CASE REPORT

Thrombosis of the brachial artery after closed dislocation of the elbow

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The brachial artery is rarely injured after closed dislocation of the elbow. We describe an unusual variation of this injury, namely, a delayed thrombosis of the brachial artery after a closed dislocation sustained during a low-energy fall. This has not previously been described in the English literature, but may be more common than this suggests. We stress the importance of a thorough neurovascular examination and vigilance in regard to this potentially disastrous complication.

Injury to the brachial artery after closed dislocation of the elbow is exceedingly rare with an incidence of approximately 0.5%.1 This is surprising given the anatomical proximity of the brachial artery to the elbow, the high rate (16%) of vascular injury seen after dislocation of the knee,1 and the frequency of dislocation of the elbow, second only to dislocation of the shoulder.2 Most cases of injury to the brachial artery after dislocation of the elbow are related to an associated fracture, an open injury or high-energy trauma.2-6 We describe an unusual case of complete thrombosis of the brachial artery presenting ten days after dislocation of the elbow from low-energy trauma.

Case report

A right-hand-dominant, healthy 63-year-old woman with a medical history only of oestrogen supplementation, sustained a fall from a standing height resulting in dislocation of her right elbow. She presented to the emergency department within one hour of the injury with swelling, erythema and tenderness over her elbow. Sensation and gross motor function were intact with a palpable radial pulse in the right upper limb. Radiographs showed a posterior dislocation of the elbow (Fig. 1). Under monitored sedation, a closed reduction was performed and she was placed in a double sugar-tong splint. Post-reduction radiographs showed a congruent reduction of the joint (Fig. 1c). The neurovascular status remained stable in the right arm after reduction. Four days later, she was re-examined and found to be doing well with no clinical changes. The splint was removed.

Ten days after the injury, she presented with paraesthesiae in the right hand and in all five digits. On examination there was sluggish capillary refill, no palpable radial pulse and slow filling through both arteries at the wrist on Allen testing. Radiographs continued to show anatomical reduction of the elbow. An arteriogram demonstrated a segment of occlusion of the brachial artery 12 cm in length proximal to the bifurcation, with filling of collateral vessels and distal reconstitution of the circulation (Fig. 2). She was started on intravenous heparin and, under the direction of the consultant vascular surgeon, taken to the operating room within 24 hours.

At operation, the brachial artery was found to be inflamed, scarred and thrombosed proximal to the bifurcation into the radial and ulnar arteries. The damaged portion was excised and sent for histological examination. Proximal and distal control was obtained, and No. 3 Fogarty catheters were used to remove the thrombus from the brachial artery. After passing the catheter 30 cm proximally, the clot was removed. Good flow and a pulse were restored in the proximal brachial artery. There was no distal clot with good back bleeding. The injured brachial artery was repaired using a saphenous vein graft.

She regained normal motor and sensory function with a palpable right radial pulse. The forearm compartments remained soft. No evidence of vasculitis, malignancy or hypercoagulation disorder was found after extensive laboratory testing. Histopathological examination showed no sign of an intimal flap. At the last follow-up, 12 months after injury, there was no instability of the elbow with full extension and flexion to 140°; sensation and motor function remained intact and her hand was...
warm and pink with brisk capillary refill and normal radial and ulnar pulses. She was free from pain and had returned to her pre-injury level of activity with no complaints.

Discussion
Vascular complications after dislocation of the elbow are well documented. However, this is the first reported case injury to the brachial artery presenting in a delayed fashion after dislocation of the elbow from minor trauma.

It is estimated that 5.4% of all elbow dislocations, open and closed, have associated vascular involvement. Most of these have been open dislocations from high-energy injuries, frequently with associated fractures. In a multicentre study of 634 closed dislocations, only three cases of injury to the brachial artery were noted (0.47%) and all the patients were suspected to have acute vascular injury at the initial evaluation.

Evers reported the first case of dislocation of the elbow with injury to the brachial artery in 1785. In 1913, Sherrill performed the first primary repair of the brachial artery for an injury after closed posterior elbow dislocation. In 1934, Marnham described the first successful result from direct ligation of the injured vessel. In 1965 Linscheid and Wheeler reported a series of over 110 elbow dislocations in which there were six cases of concomitant arterial injury. They treated three by observation alone, two by ligation of the brachial artery and one by a direct repair which thrombosed. At follow-up, all patients with vascular injury were noted to have a viable limb, but one had an ischaemic contracture of the hand and all had residual neurological loss. This led later authors to conclude that an aggressive approach to arterial injuries associated with elbow dislocation probably was warranted. Soon after, in 1966 Aufranc, Jones and Turner described the use of a vein graft to treat a similar injury. Whilst there is some continuing debate, this has remained the most common treatment.

In view of the rich collateral circulation around the elbow, some authors initially advocated ligation of the brachial artery after injury to increase the pressure in the collateral circulation. This was said to lead to return of the radial arterial pulse in some cases. However, other authors noted complications of cold intolerance and intermittent claudication of the forearm and hand. There has been no clearly documented case of limb loss secondary to ischaemia from an injury to the brachial artery sustained with a closed dislocation. This has led to a long-standing and active debate regarding the best method to treat these rare injuries by observation, ligation, direct repair or vein grafting. Observation alone has been reported in cases of pulseless, but viable hands. Currently, reconstitution of flow to the brachial artery is the most popular choice.

An anatomical study by Louis, Ricciardi and Spenger provided evidence as to why in some cases of injury to the brachial artery after dislocation of the elbow there may be inadequate distal collateral circulation. Their cadaver analysis involved creating a posterior dislocation through forceful hyperextension. In 13 of 14 elbows, the anterior anastomosis between the inferior ulnar collateral artery and the anterior ulnar recurrent artery was disrupted. The likelihood of injury to the collateral circulation during dislocation has been used as evidence for favouring vascular repair.

An index of suspicion for vascular injury is warranted following any dislocation of the elbow, especially with a high-energy or open injury, neurological compromise.

Fig. 1a
Radiographs showing a closed posterior dislocation of the elbow a) and b) before and c) after reduction.
It is unclear how many patients with closed dislocations and maintained neurovascular status have occult arterial injuries which never reach clinical significance. Of patients with arterial injury 10% may have palpable pulses distal to the site of the trauma. For example, in a case reported by Eijer et al., an arteriogram performed on a patient with a strong radial pulse showed occlusion of the brachial artery. The frequency of late pseudoaneurysms after dislocation indicates that at least some arterial injuries are missed in the acute setting.

In addition to the association with only minor trauma, the unusual feature of our case was the delayed presentation of the vascular injury. We think that this highlights important features: the need for constant vigilance and careful follow-up to avoid the potentially disastrous complication of an ischaemic arm, even in the light of previously intact neurovascular status.

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References