Paediatric axillary artery pseudo-aneurysm after simple shoulder dislocation

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Abstract

We report the unique case of a 14-year-old male with axillary artery pseudo-aneurysm associated with brachial plexus compression after a simple shoulder dislocation. Following shoulder reduction under anaesthetic, the child was discharged on chemical deep vein thrombosis (DVT) prophylaxis. However, progressive shoulder swelling and upper limb neurological symptoms developed. A multi-disciplinary approach was taken to diagnose and treat this complication. After stopping the anti-coagulants, a combination of endovascular stent-graft and open surgical decompression of the brachial plexus was employed. Paediatric guidelines on DVT prophylaxis are scarce but DVT has never been reported in children following upper limb trauma.

Keywords

brachial plexus palsy, chemical thrombo-prophylaxis, paediatrics, pseudo-aneurysm, shoulder dislocation

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Introduction

Vascular injuries associated with traumatic shoulder dislocations are rare. The literature is limited to sporadic case reports in adults.^{1–6} Within the paediatric population, vascular injury following shoulder dislocation has never been described in the English literature. The unique case of a post-traumatic pseudo-aneurysm of the axillary artery in a child following a simple anterior shoulder dislocation is described. In this case report, the diagnosis and management of such a vascular injury is discussed and outlined. Routine chemical thrombo-prophylaxis used and the role of anti-coagulation in children is discussed.

Case report

A 14-year-old, left-hand dominant boy landed on his left shoulder at moderate speed when snow-boarding in the Alps, sustaining an anterior shoulder dislocation. The left glenohumeral joint was reduced under general anaesthetic at the local hospital. The patient was discharged in a poly-sling and with daily injections of low

molecular weight heparin (LMWH) prior to his return to the UK. There were no risk factors for thrombo-embolism. In the intervening days, he described progressive swelling, numbness and weakness in his left arm that was not there at the time of the injury nor post reduction. This prompted him to seek medical attention on his return to the UK, which was 6 days following the injury.

Examination of the boy's left upper limb revealed a non-pulsatile mass in the axilla, with an associated dense brachial plexus palsy (MRC Grade 0/5 in C5–C7 and 3/5 in C8–T1). There was altered sensation in all the dermatomes and reflexes were reduced. There was no Horner's sign. Radial pulse was palpable and strong with capillary refill time less than 2 seconds.

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Figure 1. Coronal magnetic resonance imaging demonstrating the 77 mm × 103 mm pseudo-aneurysm in the axilla.

Figure 2. Axial computed tomography angiogram demonstrating the pseudo-aneurysm, which arose from the distal part of the axillary artery.

Repeat plain radiographs showed no fracture and the shoulder remained in joint. The first line of investigation to assess the brachial plexus integrity and soft tissue was magnetic resonance imaging (MRI). This revealed a 77 mm × 103 mm mass occupying most of the left axilla, suggestive of a pseudo-aneurysm (Fig. 1). The brachial plexus was compressed but intact. The LMWH injections were discontinued after the MRI findings. Computed tomography (CT)-angiography was performed to confirm the diagnosis of a pseudo-aneurysm, which was demonstrated to arise from the distal part of the axillary artery (Fig. 2).

The persistent vascular leak was controlled with a 6 mm × 50 mm endovascular stent graft (Gore Viabahn; W. L. Gore & Associates, Inc., Flagstaff, AZ, USA), inserted through the right common femoral artery. Subsequent open formal exploration of the brachial plexus and decompression of the pseudo-aneurysm was carried out. The pectoralis major tendon and the brachial plexus were found to be under tension from the pseudo-aneurysm. The axillary artery and cords of the brachial plexus were displaced medially and 200 ml of haematoma was evacuated from the pseudo-aneurysm. The patient remained stable and the left arm was well perfused throughout the investigations and procedures. Intra-operative nerve stimulation revealed intact cords with good response in axillary, median and musculocutaneous nerves distally. These nerves continue to improve clinically but a dense radial nerve palsy persists at 6 months following these events.

Discussion

This is the only report in the English literature of a vascular injury following shoulder dislocation in a child. The combination of endovascular and open surgical techniques was a safe way to control the bleeding from an artery before decompressing the tension on the brachial plexus.

'Aneurysm' is defined as >50% permanent dilatation of a vessel diameter. A true aneurysm involves the entire vessel wall, whereas a pseudo-aneurysm involves a portion of the vessel wall or the surrounding structures. Pseudo-aneurysms can be asymptomatic or present with pain, a pulsatile mass and compression of surrounding structures. The axillary artery and the brachial plexus share a common fascial layer. It is therefore clinically relevant that an aneurysm of the axillary artery can lead to compressive symptoms on the brachial plexus. Although the defect in the arterial wall may be only a few millimetres in diameter, pulsatile flow leads to focal expansion that may increase in size over time and may leak or rupture.^{7,8}

Post-traumatic pseudo-aneurysm of the axillary artery was first described in 1975⁹ with some subsequent case reports in individuals over 50 years of age.¹⁻⁶ It has been postulated that atherosclerotic changes in the vessels make them less elastic and less resistant to shearing forces. However, the blood vessels of the younger patient are more elastic and compliant, and therefore should be less vulnerable to injury. In blunt trauma, initial radiographs are essential to

diagnose fractures and dislocations. CT can provide detailed supplementary imaging, although it must be used judiciously in children as a result of radiation damage to young growing tissue.^{10,11} MRI can provide excellent soft tissue definition but duplex ultrasound or angiograms provide more detail of vessel flow. Paediatric arteries are prone to spasm; therefore, it can be difficult to distinguish between occlusion and transection. Although spasm can be closely monitored with observation, damaged arteries need prompt repair in settings of distal ischaemia and local compression on vital structures. A small series of paediatric cases with pseudo-aneurysms have been treated with surgical exploration and venous patch trans-position.¹² Interventional radiological techniques have been hugely successful in controlling haemorrhage in haemodynamically unstable patients.¹³ The present case has highlighted their utility for pseudo-aneurysm treatment. Prompt transfer to a centre where the expertise exists for a combined radiological and surgical approach is recommended.

There are no guidelines on anti-coagulation for paediatric trauma. The use of LMWH in children after shoulder dislocation is not indicated in any UK guidelines. DVT is a significant cause of morbidity and mortality in the hospitalised adult population. However, the incidence of DVT in children is less than 0.1% and is usually associated with infantile intensive care patients or following major poly trauma.¹⁴ DVT in children following upper limb trauma has never been described. There has been a drive to reduce complications of DVT and fatal pulmonary embolism in hospitals; hence, multiple national and local guidelines exist. Research studies from the adult population have been extrapolated to the paediatric population, although there is no evidence to support the efficacy and the duration of chemical anticoagulation in this group.¹⁵ The bleeding risk associated with chemical DVT prophylaxis is well documented^{16,17} and LMWH prescribed in this case may have been a contributing factor for progression of the pseudo-aneurysm. More work is required to explore this possibility.

The British Committee of Standards in Haematology has provided some guidance on chemical anticoagulation in children with haematological and oncological conditions. Orthopaedic trauma is not recognised as a significant risk factor.¹⁸ The Eastern Association of Surgery for Trauma (in USA) and the National Institute for Health and Care Excellence (NICE) do not address the indications for chemical prophylaxis for paediatric trauma.

Conclusions

This is a unique case of an axillary artery pseudo-aneurysm following simple shoulder dislocation which

was exacerbated by the use of LMWH. Subsequent brachial plexus compression occurred as a result of the leaking pseudo-aneurysm. The combined radiological and surgical approach successfully utilised in this case offers a novel safe treatment strategy.

Declaration of Conflicting Interests

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Ethical review and patient consent

Written consent forms were obtained from the patient and the parents.

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