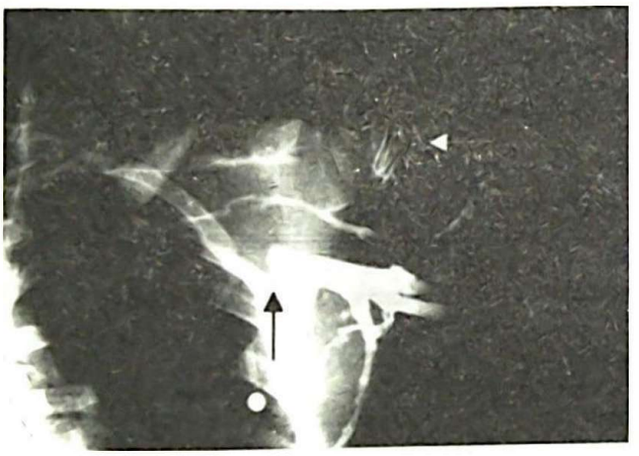

**Fig. 2:** Left upper limb venogram showing complete occlusion of the left axillary vein (black arrow). Also, note the white shadow of the surgicel (white arrow), which was used to tightly pack the wound.

**Discussion**

The axillary artery extends from the lateral border of the first rib to the inferior edge of the *teres major* muscle. The pe*ctoralis minor* muscle divides the artery into three portions. Separating the fibers of the pectoralis major muscle exposes the first portion, medial to the pectoralis minor muscle. The second and third portions, beneath and lateral to the *pectoralis minor*, are better approached beneath and lateral to the *pectoralis major* muscle by dividing the insertion of the Pectoralis minor. The cords of the brachial plexus surround the artery, and a very high incidence of neurological injury is associated with injury to the Axillary artery[3].

The incidence of axillary artery injury varies from 5% to 14% in peripheral vascular injuries[1,2] and from 5% to 36% in upper limb vascular injuries[4,5]. The mechanism of injury seems to differ somewhat between different parts of the world. It was mainly due to blunt trauma in a report from Thailand (57%) [5] while penetrating trauma dominated in a report from USA (71%)[6]. While Stab wounds caused most of the injuries in Belfast (82%), gunshot injuries were the main cause in Illinois, USA (67%). [7,8] Axillary artery injury was also reported in a case of anterior dislocation of the shoulder joint [9].

Up to 80% of patients with axillary / subclavian artery injury present with an ischemic arm, in which case they would have associated brachial plexus lesion. [10]Patients can also present in a state of shock, and all of them would have radial pulse abnormalities[5], as we experienced in both our cases. Some patients present with delayed complications of axillary artery injury in the form of thrombosis, pseudoaneurysm or arteriovenous fistula[2,8]. Subclavian or axillary artery transections, irrespective of limb viability, were also found to have associated brachial plexus trauma.[10]. The incidence of associated nerve injuries varies between 34% and 80% in different reports.[10,11]. Concomitant venous injury can also occur in up to 44% of cases of penetrating injuries to the axillary artery [11] In cases of life-threatening external bleeding, adequate compression and early transfer to a vascular surgery service is highly recommended. Assuming hemodynamic stability, all patients with suspected subclavian / axillary arterial injury, based on wound trajectory or clinical findings consistent with vascular injury, should undergo pre-operative angiography[8]. This was done in 38% of the cases in one report on penetrating injuries of the axillary artery[11]. However, clinical assessment can adequately diagnose the presence of surgically significant vascular injury in peri-clavicular penetrating injuries with trajectories lateral to the manubrium.[8]. In the case of our first patient, the attending surgeon extended the entry wound and applied, rather blindly, deep stitches which encircled not only the bleeding axillary artery, but also the adjacent axillary vein and cords of the brachial plexus. However, the best approach to the Axillary artery is through a horizontal infra-clavicular incision, which may be extended onto the arm if necessary. One must be careful in dissection of this region not to injure the nerves of the brachial plexus.[3].Operative management of the injured artery includes lateral arteriorrhaphy or resection of the damaged part and end-to-end anastomosis or replacement by vein or polytetrafluoroethylene interposition grafts[11]. Recently, endovascular stent-grafts were also successfully used for the management of those cases, which do not require urgent surgical exploration for active bleeding.[12,13]. Primary repair of associated venous injury is a point of controversy. In a report on upper extremity arterial injury, 80% of the injured veins were ligated; while in another series on penetrating injuries of the axillary artery, 93% of the concomitant venous injuries were repaired.[6,11]. Associated brachial plexus injury occurs in up to 34% of the cases and secondary nerve repair results in poor outcome[6].

Although the vascular reconstruction was successful in all cases of upper limb vascular trauma, the long-term outcome of brachial plexus lesions was very poor.[10]. Therefore, the long-term outcome of upper limb injury is not dependent on the vascular injury, which can be successfully managed, but upon the recognition, treatment, and outcome of the associated nerve injuries.[10]. In a large series of upper limb arterial injuries from the Royal Adelaide Hospital in Australia, good upper limb function was obtained in only 32% of subclavian and axillary artery injuries with an amputation rate of 14% in such cases.[14]. Blunt proximal injuries were frequently associated with neurologic, soft tissue, and bony damage, which was responsible for the poor functional outcome. Although critical limb ischemia or severe hemorrhage rarely occurred, complete brachial plexus lesions resulted in uniformly poor outcomes[14].

A mortality of 2% was reported in a series of peri-clavicular penetrating trauma secondary to blood loss from an axillary artery injury in the operating room.[8]. Mortality has also been reported in 6% of penetrating axillary artery injuries

and in up to 15% of penetrating axillary /subclavian arterial injuries due to associated injuries and massive blood loss.[11,15]. In a report on penetrating injuries to the subclavian and axillary vessels, the mortality was 20.5% for isolated arterial injuries, 50% for isolated venous injuries, and 45% for both vessels. The mortality in venous injuries was significantly higher than in arterial injuries ($P < 0.05$) [15].

## Conclusion

Penetrating injury to the axillary vessels is a serious and a potentially lethal condition. At all times, on initial management and during operation, one should try to avoid any iatrogenic injury to neighboring structures, most importantly, NERVES, as this is the determining factor in upper limb function after axillary artery injury. Initial compression to stop bleeding is definitely better and safer than blind stitching of the bleeding vessels.

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