ACTA MEDICA LITUANICA. 2019. Vol. 26. No. 3. P. 167–172
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Thrombosis of the brachial artery – a rare and devastating complication after a simple closed posterolateral elbow dislocation

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Dislocation of the elbow joint is the second most common dislocation after the shoulder joint. Although this pathology is relatively common, concomitant vascular injuries are rare. We present a case of a patient who sustained a fall on his arm with an outstretched elbow that resulted in a closed simple posterolateral elbow dislocation and delayed thrombosis of the brachial artery followed by two revascularisation surgeries. The physician must always maintain a high index of suspicion for a concomitant vascular injury before and after closed reduction of the elbow joint and have in mind that complete ischemia without any pulsations could be absent because the elbow is surrounded by rich collateral anastomoses. Suspicion should be even stronger in the presence of bony lesions or open injuries. A team of trauma and vascular surgeons has to work hand in hand as surgical treatment with a saphenous graft or direct suture is the first method of choice with the prior requirement of a stable elbow joint.

Keywords: elbow dislocation, brachial artery, thrombosis, closed reduction

INTRODUCTION

A dislocation of the elbow joint is the second most common dislocation after the shoulder joint with the incidence of 5–6 cases per 100,000 a year, of which about 90% are posterior or posterolateral dislocations (1–3). The most common mechanism of the injury is the fall on the hand with an outstretched elbow which creates hyperextension forces in the joint (4). Although this pathology is relatively common, concomitant vascular injuries are rare: from 5% to 13% in open or complex

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dislocations (associated with bony lesions) and only up to 0.5% in simple closed dislocations (3, 5–10). In the literature, it is suggested as surprisingly low given the proximity of the brachial artery to the elbow joint when compared to popliteal artery injuries after knee joint dislocations, which are up to 16% (5). However, it could possibly be explained by brachial and supinator muscles separating the elbow joint from the brachial artery in contrast to the popliteal artery, which lies directly over the joint capsule in the knee (11). Furthermore, only case reports and small series of cases appear in the literature, and there is a lack of consensus on the management of this rare pathology (12, 13). We report a case of brachial artery thrombosis after a simple posterolateral dislocation of the elbow joint.

Presentation of the case

A 26-year-old left-handed male fell over on his right palm with his elbow in extension while snowboarding and immediately began to experience severe pain, swelling, and loss of motion at the site. Two hours and 30 minutes after the initial accident, the patient was examined at the emergency department. Clinical evaluation revealed a deformity at the joint and absence of its function; pulsations of radial and ulnar arteries were normal, and there was no neurological deficiency. Plain radiographs of the affected joint revealed a simple posterolateral dislocation of the elbow joint without any concomitant bony lesions (Fig. 1). Closed reduction under local intra-articular anaesthesia was performed immediately.

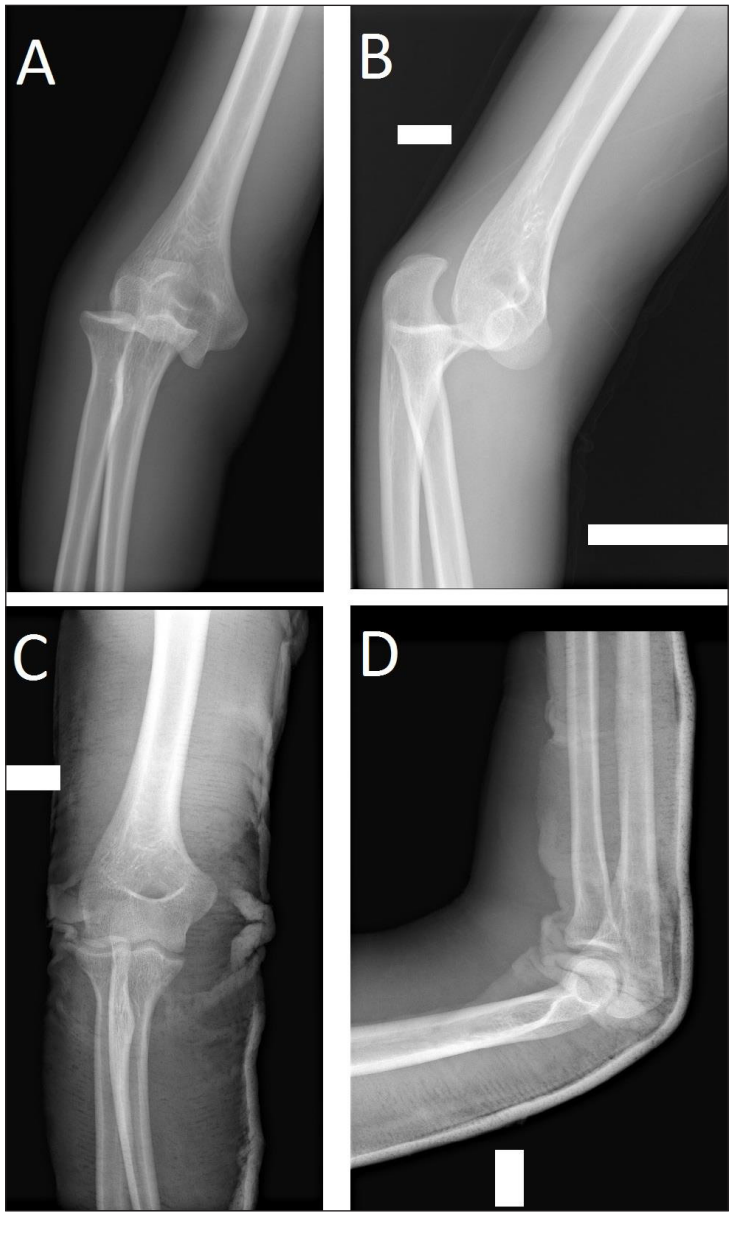

Fig. 1. A–B – plain elbow radiographs demonstrate a posterolateral dislocation of the elbow. C–D – a radiographic view after closed reduction – joint congruence is restored, no signs of bony lesions

Clinically, the joint was stable and full passive motion was present. There were no signs of neurovascular damage: pulsations of radial and ulnar arteries, motions of fingers, and sensations were normal. Closed reduction was followed by cast immobilisation in 90° flexion with palm in supination. As control radiographs showed successful reduction (Fig. 1), the patient was discharged from hospital for further treatment at his primary health centre. On the way home, the patient started to feel intermittent numbness in the fingers, but he thought it was the consequence of the local anaesthetic.

On the following day, the patient noticed that it became difficult to move fingers, and paraesthesia became permanent. Ten hours after the first admission, the patient was examined at the emergency department for the second time. Clinical examination revealed a stable right elbow joint, haematoma in the antecubital fossa, absence of pulsations of radial and ulnar arteries, and a decreased capillary refill in fingers. There was slight weakness of flexion in fingers – median nerve palsy. Doppler sonography showed magistral bloodstream in the brachial artery only cranially to the elbow joint. The patient was urgently prepared for general anaesthesia and taken to the operating theatre without delay.

The elbow was explored through a curvilinear incision across the joint. A large 10 cm segment of the brachial artery was contused and thrombosed. The distal part of the ipsilateral saphenous vein was harvested and used as an interposition graft. End-to-end anastomoses were made proximally and distally 2 cm above the bifurcation of the brachial artery. Revascularisation time was about 20 hours. During the surgery, there were a few recurrent dislocations of the elbow joint. A trauma surgeon was called for consultation as the brachial muscle, the anterior part of the joint capsule, and the medial collateral ligament had been ruptured. Damaged structures were sutured, and it was decided to use external fixation (Fig. 2).

On the first postoperative day, the patient started complaining about numbness in his fingers and difficulty in flexing them. There were no pulsations in radial and ulnar arteries, and the microcirculation of the fingers was decreased. An immediate angiography showed the thrombosis of the saphenous graft, and the patient was taken to the operating theatre for the second time (Fig. 2). The saphenous vein from the thigh was used for the second end-to-end graft from the proximal third of the brachial artery to its distal part just 1 cm above the bifurcation. Furthermore, fasciotomies of the forearm were performed due to

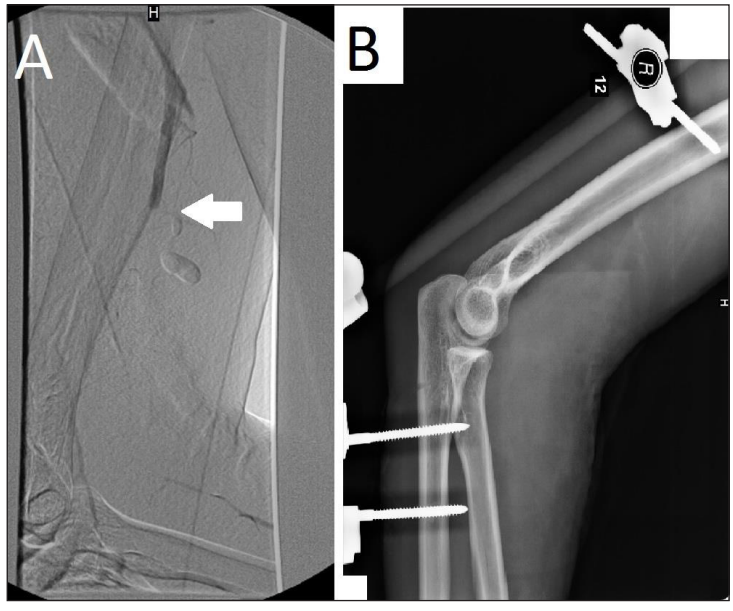

Fig. 2. A – the angiogram shows the interruption of the flow in the proximal part of the saphenous vein graft (white arrow) on the first postoperative day. B – the lateral elbow radiograph after application of external fixation device

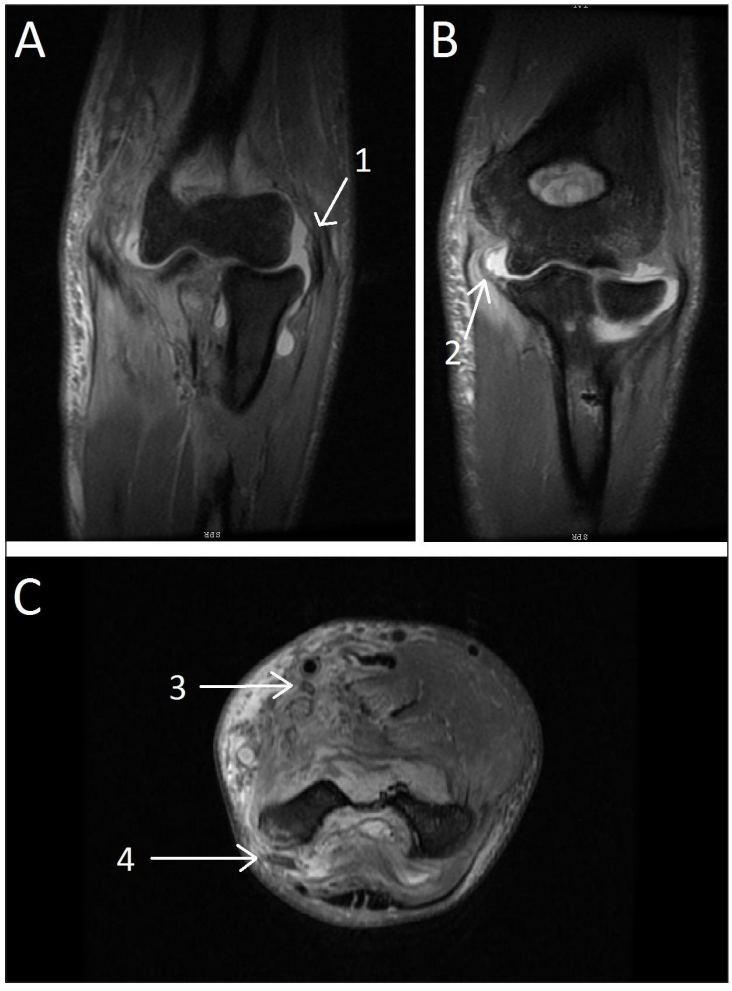

Fig. 3. A–C – MRI scans of the right elbow joint three weeks after trauma. 1 – rupture of the lateral collateral ligament, 2 – rupture of the medial collateral ligament, 3 – median nerve oedema, 4 – ulnar nerve oedema

the excessive swelling. Further post-operative course was uneventful. Three weeks later, the external fixator was removed, and rehabilitation initiated. An MRI scan showed the rupture of both collateral ligaments and oedema of median and ulnar nerves (Fig. 3). Two months after the initial event, the patient had 10° extension contracture; there was no deficiency in sensations and microcirculation, but slight palsy of the median nerve was still present. The patient is still undergoing further rehabilitation.

DISCUSSION

To begin with, flexion/extension or supination/pronation contracture, heterotopic ossification, median nerve palsy, and residual instability are well-known and described complications after a closed elbow dislocation (7). To our best knowledge, there are about 50 cases of brachial artery injuries after an elbow dislocation (closed, open, or with accompanying bone fractures) documented in the medical literature (2, 6). Fortunately, in the most cases, an arterial injury is present at the time of dislocation, but presentation can be delayed from the time when the patient is discharged from the hospital to ten days after closed reduction (5). It is shown that there are two patterns of the injury – a complete transection or an intimal tear followed by secondary thrombosis or formation of pseudo-aneurysm (2, 6, 8, 13). The most likely cause could be explained by the anatomy of the cubital fossa: during a posterior elbow dislocation, the distal portion of the brachial artery is trapped between the rigid biceps aponeurosis and the distal humerus (2).

A closed dislocation with or without a neurovascular impairment should be followed by immediate closed reduction of the elbow joint in the emergency room (1). If there are any signs of brachial artery injury (absent or weak pulsations of ulnar and radial arteries, excessive swelling at the elbow joint, median nerve palsy), arteriography is the first choice test as Doppler sonography is more user-dependent and might be difficult to

perform on a swollen limb (2, 7). However, we did not perform arteriography during the first visit as our institution preferred Doppler sonography at that moment. Furthermore, as arteriography might be out of reach in smaller hospitals, Doppler sonography is a reasonable alternative (12).

The elbow joint is surrounded by rich collateral arterial blood supply: the radial artery connects to the proximal part of the brachial artery through the anterior branch of the deep brachial artery, and the ulnar artery has its connection through superior and inferior collateral ulnar arteries (11). Because of this feature, in up to 10% of cases, pulsations of ulnar and radial arteries are present despite blood flow disruption in the brachial artery (3, 5, 7). In such cases, the physician should be alerted to excessive swelling at the joint and the presence of median nerve palsy. Surgical treatment with a saphenous vein graft or direct suture should be preferred even in the cases when the neurovascular status is maintained to prevent further claudication and cold intolerance (7, 12). However, in our opinion, conservative treatment would be possibly more beneficial for low-demanding patients. As a proof, it is unknown how many patients have latent brachial artery injury after a closed dislocation and maintained neurovascular status. In such a case, angiography is mandatory to differentiate thrombosis from rupture of the brachial trunk. If a rupture is present, swelling and large haematoma could interfere with collateral blood supply, and surgical exploration is indicated despite the social status of the patient.

After analysis of our case and other cases reported in the literature, it is clear that this pathology has to be managed jointly by a vascular surgeon and a trauma surgeon. Firstly, vascular repair requires a stable elbow joint. Assisted by a vascular surgeon a trauma surgeon should explore the elbow joint and repair ruptured collateral ligaments if possible. It is the responsibility of the trauma surgeon to decide whether cast immobilisation or external fixation should be applied. One of the pitfalls of our case was that the trauma surgeon advised the vascular surgeon only during the first operation and applied external fixation after the vascular repair, which might have been the possible reason for venous graft thrombosis. In the cases of excessive swelling and fasciotomies of the forearm, external fixation should be the method of choice because the cast might interfere with post-surgery swelling. If collateral ligaments are intact and there is no significant swelling and need for fasciotomies, cast immobilisation should suffice when the elbow joint is stable in full range of passive motion. In our opinion, cast immobilisation or external fixation is necessary to prevent secondary thrombosis and provide safe arterial transformation for a venous graft.

Furthermore, the use of the great saphenous vein graft or direct suture of the brachial trunk should be preferred. After successful revascularisation of the limb, both surgeons have to decide if there is a need for forearm fasciotomies. In the literature, there are no clear guidelines when it is necessary. However, in the presence of significant swelling, prolonged time of ischemia, and doubts for compartment syndrome, fasciotomies are mandatory.

INFORMED CONSENT

The patient and his family were informed that the data from the case would be submitted for publication and gave their informed consent.

CONFLICTS OF INTEREST

There are no conflicts of interest.

Received 20 September 2019
Accepted 29 October 2019

References

1. Hackl M, Beyer F, Wegmann K, Leschinger T, Burkhart KJ, Müller LP. The treatment of simple elbow dislocation in adults. Dtsch Ärztebl Int. 2015 May; 112(18): 311–9.
2. Ayel J-E, Bonnevialle N, Lafosse J-M, Pidhorz L, Al Homsy M, Mansat P, Chaufour X, Rongieres M, Bonnevialle P. Acute elbow dislocation with arterial rupture. Analysis of nine cases. Orthop Traumatol Surg Res. 2009 Sep; 95(5): 343–51.
3. Miyazaki AN, Fregoneze M, Santos PD, do Val Sella G, Checchia CS, Checchia SL. Brachial artery injury due to closed posterior elbow dislocation: case report. Rev Bras Ortop. 2016 Apr; 51(2): 239–43.
4. C JB, Sampath D, N HR, Motukuru V. Complete brachial artery transection following closed

posterior elbow dislocation: a rare case report. J Orthop Case Rep. 2015 Dec; 5(4): 27–9.
5. Garrigues GE, Patel MB, Colletti TP, Weaver JP, Mallon WJ. Thrombosis of the brachial artery after closed dislocation of the elbow. J Bone Joint Surg Br. 2009 Aug; 91(8): 1097–9.
6. Marcheix B, Chaufour X, Ayel J, Hollington L, Mansat P, Barret A, Bossavy JP. Transection of the brachial artery after closed posterior elbow dislocation. J Vasc Surg. 2005 Dec; 42(6): 1230–2.
7. Martin BD, Johansen JA, Edwards SG. Complications related to simple dislocations of the elbow. Hand Clin. 2008 Feb; 24(1): 9–25.
8. Eijer H, Ballmer FT, Ris HB, Hertel R. Delayed diagnosis of a ruptured brachial artery after posterior dislocation of the elbow. Injury. 1998 Jun; 29(5): 390–2.
9. Ferrera PC. Elbow dislocation complicated by brachial artery laceration. Am J Emerg Med. 1999 Jan; 17(1): 103–5.
10. Trigo Lahoz L, Lamas Gomez C, Sarasquete Reiriz J, de Caso Rodriguez J, Proubasta Renart I. Elbow dislocation with ipsilateral fracture of the distal radius associated with a brachial artery injury: A new pathological condition of traumatic origin. Rev Espanola Cirugia Ortop Traumatol. 2016 Nov 25.
11. Moore KL, Dalley AF, Agur AMR. Clinically Oriented Anatomy, 6th edn. Baltimore: W. Wilkins; 2010, p. 739.
12. Harnarayan P, Cawich SO, Harnanan D, Budhooram S. Brachial artery injury accompanying closed elbow dislocations. Int J Surg Case Rep. 2015; 8C: 100–2.
13. Lutter C, Pfefferkorn R, Schoeffl V. Arterial damages in acute elbow dislocations: which diagnostic tests are required? BMJ Case Rep. 2016 Jul 19; 2016.

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ŽASTINĖS ARTERIJOS TROMBOZĖ – RETA IR SUDĖTINGA KOMPLIKACIJA PO PAPRASTO UŽDARO UŽPAKALINIO-ŠONINIO ALKŪNĖS SĄNARIO IŠNIRIMO

Santrauka

Alkūnės sąnario išnirimas yra antra po peties sąnario dažniausia išnirimo lokalizacija. Nepaisant to, kad alkūnės sąnario išnirimas santykinai dažna patologija, jį lydintys kraujagyslių pažeidimai reti. Mes pristatome atvejį, kai pacientui, pargriuvusiam ant ištiestos per alkūnės sąnarį rankos, įvyko uždaras užpakalinis-šoninis alkūnės sąnario išnirimas. Šiam pacientui išsivystė vėlyva žastinės arterijos trombozė ir buvo atliktos dvi revaskuliarizacijos operacijos. Gydytojai prieš ir po uždaros alkūnės repozicijos turi didžiausią dėmesį skirti galimam kraujagyslių pažeidimui, kadangi visiška išemija be pulso pasireiškia ne visada, nes alkūnę supa gausus kolateralinių anastomozių tinklas. Tai ypatingai svarbu, esant kauliniams pažeidimams ar atviram sąnario išnirimui. Komanda, sudaryta iš ortopedo-traumatologo ir kraujagyslių chirurgo, turi dirbti kartu, nes pirmo pasirinkimo operaciniam gydymui *v. saphena* šuntu ar tiesioginiu kraujagyslių susiuvimu reikalingas stabilus alkūnės sąnarys.

Raktažodžiai: alkūnės išnirimas; žastinė arterija; trombozė; uždara repozicija