S CASE REPORT

Non-union of a clavicle fracture: lateral fragment excision for brachial artery embolism

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ABSTRACT

Received

Received 12 July 2013;
accepted 10 January 2014

Keywords

Clavicle non-union; arterial thoracic outlet syndrome; claviclelectomy

Conflicts of Interest

None declared

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DOI: 10.1177/1758573214522025

A 67-year-old motorcyclist was admitted to hospital following a high-speed road traffic collision and found to have a left midshaft clavicle fracture and multiple ipsilateral rib fractures. He was treated conservatively and went on to have non-union of the clavicle. The non-union was managed non-operatively. The patient then re-attended the hospital with an acute ischaemic left hand 3 years after the original injury date. An arterial duplex scan confirmed an embolus to the brachial artery. A brachial embolectomy was urgently performed. A computed tomography scan showed non-union of the clavicle fracture and an inflammatory mass compressing the left subclavian artery, which was the focus of the embolic event. The clavicle non-union was managed operatively with lateral half claviclelectomy. Immediately after clavicle excision, the vascular team performed reconstruction of the brachial artery. At follow-up, there was normal shoulder and hand function at outpatient clinic. A duplex scan confirmed good triphasic waveforms throughout the arteries of the left upper limb.

INTRODUCTION

Vascular complications as a result of clavicle fractures are rare but are well recognized when occurring at the time of injury. We report a case of brachial artery embolism, following non-union of a mid-shaft clavicle fracture, presenting 3 years following the initial injury. Excision of the lateral clavicle fragment and vascular reconstruction prevented any further embolic events, with no shoulder dysfunction or residual symptoms. To our knowledge, the presentation, findings and management of this case have not been previously reported in the literature.

CASE REPORT

A 67-year-old motorcyclist was involved in a high-speed road traffic collision and sustained a displaced left mid-shaft clavicle fracture and ipsilateral rib fractures. His medical history included diabetes mellitus and hypertension. His clavicle fracture was initially treated with a broad-arm sling, followed by mobilization as pain allowed. At 9 months post-injury, radiographs confirmed non-union of the fracture with substantial shortening (Fig. 1). The patient reported occasional clavicle clicking and very mild discomfort. Osteosynthesis of the clavicle was offered but refused by the patient. He was further reviewed 18 months later. Upon clinical examination, he had a full range of motion to the left shoulder with no neurovascular deficits.

He presented 7 months later with an acutely ischaemic left hand. An arterial duplex scan confirmed an embolic obstruction of the brachial artery. The patient was initially managed

with a surgical brachial embolectomy following a cubital fossa 'cut-down'. On the third day, the brachial artery re-occluded and another open embolectomy was performed. Intraoperative angiography suggested narrowing of the subclavian artery. A subsequent computed tomography scan revealed a clavicle non-union with an associated callus mass at the fracture site causing compression of the left subclavian artery (Figs 2 and 3).

Further embolic events remained a major concern and hence the patient underwent excision of the lateral fragment of the clavicle non-union (Fig. 4) along with vascular reconstruction of the upper brachial artery.

At 4 months follow-up, the patient had no residual symptoms with normal shoulder/hand function and a follow-up duplex scan confirmed good tri-phasic waveforms throughout the arteries of the left upper limb from the base of the neck to the wrist. The patient was discharged from follow-up and, to date, has not re-presented to the hospital.

DISCUSSION

Clavicle fractures comprise 3% of all fractures [1] and, of these, 80% involve the middle third of the clavicle [2]. Vascular complications as a result of clavicular fractures are rare but can occur at the time of injury. Our case was unusual in that the development of subclavian artery compression and the resultant brachial artery embolism occurred late and was caused by a large surrounding callus mass at the non-union site.

A search of the literature confirmed the rarity of vascular complications secondary to clavicular non-unions and the lack

Fig. 1 Plain anteroposterior radiograph showing non-union of mid shaft clavicle fracture.

Fig. 4 Post-operative anteroposterior radiograph showing excision of lateral half of the clavicle.

Fig. 2 Axial computed tomography image showing large amounts of callus in the subclavicular space.

Fig. 3 Axial computed tomography image showing the callus-like mass from the clavicle fracture narrowing the subclavian artery.

subclavian artery. This patient had however originally undergone a trans-clavicular osteotomy to gain access to a subclavian aneurysm, which had then failed to unite. The patient subsequently developed distal ischaemia of the upper limb. The non-union had been present for 24 months, and necessitated subsequent clavicular osteosynthesis. At the time of this surgery, the non-union was classified as atrophic. This is different from our case who, as a result of trauma, had sustained the original fracture and demonstrated an abundance of callus material surrounding the clavicle non-union site. It is unclear in the study by Jupiter and Leffert [3] whether the narrowing of the subclavian artery occurred as a direct consequence of the original aneurysm and to what extent the non-union directly contributed to its occurrence. A further study by Howard and Shafer reported 14 patients with neurovascular complications following traumatic clavicle injuries [4]. Eight of the 14 cases presented late, ranging from 2 months to 10 years. Howard and Shafer postulated two mechanisms by which neurovascular compression had occurred [4]. The first mechanism involved compression of the carotid artery at the level of the medial clavicle resulting in syncopal episodes. The second mechanism involved compression of the subclavian vessels/brachial plexus between the clavicle and first rib. This second mechanism is likely in our patient with excessive callus causing the compression.

A retrospective study by Criado et al., investigating arterial compression at the thoracic outlet, found that 41 of 346 patients who underwent decompression of the thoracic outlet had arterial compression of the subclavian artery [5]. Two-thirds of the patients had associated bony anomalies, most commonly cervical ribs, although four cases had clavicle and first rib fractures. Of the 13 patients who presented with ischaemia secondary to hand/arm embolization, all of them had pathology in the subclavian artery. It was inferred that this was most likely the end result of chronic compression of the vessel resulting in pathological change to its wall, leading to stenosis or aneurysm formation [5].

Our case was unusual in that compression of the subclavian artery was a result of compression by the large callus mass, and in that our patient was asymptomatic until he presented

of previously documented cases such as ours. Jupiter and Leffert reported 21 cases of clavicle non-unions resulting from fractures and two cases of non-unions secondary to osteotomies during a 11-year period [3]. Only one of these patients developed arterial ischaemia as a result of an occluded

acutely with the embolic event. His symptoms settled completely with surgical excision of the lateral part of the clavicle non-union and vascular reconstruction. Alternative options would have been fixation of the clavicular non-union and excision of the callus mass, although this may have been associated with higher risk of vascular injury because of the associated scarring in that area, as well as providing the possibility of recurrent compression of the subclavicular space. Indeed, Burnand et al. described a case where brachial, radial and ulnar embolization occurred following fixation of a clavicle non-union [6]. Resection of the lateral half of the clavicle was performed rather than excising individual fragments because it was difficult to predict the extent of resection needed distally. We consider that the method employed in this case provided a more definitive long term decompression of the deep seated vessels. The lateral half resection resulted in further prevention of embolism and was associated with no functional shoulder problems. This preserved shoulder function following claviclectomy is not unusual because previous studies describing partial or total clavicle excisions for the treatment of trauma, infection or tumours have reported satisfactory outcomes [7–9]. What is unusual is that the patient had no residual symptoms after treatment which is in contrast to the study by Kitsis et al. reporting that the majority of patients suffer some form of residual symptoms [10].

Conclusions

The present case report highlights an unusual case of brachial artery embolism resulting from compression of the subclavian

artery following a clavicle non-union and the use of lateral clavicle fragment excision in its treatment.

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