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Case report

Subclavian artery and vein injury following clavicle fracture due to blunt trauma

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1. Introduction

Fracture of the clavicle is common, accounting for 5–12% of all fractures and up to 44% of injuries to the shoulder girdle. Damage to neurovascular structures associated with closed fractures of the clavicle due to blunt trauma is rare,^{3,4,8} and are more frequently related to penetrating injuries.^{1,5–7} The usual mechanisms of injury include fall on an outstretched hand or on the point of the shoulder, and direct or indirect trauma associated with contact sports.^{3,8}

To the best of authors' knowledge, the incidence of subclavian vascular injury in closed fractures of clavicle has not been documented in the literature. We present a case of closed fracture of the clavicle with injury to the subclavian artery and vein, that presented as critical ischaemia of the upper limb, successfully treated by reversed saphenous vein graft (SVG).

2. Case report

A 22-year-old man presented to our emergency department with left shoulder pain and swelling after a motorcycle accident. There was tenderness and crepitus at the middle third of the left clavicle. He had difficulty in moving his left upper limb, but active movements of the fingers of the left hand were possible. There was no sensory deficit over the upper limb. Ipsilateral radial and brachial pulses were absent, but capillary filling was fairly good. Radiography of the left shoulder (Fig. 1) showed fracture of the middle third of the clavicle, and computed tomographic (CT) angiogram of left upper limb revealed fracture of left clavicle with occlusion of left subclavian artery at the level of first rib, refilling at the level of second rib (Figs. 2 and 3).

The man was immediately taken to the operating theatre for surgical exploration. Operative findings included: fracture of left clavicle at the junction of the medial and middle thirds; transection of the left subclavian vein with thrombus at both ends (Fig. 4);

contusion of the left subclavian artery part II with intimal dissection and thrombus *in situ* (Fig. 5); and good back bleeding from distal arterial end.

The man underwent left subclavian artery segmental excision and vein repair with an interposition SVG, and open reduction and internal fixation of the fractured clavicle using a 3.5-mm reconstruction plate.

Operation involved a left supraclavicular incision, so that the platysma and the clavicular head of the sternocleidomastoid could be cut and retracted to expose the scalene muscles. The scalenus anterior was divided and the subclavian vessels were exposed. The lesions were identified and both the subclavian vein and artery were dissected and looped, obtaining proximal and distal control of the artery. The cut ends of the vein were isolated and thromboembolectomy was performed with a no. 5 Fogarty catheter, after heparinisation. The saphenous vein was harvested from left lower limb and an interposition SVG was inserted between the ends of the subclavian vein, using 6.0 prolene. The subclavian artery was opened at the site of contusion and the thrombus was removed by embolectomy catheter. Good back bleeding was noted. The contused segment was excised and continuity was restored by an interposition SVG using 6.0 prolene (Fig. 6). Good run-off and distal pulsation were observed. The fractured clavicle was fixed using a reconstruction plate (Fig. 7). Haemostasis was achieved and the wound was closed in layers over a suction drain.

Postoperatively, the man received antithrombotic agents for 3 months and retained good brachial and radial pulses throughout. At the recent 1-year follow-up, radiography showed satisfactory union with implants *in situ*; peripheral pulses were normal and ranges of motion of the shoulder were full, without any motor or sensory deficits.

3. Discussion

To the best of our knowledge, the incidence of subclavian vascular damage in closed fractures of clavicle has not previously been described as such in the literature. A high degree of clinical

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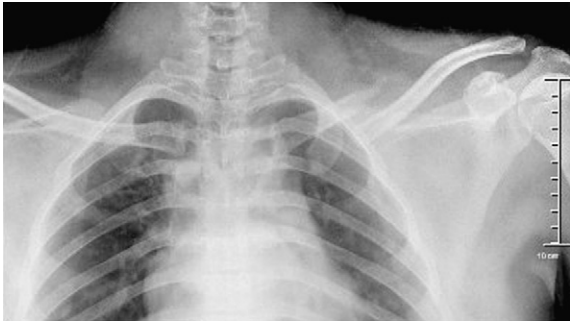


Fig. 1. Radiograph showing fracture of left clavicle.

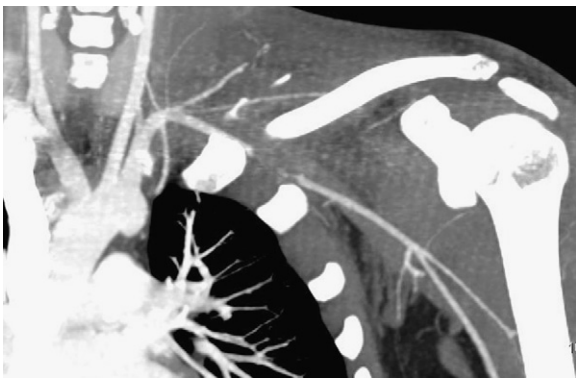


Fig. 2. CT angiogram showing fracture of left clavicle with occlusion of left subclavian artery at level of 1st rib, and reformation at level of 2nd rib.



Fig. 3. 3D reconstruction of clavicular fracture and occlusion of left subclavian artery.



Fig. 4. Subclavian vein severed, with thrombus at both ends.

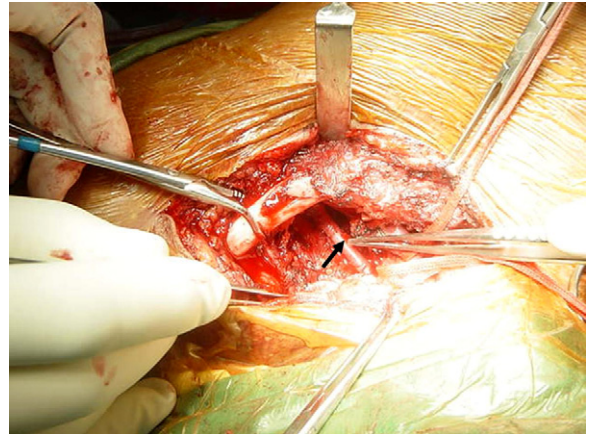


Fig. 5. Contused left subclavian artery.

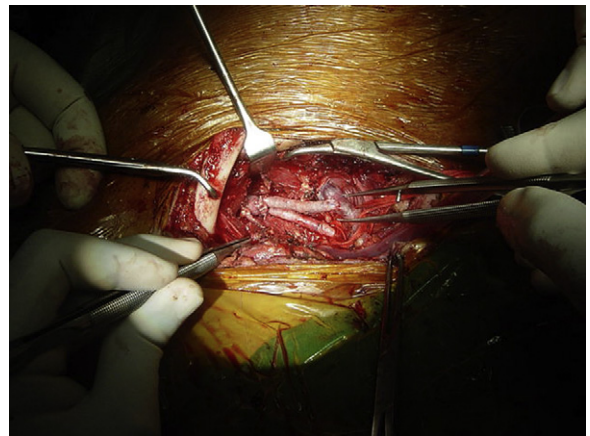


Fig. 6. Contused segment of subclavian artery excised and continuity restored by interposition saphenous vein graft.

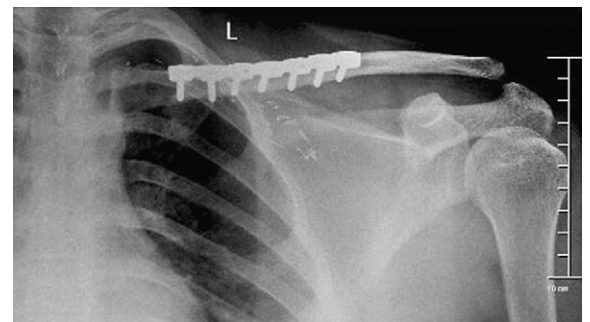


Fig. 7. Postoperative radiograph of clavicular fixation with reconstruction plate.

suspicion is necessary to detect subclavian transection from blunt trauma because of the location of this injury, lack of initial bleeding and rich collateral blood supply to the arm.² An angiogram or CT angiogram with 3D reconstruction can throw light on the degree of vascular damage, the level of injury, the involvement of the artery and vein and any external compression due to haematoma. In our case, vascular repair was carried out as an emergency by the vascular team, and the clavicle fixed with a reconstruction plate and screws. Postoperatively, the man

received antithrombotic drugs for 3 months and attended regular follow-up appointments.

4. Conclusion

We postulate that high-velocity trauma, such as that which can occur in a road traffic accident, may include direct blunt injury to the clavicle resulting in fracture of the middle third. In these circumstances, displaced sharp bone fragments can pinch the subclavian vasculature causing intimal damage, or can sever the underlying subclavian artery and vein.

A high degree of suspicion is necessary to rule out possible vascular lesions in cases of blunt trauma to shoulder with clavicular fracture. Early recognition of these rare lesions can guide the physician in planning appropriate treatment.

References

1. Costa MC, Robbs JV. Non-penetrating subclavian artery trauma. *J Vasc Surg* 1988;8:71–5.
2. Cunningham RJ. Subclavian artery transection due to blunt trauma. *Vasc Endovasc Surg* 1984;18:386–90.
3. Hill JM, McGuire MH, Crosby L. Closed treatment of displaced middle-third fractures of the clavicle gives poor results. *J Bone Joint Surg* 1997;4:537–9.
4. Hutchinson MR, Ahuja GS. Diagnosing and treating clavicle injuries. *Phys Sports Med Minneapolis* 1996;3:26–31.
5. Katras T, Baltazar U, Rush DS, Davis D, Bell TD, Browder IW, et al. Subclavian arterial injury associated with blunt trauma. *Vasc Surg* 2001;35(1):43–50.
6. Kendall KM, Burton JH, Cushing B. Fatal subclavian artery transection from isolated clavicle fracture. *J Trauma* 2000;48(2):316–8.
7. Natali J, Maraval M, Kieffer E. Fractures of the clavicle and injuries of the subclavian artery. *J Cardiovasc Surg* 1975;5:41–4.
8. Rockwood Jr CA, Williams GR, Young DC. Injuries to the acromioclavicular joint. In: Rockwood Jr CA, Green DP, Bucholz RW, Heckman JD, editors. *Fractures in adults*. 3rd edn., Philadelphia, PA, USA: Lippincott; 1991. p. 1181–239.