Posterior Elbow Dislocation Combined with Subadventitial Rupture of the Brachial Artery: Interposition with the Use of the Autologous Basilic Vein

Šlais M., Špaček M., Rohn V., Mitáš P., Tošovský J.
Department of Cardiovascular Surgery of the First Faculty of Medicine, Charles University in Prague, and General Teaching Hospital, Prague, Czech Republic

Received January 30, 2007, Accepted February 20, 2007.

Key Words: Brachial artery – Avulsion injury – Elbow dislocation – Basilic vein

Mailing Address: Marek Šlais, MD, Department of Cardiovascular Surgery, U Nemocnice 2, 128 08, Prague 2, Czech Republic, Phone: +420 608 173 220; e-mail: mslais@seznam.cz

 Prague Medical Report / Vol. 108 (2007) No. 1, p. 87–92

Abstract: The authors describe a relatively rare avulsion injury of the brachial artery complicating elbow dislocation in a young man, together with the relevant diagnostics and treatment. In the discussion, they deal with the symptomatology of artery injuries and available examination methods, suggesting an appropriate treatment algorithm.

Introduction

Artery injuries are a common component of more complex polytrauma affecting individual anatomical areas (7–10%) [1, 4]. Injury of the brachial artery typically accompanies supracondylar elbow fractures [9, 10]. In this short report, the authors present a relatively rare avulsion injury of the brachial artery, accompanying posterior elbow dislocation in a young man.

Case Report

The patient (28, male), a professional drummer who had a fall on his extended left arm, was referred to our department for suspected acute occlusion of the forearm arteries, combined with traumatic posterior dislocation of the elbow on the left. An attempted reposition at the local surgical outpatient department had failed. In view of the absence of peripheral pulsations and parestheses of the median nerve, the arm was fixed only and the patient was referred to our center. Initial examination revealed typical signs of posterior elbow dislocation, confirmed by X-ray examination (Figure 1). Mobility of the arm was unaffected; acral parts were cold, but without any signs of critical ischemia.

Figure 1 – Posterior elbow dislocation.

Under analgosedation, we performed closed reposition and fixation. Angiography revealed short occlusion of the distal brachial artery; contrast filling re-appeared in the area of cubital artery ramification (Figure 2). The patient was indicated for surgical review. By means of a short incision, we reviewed the area of the distal brachial artery (Figure 3), finding subadventitial rupture and occlusion of the entire affected section and a tear in joint capsule. We sutured joint capsule, then resected the affected part of the artery, ensuring both central and peripheral patency easily through indirect trombectomy with Fogarty catheter. We interposed a short

Figure 2 – Preoperative angiography.

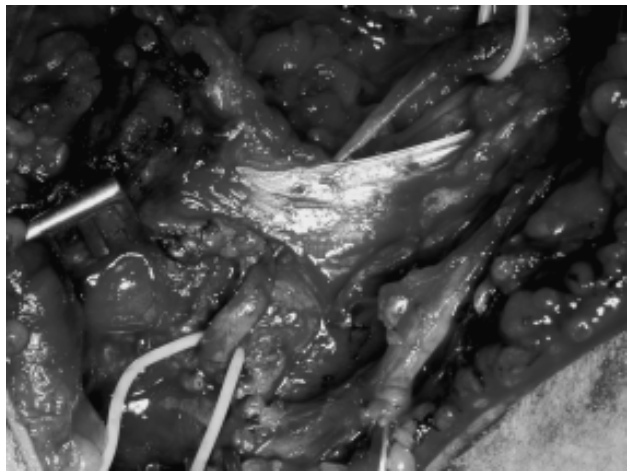

Figure 3 – Injured brachial artery.

section of the basilic vein ("end to end") (Figure 4), with good effect, palpable peripheral pulsation. Post-operative course was without complications. There was no appearance of the compartment syndrome. The patient left hospital at the fourth day following the surgery and continued to be monitored on an outpatient basis. For 3 months, standards antiaggregation therapy was applied.

Discussion

Artery injuries are a relatively common complication of trauma, and especially of the polytrauma (7–10%) [1, 10]. Most often these are direct injuries, either from a sharp object (punctures, incisions, slashes or gunshot wounds) or a blunt one (contusion, compression, constriction). Indirect injuries (artery avulsion) or deceleration injuries are much rarer.

Indirect avulsion-type injuries are usually connected with dislocations of large joints. The most common injuries include damage to the popliteal artery in the case of knee dislocation and to the axillary artery in shoulder dislocation. Other areas are affected less often [1, 2, 9, 10].

Limb artery injuries manifest by diverse clinical symptoms. Only a minor proportion of patients show a full clinical picture of the acute disruption of the artery (pulsating hematoma, growing hematoma, external bleeding, loss of distal pulsation, ischemia of the limb). Patients with clear clinical signs of artery injury are candidates for urgent surgical review. If needed, peroperative angiography is performed. Unfortunately, most artery injuries have insufficient clinical manifestations, especially in emergency situations, when injuries of other organ systems are more evident. Due to rich collateral blood supply, ischemia in the area of the brachial artery may not have clear clinical manifestations [9]. An additional factor which makes diagnostics more difficult is the frequent presence of hypovolemia, and, as a result, cold limbs. Especially in such case the patient must

Figure 4 – Interposition with basilic vein.

be examined thoroughly and peripheral pulsations, sensation and mobility must be recorded, not only for forensic reasons. To summarize, absence of peripheral pulsations in connection with the polytrauma is not only a sign of shock, but can be the very important alarm sign of artery injuries especially when the injury of great joints and juxtaarticular fractures happen.

The first option in examination is duplex sonography. However, of all complementary examinations, its benefits are most dependent on the examiner's expertise. Digital subtraction angiography (DSA) represents the gold standard. Generally speaking, angiography is not required in patients showing presence of peripheral pulsations and ankle/brachial index over 1 [2]. However, these patients must be examined repeatedly over at least 24 hours. In the remaining cases of significant suspicion of peripheral artery injury, DSA provides a clear answer and guidance for taking the appropriate steps.

The timing of surgical treatment follows generally accepted recommendations. In the first stage, bone stabilization is indicated. Subsequently, vein reconstruction is performed. In the case of avulsion injury, it is necessary to perform exclusion of the entire section with subadventitial rupture, resecting the area up to healthy artery wall or inserting an interposition in the affected section. Depending on the case, thrombectomy of the distal blood vessels by Fogarty catheter may be appropriate. However, the treatment procedure must always be based on the seriousness of the ischemia, which corresponds to the level of occlusion and capacity of the pre-formed collateral circulation.

To replace the affected section of the artery, the most suitable material is an autologous vein, usually the great saphenous vein. The basilic vein used in our case had the appropriate parameters and was a suitable alternative. Artificial blood vessel prostheses are not a first option material in reconstructions of injured peripheral arteries, owing to the risk of early infection, worse patency and other factors. If there is needed to implant a blood vessel prosthesis, the most convenient material is PTFE, given its good long-term patency and relative resistance to infection [11].

Endovascular surgery is also being increasingly used in the treatment of injuries of peripheral arteries. According to the type of trauma (arteriovenous fistula, false aneurysm, bleeding), embolisation using spirals or a tissue glue can be performed successfully. Another option is the use of a stentgraft. In a suitable anatomic location, the combination of a stent and PTFE prosthesis is the option presenting the least burden for the patient [2, 3, 6, 7, 8]. It is, however, only a complementary method, since the use of a stentgraft cannot be recommended for instance around the joints due to the risk of deformation and subsequent occlusion, apart from the fact that it is not possible to expect long-term patency in areas with low flow levels.

In the postoperative period, the complications of the possible compartment syndrome must be avoided. Fasciotomy in the forearm area is less common if

compared to the calf; nevertheless, data taken from literature show that it is used in up to 12% of all surgical interventions of injury [1]. Its probability increases with the duration of ischemia. Since the Korean War, the incidence of upper limb amputation for trauma combined with damage to the brachial artery has dropped from 13% to approx. 1%. The main reason of this development is the reduction of the duration of ischemia to less than 6 hours.

References

1. ZELLWEGER R., HESS F., NICOL A.: An analysis of 124 surgically managed brachial artery injuries. *Am. J. Surg.* 188: 240–245, 2004.
2. WEAVER F. A., HOOD D. B.,YELLIN A.: Vascular injuries of the extremities. In *Rutherford Vascular Surgery*, Fifth edition, W. B. Saunders Company, 2000, 862–871.
3. LONN L., DELLE M., KARLSTROM L., RISBERG B.: Should blunt arterial trauma to the extremities be treated with endovascular techniques?. *J. Trauma* 59: 1224–1227, 2005.
4. HAFEZ H. M., WOOLGAR J., ROBBS J. V.: Lower extremity arterial injury: results of 550 cases and review of risk factors associated with limb loss. *J. Vasc. Surg.* 33: 1212–1219, 2001.
5. DENNIS J. W., FRYKBERG E. R., VELDENZ H. C., HUFFMAN S., MENAWAT S. S.: Validation of nonoperative management of occult vascular injuries and accuracy of physical examination alone in penetrating extremity trauma: 5- to 10-year follow-up. *J. Trauma* 44: 243–252, 1998.
6. ALTHAUS S. J., KESKEY T. S., HARKER C. P., COLDWELL D. M..: Percutaneous placement of self-expanding stent for acute traumatic arterial injury. *J. Trauma* 41: 145–148, 1996
7. BRANDT M. M., KAZANJIAN S., WAHL W. L.: The utility of endovascular stents in the treatment of blunt arterial injuries. *J. Trauma* 51: 901–905, 2001.
8. ROSE S. C., MOORE E. E.: Trauma angiography: the use of clinical findings to improve patient selection and case preparation. *J. Trauma* 28: 240–245, 1988.
9. FITRIDGE R. A., RAPTIS S. , MILLER J. H.: Upper extremity arterial injuries: experience at the Royal Adelaide Hospital, 1969–1991. *J. Vasc. Surg.* 20: 941–946, 1994.
10. MCCROSKEY B. L., MOORE E. E., PEARCE W. H.: Traumatic injuries of the brachial artery. *Am. J. Surg.* 156: 553–555, 1988.
11. VAUGHN G. D., MATTOX K. L., FELICIANO D. V.: Surgical experience with expanded polytetrafluorethylene /PTFE/ as a replacement graft for traumatized vessels. *J. Trauma* 19: 403, 1979.