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POST-TRAUMATIC PSEUDOANEURYSMS OF THE AXILLARY ARTERY: A RARE AND UNEXPECTED COMPLICATION FROM ANTERIOR DISLOCATION OF THE SHOULDER. CASE REPORT

Abstract

Rarely does anterior dislocation of the shoulder, which represents about 45% of all dislocations, cause vascular lesions; actually, there have been very few cases described in literature. The diagnosis is often delayed due to the bone and muscle structure in the chest and shoulder which tends to disguise the signs of lesion; an efficient collateral circulation will help maintain a normal radial pulse. The inconsistent and unpredictable behavior of false aneurysms can lead to sudden and severe hemorrhaging, to slowly developing anemia, or remaining hidden for weeks, even months before manifesting themselves in the form of pulsating hematomas. Furthermore, these factors render difficulties in compiling a standard protocol for diagnosis and thus potentially create serious consequences for the patient. The authors detail a clinical case of pseudoaneurysm involving the axillary artery resulting from an anterior dislocation of the shoulder. The authors also research eventual risk factors, investigate diagnostic difficulties and considering the high frequency of this form of dislocation, the possibility of a resulting vascular lesion and the consequences associated from late or misdiagnosis.

Key words:

Pseudoaneurysm, axillary artery.

Anterior dislocation of the shoulder is a traumatic lesion, occurring with high frequency, representing about 85% of all dislocations of the glenohumeral joint and about 45% of all bodily dislocations[16]. Usually this form of injury is benign, but in certain cases may be associated with severe consequences; possibly involving bone structure, as well as nervous and vascular systems.

Vascular complications resulting from anterior dislocation of the shoulder are rare,

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lesions of the axillary artery, according to Fontaine, occur in less than one case per 100 dislocations (7). Bertrand reports a frequency of 0.3 per 100 dislocations (1).

Sometimes lesions of the arterial wall lead to the formation of a pseudoaneurysm that temporarily blocks or reduces hemorrhaging and maintains open the lumen of the artery, thus disguising symptoms of the vascular lesion and also delaying the diagnosis and eventual treatment.

Case Report

A male aged 69 years, affected with, but not being treated for, hypertension was struck by an automobile while walking resulting in a fracture of the tibial plate and anterior dislocation of the left shoulder. The resultant examination revealed the presence of bruising about the left shoulder, no evidence of neurovascular damage (he retained normal mobility of the elbow and hand, had no paresthesia sensation, and maintained a normal

radial pulse). Immediate reduction was performed under general anesthesia and limb immobilized with a Dessault bandage. Routine laboratory examination revealed hemoglobin of 13.60 gm. The day following admission to the hospital, after no longer being able to tolerate the Dessault bandage, the patient autonomously removed it. X-rays were performed to verify the maintenance of the reduction and a sling was utilized to maintain immobility while casually allowing visibility of the bruising. On the seventh day of recovery pre-scheduled surgery was performed on the fractured tibial (synthesis with two cannulated screws). Post-surgery blood exam revealed a hemoglobin value of 11.70 gm. Subsequent postoperative days progressed normally, however bruising persisted about the anterior region of the left shoulder. Five days after surgery routine blood examination revealed the reduction in hemoglobin level (10.10 gm). More frequent blood examinations were scheduled, about every two days, these tests

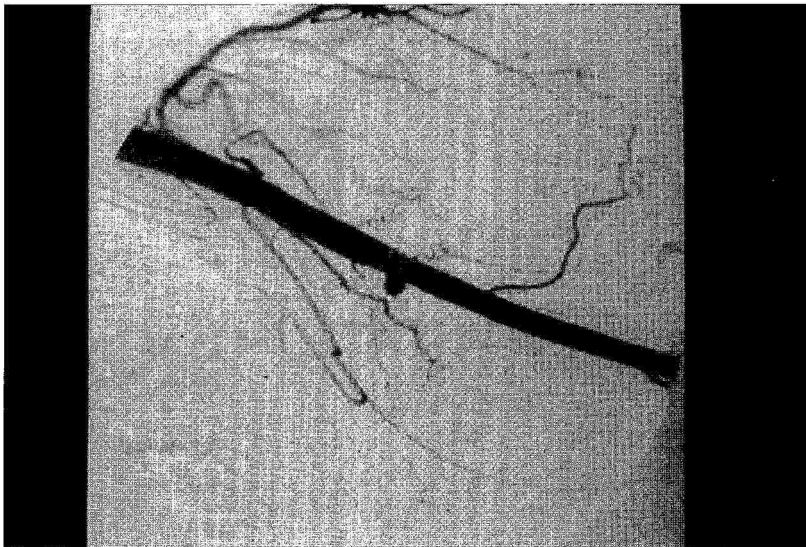


Figure 1 - *Digital Angiogram revealing a pseudoaneurysm in the distal portion of axillary artery.*

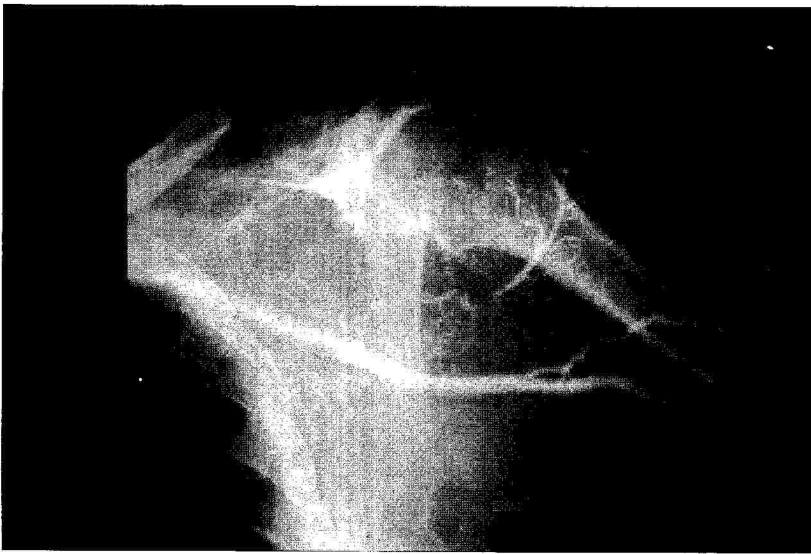


Figure 2 - Arteriogram of the axillary artery showing the middle and distal portions of the anterior circumflex artery.

revealed a slow and steady decrease in hemoglobin level until it reached a value of 8.00 gm. Excluding other causes for the anemia, and taking into consideration a spreading of the bruising onto the thorax, a decision was made to perform an angiogram (fig. 1) of the axillary artery. This revealed a post-traumatic pseudoaneurysm approximately 2 cm in diameter, probably caused by an avulsion to the anterior circumflex artery. The middle and distal portion of the anterior circumflex artery are clearly visible in the angiogram due to blood flow from the collateral circulation (fig. 2). The angiogram reveals no evidence of blood flow from the lesion. The patient was transferred to the operating room, where under local anesthesia an incision was made to gain access to the brachial artery. A Nitinol stent was inserted into the axillary artery with fluoroscopic control to bypass the pseudoaneurysm (fig. 3). The implantation, performed without complication, allowed a progressive increase in the patient's

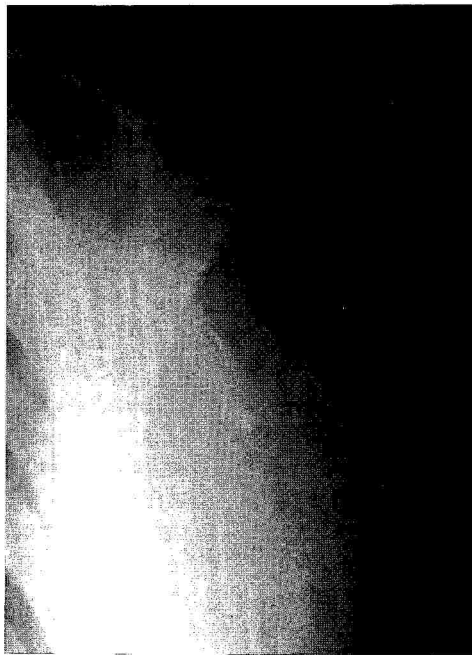


Figure 3 - Anteroposterior radiograph showing the nitinol stent.

hemoglobin level and a return to general well being.

Anatomy

The axillary artery is the continuation of the subclavian artery. It is generally accepted that it initiates at the lateral border of the first rib (16, 21) (according to Testut (20) it originates near the middle portion of the clavicle) and ends at the inferior border of the pectoral major muscle where it then becomes the brachial artery. At first the axillary artery lies deep and later, distally, becomes more superficial where only the skin and fascial sheath covers it. The pectoral minor muscle crosses the vessel, dividing it into three sections; the proximal, middle, and distal. The proximal portion gives rise to the superior thoracic artery. The middle portion, posterior to the pectoral minor, gives rise to the thoraco-acromial and lateral thoracic arteries. The distal portion gives rise to the anterior and posterior circumflex arteries, as well as the subscapular artery. The subscapular artery connects with the distal portion of the axillary artery through anastomosis with the transverse cervical (when present), dorsal scapular, branches of the subscapular, and suprascapular arteries. Significant collateral circulation arises from anastomoses between the lateral thoracic artery and the thoracic scapular system; anastomoses between the subscapular artery and the brachial system; and from the connections between the anterior and posterior circumflex arteries. A common fascial sheath encloses both the axillary artery and the brachial plexus together (9). The medial, lateral and posterior cords of the brachial plexus surround the proximal part of the axillary artery.

The median nerve lies on the anterior surface of, the ulnar nerve lies medial to, and the radial and axillary nerves lie posterior, the axillary artery.

Discussion

Lesions of the axillary artery originating from anterior dislocation of the shoulder are rare due to the resiliency of this vessel. In addition to atherosclerotic changes of the arterial wall, which reduces the vessel's resiliency (most cases occurring in the elderly), predisposing factors leading to lesions of the axillary artery resulting from anterior dislocation of the shoulder are: violent trauma yielding a large displacement of the humeral head, recurring anterior dislocations (especially when scar tissue is formed near the vessel), longstanding dislocation (the lesion occurring at the moment of reduction), and reduction performed with excessive force (due to insufficient muscle relaxation) (5,12,15).

Injuries to the axillary artery can be classified into three main groups. Firstly, and most frequently occurring, lesions due to avulsion of a collateral artery (full - thickness focal defects) (5). Secondly, subadventitial lesions, which primarily involve the intima coat, could also be associated with lesions of the middle coat, but never implicate the adventitia coat. Lastly, full-thickness circular wall rupture that occurs distally from the collateral branches and yields a compressive hematoma or arterial thrombosis (15). An extraordinary occurrence would be the imprisoning of the axillary artery between the humeral head and the anterior edge of the glenoid cavity (8).

Most lesions occur in the middle and distal portions of the axillary artery due, respectively to, avulsion of the thoraco-acromial trunk and of the subscapular and circumflex arteries (5). Several hypothesis have been suggested to explain the mechanisms of injury. According to Brown and Navigato, the axillary artery which is fixed to the lateral border of pectoralis minor muscle, is taut when the shoulder is at abduction and external rotation. As the humeral head dislocates

anteriorly it forces the axillary artery forward and the pectoralis minor acts as a fulcrum over which the artery is deformed and ruptured (2). The circumflex and subscapular arteries originate from the posterior wall of the axillary artery and serve to fix the axillary artery to posterior planes. According to Bertrand, it is in those cases of traumatic displacement of the axillary artery, in which the circumflex and subscapular arteries are unable follow, that yield a tear at their origin (1).

Pseudoaneurysms normally arise from a full thickness focal defect in the arterial wall, that lead to a saccular dilatation. In cases where the hemorrhage is contained by surrounding tissues, the hematoma may continue to communicate with the bloodstream through the arterial wall defect. If this situation persists, the hematoma will transform into an aneurysm sac by way of lysis or from compression of its contents by the pulsating stream that communicates with it (10).

The difficulty in diagnosis is mainly due to temporal variability in the appearance of clinical signs relating to the traumatic event. Bone and muscle structure can often hide an hematoma or a small pseudoaneurysm, additionally the pain of injury and resulting muscular contraction renders difficult the physical examination of axilla.

According to literature, early but aspecific signs of vascular lesion secondary to anterior dislocation of the shoulder developing pseudoaneurysms are: hematoma or bruise in the shoulder region, a weak or absent radial pulse prior to reduction or brachial plexus palsy (6,9,13).

Following normal progression, the pseudoaneurysm can grow (up to 20x25cm) and compress nervous and venous structures causing; respectively, neurological deficit and venous obstruction, resulting emboluses, the limiting of gleno-humeral joint range of motion, the stimulation of periosteal reactions,

an eroding clavicle, and to a slowly developing anemia. Sudden rupture (which can frequently occur before the restraining surrounding tissues have matured into a definitive sac) can cause a massive hemorrhage and a large hematoma to spread to limbs and chest causing shock (3,4,9,11,14,18).

In case presented, no pathognomic signs of arterial injury (distal circulatory deficit, ischemia, diminished or absent pulses, bruiting, nor expanding or pulsating hematoma) were apparent on admission (17). Additionally, there were no signs of neurological deficit; according to many authors (5,9,13,22) these deficits (which are sometime irreversible) are most often revealed in cases involving an axillary artery lesion probably occurring because of the close anatomical relationship between neural and vascular structures. The bruising (which was visible after the Desault bandage was removed) was believed to be secondary to trauma. Days following admission, however, its color and size remained unchanged; not respecting the normal procedure of reabsorption. Initially, the decrease in hemoglobin was associated with the bruising and the operation. When the bruising suddenly spread to the chest (two weeks after admission) it was then believed that a vascular lesion was involved.

In conclusion, diagnosing pseudoaneurysms of the axillary artery can be delayed by the causes we have reported and by the lack of suspicion for axillary artery injury secondary to anterior shoulder dislocation. When the risk factors are present, to avoid hemorrhage and permanent neurologic deficit, we recommend careful study of the vessel by Doppler sonography (or angiography if necessary) (19). Furthermore, high risk patients need more frequent follow up (laboratory and clinical) and if necessary a longer recovery period. These precautions should be integrated into the currently adopted treatment for

shoulder dislocation which usually consist of immobilizing the shoulder in a Desault

bandage and a follow up exam after two or three weeks.

Italian abstract

Raramente la lussazione anteriore di spalla, che rappresenta circa il 45% di tutte le lussazioni, provoca lesioni vascolari; infatti pochissimi casi sono descritti in letteratura. La diagnosi è spesso tardiva in quanto le strutture ossee e muscolari del torace e della spalla stessa tendono a nascondere i segni della lesione e un efficiente circolo collaterale può mantenere normosfigmico il polso radiale. Il comportamento incostante e imprevedibile dei falsi aneurismi, i quali possono dare luogo ad immediate e cospicue emorragie, a lente anemizzazioni, o rimanere silenti per settimane o mesi manifestandosi in seguito sotto forma di ematomi pulsanti, rende difficoltosa la compilazione di un protocollo di comportamento standard che ne preveda e ne anticipi le pericolose conseguenze.

Gli autori descrivono con dovizia di particolari clinici un caso di pseudoaneurisma dell'arteria ascellare conseguente ad un episodio di lussazione anteriore di spalla ricercando eventuali fattori di rischio e soffermandosi sulle difficoltà diagnostiche, considerata l'alta frequenza della patologia potenzialmente determinante la lesione che nell'eventualità di diagnosi mancata o tardiva può essere foriera di gravi conseguenze.

Parole chiave: Pseudoaneurisma, arteria ascellare.

References

- 1) Bertrand J.C.: Les complications vasculaires des luxations antérieures fermées de l'épaule. A propos de 3 cas. Ann Chir 36:329-333, 1982.
- 2) Brown F., Navigato W.J.: Rupture of the axillary artery and brachial plexus palsy associated with anterior dislocation of the shoulder. Clin Orthop 60:195-199, 1968.
- 3) Cappello T., Gordon W.N., Kevin D.N., McCarthy W.J.: Acute ischemia of the upper limb fifteen years after anterior dislocation of the glenohumeral joint and a modified Bristow procedure. A case report. J Bone Joint Surg [Am] 78:1578-82, 1996.
- 4) Curr J.F.: Rupture of the axillary artery complicating dislocation of the shoulder. Report of a case. J Bone Joint Surg [Br] 52:313-317, 1970.
- 5) Drury J.K., Scullion J.E.: Vascular complications of anterior dislocation of the shoulder. Br J Surg 67:579-581, 1980.
- 6) Fitzgerald J.F., Keates J.: False aneurysm as a late complication of anterior dislocation of shoulder. Ann Surg Jun 181: 785-6, 1975.
- 7) Fontaine J.L.: Les lésions vasculaires au cours de la luxation de l'épaule. Entretiens Bichat (Chirurgie) Expansion Scientifique Française, Paris, pp 171-174, 1972.
- 8) Fraioli J.P., Farge C., Cahuzac J., Cohen - Boulakia A., Turpin P.: Incarcération de l'artère axillaire entre la tête Humérale et le rebord Antérieur de la glène: une complication vasculaire exceptionnelle de la luxation de l'épaule. Ann Chir 36:378-380, 1982.
- 9) Gallen J., Wiss D.A., Cantelmo N., Menzoin J.O.: Traumatic pseudoaneurysm of the axillary artery: report of three cases and literature review. J

Trauma 24:350-354, 1984.

10) Gallone F.: Patologia chirurgica Casa Editrice Ambrosiana, Milano. Vol I, pp 179-80 / 189-90, 1991.

11) Julià J., Lozano P., Gomez F., Corominas C.: Traumatic pseudoaneurysm of the axillary artery following anterior dislocation of the shoulder. J Cardiovasc Surg 39:167-9, 1998.

12) Mustonen P.K., Kouri K.J., Oksala I.E.: Axillary artery rupture complicating anterior dislocation of the shoulder. Case report. Acta Chir Scand 156:643-5, 1990.

13) Oberwader M., Thoni H., Brugger M., Pointer R.: Traumatic aneurysm of the axillary, a rare and severe complication of anterior shoulder dislocation. Chirurg 65:1056-8, 1994.

14) Orecchia P.M., Calcagno D., Razzino R.A.: Ruptured axillary pseudoaneurysm from chronic shoulder dislocation. J Vasc Surg 24:499-500, 1996.

15) Patra P., Hauer P., Charbonneau R., Duveau D., Despins P., Letenneur J., Dupon H.: Traumatismes de l'artère axillaire au cours des luxation de l'épaule a propos d'un cas. Revue Chir Orthop 71:333-336,

1985.

16) Rockwood C.A., Matsen F.A.: The Shoulder. W.B.Saunders, Philadelphia, London, Toronto, vol II, pp 643-644/666-667, 1998.

17) Rutherford R.B.: Vascular surgery. WB Saunders. pp 1117-8, 1994.

18) Stein E.: Case report 374: Post-traumatic pseudoaneurysm of axillary artery. Skeletal Radiol 15:391-3, 1986.

19) Sustic A., Stancic M., Eskinja N., Matana A., Fuckar Z.: Iatrogenic pseudoaneurysm of the axillary artery: The role of color doppler sonography. J Clin Ultrasound 24:323-325, 1996.

20) Testut L.: Trattato di anatomia umana. Angiologia. Unione Tipografica Editrice Torinese, Torino, 2:178-181, 1902.

21) Warwick R., Williams P.L.: Anatomia del Gray. Zanichelli Editore, Bologna, vol.II, pp 518-520, 1980.

22) Zieren J., Kasper A., Landwehr P., Erasmi H.: Das traumatische Pseudoaneurysma der Arteria axillaris nach Schlterluxation. Chirurg 65:1058-1060, 1994.