

Clavicle Fracture and Subclavian Vessels Disruption with Massive Haemothorax Mimic Intrathoracic Injury

Wan Ismail FAISHAM¹, Paiman MOHAMMAD¹, Haron JUHARA²,
Nik Mahdi MUNIRAH², Hassan SHAMSULKAMARULJAN³,
Ghazali Mohamad ZIYADI⁴

Submitted: 18 Apr 2010

Accepted: 14 Dec 2010

¹ Department of Orthopaedic, School of Medical Sciences, Universiti Sains Malaysia Health Campus, 16150 Kubang Kerian, Kelantan, Malaysia

² Department of Radiology, School of Medical Sciences, Universiti Sains Malaysia Health Campus, 16150 Kubang Kerian, Kelantan, Malaysia

³ Department of Anaesthesiology, School of Medical Sciences, Universiti Sains Malaysia Health Campus, 16150 Kubang Kerian, Kelantan, Malaysia

⁴ Cardiothoracic Unit, Department of Surgery, School of Medical Sciences, Universiti Sains Malaysia Health Campus, 16150 Kubang Kerian, Kelantan, Malaysia

Abstract

We report a case of open fracture of the clavicle with subclavian artery and vein laceration and perforation of the parietal pleural below the first rib that caused massive haemothorax. Emergency thoracotomy and exploration followed by repair of both vessels were able to salvage the patient and the extremity.

Keywords: bone fractures, clavicle, haemothorax, subclavian artery, trauma

Introduction

Fracture of the clavicle is common, accounting 5% of all fracture cases. Damage to the neurovascular structure associated with fracture of the clavicle, however, is rare and more frequently related to penetrating injuries (1). To the best of the authors' knowledge, the incidence of open fracture of the clavicle and subclavian vascular injury with penetrating injury to the pleura has not been documented in the literature.

Case Report

A previously healthy 19-year-old helmeted man on a motorbike had a head-on collision with a lorry at the speed of approximately 100 km/h. He was brought by passers-by to our institution within an hour after the accident. The patient was alert and oriented, with continuous bleeding from a 4.0-cm wound in the upper left chest, which was packed with sterile gauze and compressive dressing. The left upper limb was dusky, with absence of radial and ulnar pulses. Emergency chest radiography revealed extensive left pneumo-

haemothorax, with mediastinal shift to the right side and left medial third clavicle fracture with significant displacement (Figure 1). He also had left femur and segmental mandible fracture.

A left tube thoracostomy initially returned 1000 mL of blood, with continuous drainage of 800 mL over 2-hour period. Aortic arch and selective left subclavian artery angiography revealed tapering of subclavian artery, with filling defect at the distal end due to spasm-associated complete thrombosis (Figure 2). Upper limb venography showed non-opacification of the distal cephalic vein and multiple collaterals seen from the cephalic and subclavian veins that resulted from compressive dressing (Figure 3). There was no evidence of extravasation of intravenous contrast from the vessels into the chest or around the injured area.

While the patient was induced and under mechanical ventilation prior to the surgery, there was gushing of blood from the wound; local exploration at the time was highly suspicious of intra-thoracic bleeding. Thoracotomy through left posterolateral approach revealed a collection of 1500 mL of blood and clots, with a 2.0-cm

laceration at the left middle lobe and apical lung contusion. There was 2.0 × 2.0 cm perforation of apical pleural below the first rib with avulsion fracture of the latter. Exploration of the subclavian vessels revealed 1.0-cm laceration of vein with active bleeding, segmental spasm of subclavian artery, and contused brachial plexus (Figure 4). Both artery and vein was resected and bypassed with reverse saphenous graft (Figure 5). Pleural perforation was repaired and medial clavicle was stabilised with inter-osseous wiring. The fractured femur and mandible were stabilised with plate and screwed 48 hours later.

The patient was ventilated for 48 hours and tube thoracostomy was removed at day 3 post-operatively. There was presence of lower plexus neuropraxia, evidenced by weak handgrips, power of grade 3. Subsequent chest radiograph showed full lung expansion with minimal local pulmonary contusion. The patient returned home after 12 days of hospitalization with full strength and sensation of the left upper limb. At 3-month follow-up, his radial pulse was equal with no neurological deficits and the fractured clavicle had united with the help of the in situ wire (Figure 6).



Figure 1: Chest radiograph showed massive left pneumo-haemothorax and shift of the mediastinum to the right. Note also the fracture of the medial third of the clavicle, indenting the pleural surface inwardly.

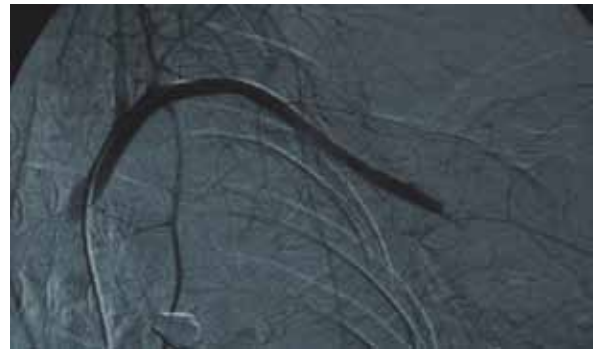


Figure 2: Angiography revealed complete cut-off of the left subclavian artery flow. However, there was no leak of intravenous contrast to suggest extravasation.

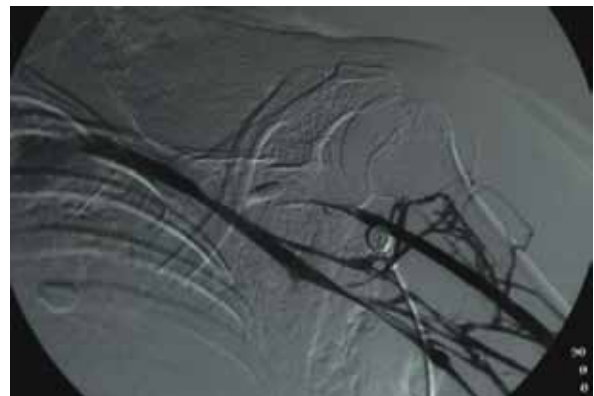


Figure 3: Venography of the left upper limb showed multiple collaterals and non-opacification of distal cephalic vein before draining into the subclavian vein.



Figure 4: Pleural perforation below first rib. Vascular clamp used to control bleeding from injured subclavian vein. Subclavian artery was spasmmed and thrombosed.



Figure 5: Both subclavian vessels were resected and bypassed with reverse saphenous vein graft.



Figure 6: Chest radiograph showed normal lung field with united clavicle fracture and inter-osseous wire in situ.

Discussion

The initial approaches in subclavian vessels injury include aggressive resuscitation of hypovolaemic shock, assessment of other injuries, and diagnostic angiography, if time permits (2,3). External bleeding from the subclavian artery must be controlled rapidly, and associated pneumo-haemothorax must be managed by urgent chest thoracostomy. Direct pressure and compressive dressing are effective in controlling bleeding in urgent situation, particularly in the emergency department. Proper compression to the subclavian vessels injury produces tamponade, and this method is effective in most of the cases. Pleural perforation within the injured area can drain blood from the injured vessels to the pleural cavity, producing massive haemothorax; this condition may mislead the judgment that ongoing bleeding was controlled. This case highlighted that the mediastinum was a potential space with negative pressure that was able to collect huge amount of ongoing bleeding, which led to persistent hypovolaemic shock (3–6).

The mediastinum and pleural space are potential areas to develop hematoma due to negative pressure. This will lead to false clinical judgment as external bleeding was well controlled despite of deteriorating haemodynamic status. Lung ventilation produces positive pressure and the haemothorax will be pushed through pleural perforation mimicking intrathoracic massive bleeding.

Conclusion

Clavicle fracture is known as a benign condition, but it can potentially lead to intrathoracic vascular injury and massive haemothorax.

Authors' Contributions

Concept and design: WIF
Critical revision of article: HS
Final approval of the article: NMM
Drafting of the article: HJ, PM
Provision of study materials and patients: WIF, PM, MGZ

Correspondence

Associate Professor Dr Faisham Wan Ismail
MD (UKM), MMed Ortho (USM)
Department of Orthopaedic
School of Medical Sciences
Universiti Sains Malaysia Health Campus
16150 Kubang Kerian
Kelantan, Malaysia
Tel: +609-767 6381
Fax: +609-767 4510
Email: faisham@kb.usm.my

References

1. Raviraja A, Chandrashekar CM, Roshan SD, Srinivas JV. Subclavian artery and vein injury following clavicle fracture. *Injury Extra*. 2009;**40(2)**:36–38.
2. Leblang SD, Dolich MO. Imaging of penetrating thoracic trauma. *J Thoracic Imaging*. 2000;**15(2)**:128–135.
3. Hyre CE, Cikrit DF, Lalka SG, Sawchuk AP, Dalsing MC. Aggressive management of vascular injuries of the thoracic outlet. *J Vasc Surg*. 1998;**27(5)**:880–885.
4. Kendall KM, Burton JH, Cushing B. Fatal subclavian artery transection from isolated clavicle fracture. *J Trauma*. 2000;**48(2)**:316–318.
5. Baikoussis NG, Siminelakis SN, Matsagas M, Michalis LK. Massive haemothorax due to subclavian artery rupture: Emergency thoracotomy or primary stent grafting? *Heart Lung Circ*. 2010;**19(7)**:431.
6. Kidd JN, Drummond-Webb JJ, Vandevanter SH, Wagner CW. Subclavian artery disruption caused by blunt trauma in an adolescent: Case report and review of the literature. *J Trauma*. 2005; **58(4)**:845–847.