

Occlusion of Brachial Pseudoaneurysm After Periprosthetic Humerus Fracture

Andrew P. T. Robinson, MD, Paul C. Rijk, MD, PhD, Abdelkarime Kh. Jahrome, MD, and Jan Willem Schimmel, MD, PhD

Abstract

Pseudoaneurysms of the brachial artery are rare and most often occur after a penetrating injury. The incidence of periprosthetic humerus fractures is low, and surgical treatment can be demanding. The treatment of choice for an occluded pseudoaneurysm of the brachial artery is saphenous vein bypass.

In this article, we report the case of a 73-year-old woman who presented with an occluded pseudoaneurysm of the brachial artery sustained after a neglected periprosthetic humerus fracture. A saphenous vein bypass was performed after removal of the distal tip of the prosthesis. Patency was observed 3 months after surgery. This case shows malunion of a neglected periprosthetic humerus fracture and a good result after saphenous vein bypass.

recently she had noticed swelling in the medial upper arm.

Physical examination of the right shoulder and arm revealed forearm and hand pallor, intact sensibility, weak radial artery pulsations, absent ulnar artery pulsations, and delayed capillary refill at the fingers. There was a solid swelling palpable on the medial aspect of the humerus 10 cm below the axilla. The humerus was stable, and axial compression was not painful. Radiographs showed malunion after periprosthetic fracture of the humeral shaft with the distal tip of the prosthesis protruding medially (Figure 1). Ultrasonography showed an occluded pseudoaneurysm of the brachial artery below the malunion, more thrombus distally, a patent radial artery with low flow, and an occluded ulnar artery.

The patient was admitted for investigation and treatment. The next day, an angiogram showed an occlusion of the brachi-

Figure 1. Radiograph of right humerus shows malunion after neglected periprosthetic fracture with protruding tip of prosthetic stem. Radiolucency around cement mantle suggests component loosening.



Periprosthetic humerus fractures are rarer than periprosthetic femur fractures. The incidence of periprosthetic humerus fractures ranges from 0.6% to 2.4%.¹⁻³ Approximately 30% to 50% of all peripheral vascular injuries are sustained in the upper limb, of which the majority are brachial artery lesions.⁴ Vascular injury of the brachial artery can have serious consequences, including above-elbow amputation.

In this article, we report a case of a delayed presentation of a periprosthetic humerus fracture complicated by an occluded pseudoaneurysm of the brachial artery. The patient provided written informed consent for print and electronic publication of this case report.

Case Report

A 73-year-old woman presented to the emergency department with excruciating pain in the right elbow and upper arm. Medical history included type 2 diabetes, alcohol abuse, and, 2 years earlier, humeral head replacement after a right humerus fracture. For several months, she had mild pain in the upper arm and shoulder with intermittent discoloration of the forearm and hand. She indicated there had been no new trauma since the humerus fracture, but more

Authors' Disclosure Statement: The authors report no actual or potential conflict of interest in relation to this article.

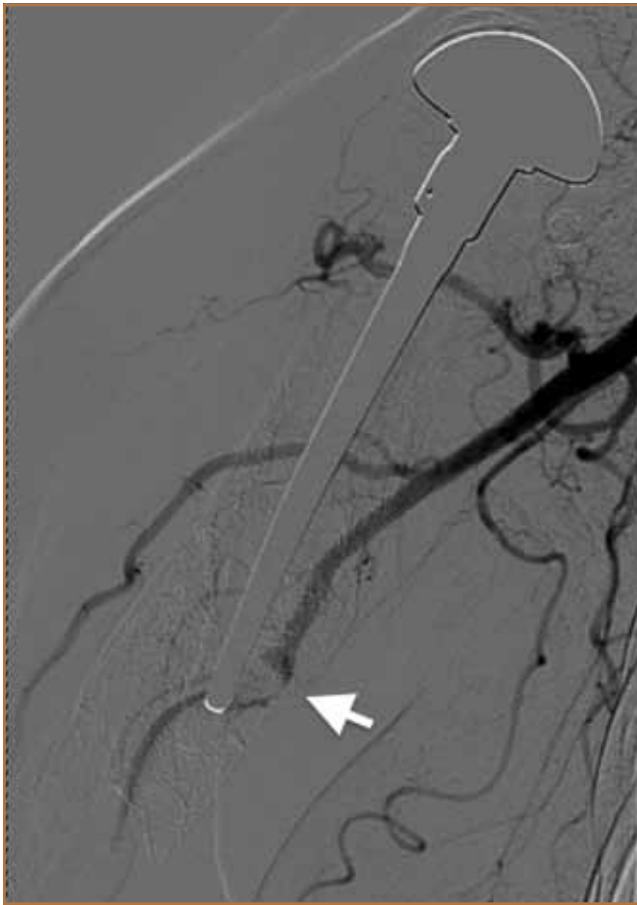


Figure 2. Angiogram of occluded pseudoaneurysm of right brachial artery (arrow).

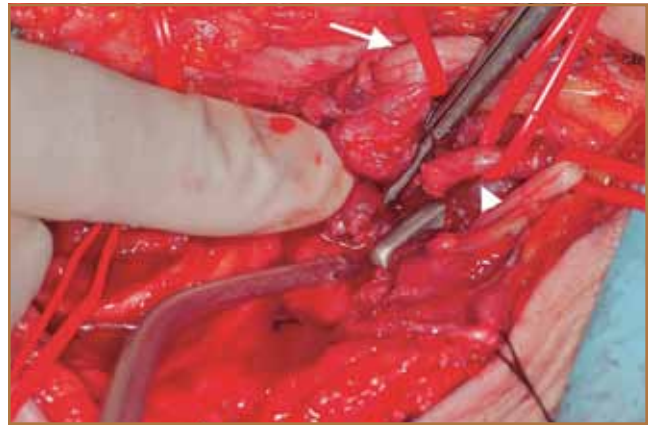


Figure 3. Intraoperative images show protruding prosthetic stem, brachial artery (arrow head), and median nerve (arrow).



Figure 4. Postoperative radiograph of right humerus after removal of protruding prosthetic stem tip.

al artery at the tip of the prosthetic stem. This occlusion could not be treated with endovascular methods (**Figure 2**). After a multidisciplinary consultation, it was decided to explore the brachial artery and, if necessary, cut the distal protruding stem and perform a saphenous vein graft interposition. During the operation, it seemed that abundant callus and the protruding prosthetic stem had damaged the brachial artery and caused a false aneurysm, which was now occluded (**Figure 3**). The stem tip was cut, and a planned interposition was performed. The venous bypass was tunneled anteriorly to avoid the remaining callus after removal of the prosthetic tip. An end-to-end anastomosis after ligation of the diseased brachial artery was performed.

The patient's postoperative recovery was uneventful, her pain diminished, forearm and hand were well circulated, and sensibility was intact (**Figure 4**). Three months after surgery, clinical examination revealed sufficient radial artery pulsations and no sign of thromboembolic events after the venous bypass surgery.

Discussion

The incidence of periprosthetic humerus fractures is low, and surgical treatment is demanding.¹⁻³ The case reported here

involved a malunion of a neglected periprosthetic humerus fracture. Whether to treat periprosthetic humerus fractures surgically or nonsurgically depends on fracture location, dislocation, and stem fixation. In cases of sound fixation of the prosthesis with a fracture distal to the prosthesis, nonsurgical treatment is advised.⁵ Consolidation of our patient's fracture suggested good stem fixation, which was confirmed intraoperatively despite the radiolucency around the prosthetic stem (**Figure 1**). We retained the prosthesis and primarily treated the diseased vessel. Pseudoaneurysms of the brachial artery most often are seen after traumatic vascular penetration (eg, catheterization, shot and stab wounds).⁶ Pseudoaneurysms of

the artery after blunt trauma are rare; the literature includes only a few case reports.^{6,7} Moreover, there are only 2 reports of these pseudoaneurysms after humerus fracture.^{8,9} In these reports, pseudoaneurysms after blunt trauma appear as late complications. In our patient's case, sharp injury at time of fracture may have caused the vascular damage, and then the pseudoaneurysm developed gradually.

Physical examination combined with ultrasonography is sufficient for diagnosis. Pain and edema develop in the hand and fingers of patients with expanded pseudoaneurysms because of adjacent neurologic structure compression, distal arterial thrombus, and venous edema of the extremity.^{10,11} Color-flow Doppler ultrasonography can noninvasively provide sufficient diagnostic information. For surgical planning, however, selective upper extremity arteriography is the gold standard.^{12,13} Pseudoaneurysms of the upper extremity can cause thromboembolisms of the extremity, which can lead to gangrene and amputation. Because endovascular treatment is often not possible, surgical intervention is still considered as giving the best results.^{12,14}

In our patient's case, a saphenous vein bypass was performed after resection of the aneurysm. We recommend not delaying surgical therapy, but performing a resection of the diseased part and a repair with an end-to-end anastomosis or with graft interposition.

Conclusion

Pseudoaneurysms distal to the axillary artery are rare and are often the result of a penetrating injury. Our patient presented with a pseudoaneurysm after sustaining a blunt trauma resulting in a periprosthetic humerus fracture. Surgical treatment with resection of the aneurysm and saphenous graft interposition provided a good clinical outcome.

Dr. Robinson is Specialist Registrar, and Dr. Rijk is Orthopaedic Surgeon, Department of Orthopaedic Surgery, Dr. Jahrome is Vascular

Surgeon, Department of Vascular Surgery, and Dr. Schimmel is Orthopaedic Surgeon, Department of Orthopaedic Surgery, Medisch Centrum Leeuwarden, Leeuwarden, The Netherlands.

Address correspondence to: Andrew P. T. Robinson, MD, Medisch Centrum Leeuwarden, Secretariaat Orthopaedie, Postbus 888, 8901 BR Leeuwarden, The Netherlands (tel, 31-58-286-1341; fax, 31-58-286-7611; e-mail, robinson@home.nl).

Am J Orthop. 2014;43(3):141-143. Copyright Frontline Medical Communications Inc. 2014. All rights reserved.

References

1. Kumar S, Sperling JW, Haidukewych GH, Cofield RH. Periprosthetic humeral fractures after shoulder arthroplasty. *J Bone Joint Surg Am.* 2004;86(4):680-689.
2. Boyd AD Jr, Thornhill TS, Barnes CL. Fractures adjacent to humeral prostheses. *J Bone Joint Surg Am.* 1992;74(10):1498-1504.
3. Levy O, Copeland SA. Cementless surface replacement arthroplasty of the shoulder. 5- to 10-year results with the Copeland Mark-2 prosthesis. *J Bone Joint Surg Br.* 2001;83(2):213-221.
4. Hunt CA, Kingsley JR. Vascular injuries of the upper extremity. *South Med J.* 2000;93(5):466-468.
5. Dehghan N, Chehade M, McKee MD. Current perspectives in the treatment of periprosthetic upper extremity fractures. *J Orthop Trauma.* 2011;25(suppl 2):S71-S76.
6. Crawford DL, Yuschak JV, McCombs PR. Pseudoaneurysm of the brachial artery from blunt trauma. *J Trauma.* 1997;42(2):327-329.
7. Jutte EH, Wisselink W, Rijbroek A, Rauwerda JA. Pseudoaneurysm of the brachial artery due to blunt trauma in a child. *Cardiovasc Surg.* 2002;10(1):52-53.
8. Moran D, Roche-Nagle G, Ryan R, Brophy D, Quinlan W, Barry M. Pseudoaneurysm of the brachial artery following humeral fracture. *Vasc Endovascular Surg.* 2008;42(1):65-68.
9. Dolibois JM, Matrká PJ. False aneurysm of the brachial artery complicating closed fracture of the humerus. A case report. *Clin Orthop.* 1975;(113):150-153.
10. Roganovic Z, Misovic S, Kronja G, Savic M. Peripheral nerve lesions associated with missile-induced pseudoaneurysms. *J Neurosurg.* 2007;107(4):765-775.
11. Robbs JV, Naidoo KS. Nerve compression injuries due to traumatic false aneurysm. *Ann Surg.* 1984;200(1):80-82.
12. Gray RJ, Stone WM, Fowl RJ, Cherry KJ, Bower TC. Management of true aneurysms distal to the axillary artery. *J Vasc Surg.* 1998;28(4):606-610.
13. Ho PK, Weiland AJ, McClinton MA, Wilgis EF. Aneurysms of the upper extremity. *J Hand Surg Am.* 1987;12(1):39-46.
14. Yetkin U, Gurbuz A. Post-traumatic pseudoaneurysm of the brachial artery and its surgical treatment. *Tex Heart Inst J.* 2003;30(4):293-297.