Post-traumatic pseudoaneurysm of the upper extremity in two pediatric patients

Funda Aköz Saydam, Karaca Başaran, Özgür Pilancı, Asuman Özel
Plastic, Reconstructive and Aesthetic Surgery Clinic, Başçolar Training and Research Hospital, Istanbul, Turkey

Abstract
Pseudoaneurysm is the peri-arterial hematoma formed on the arterial wall following a partial laceration or an incomplete traumatic injury. Unlike actual aneurysms, it does not involve intima, media, and adventitia. This condition, which may occur in hand surgery practice, is rarely seen in the pediatric population. In this report, we present examples of post-traumatic pseudoaneurysms developing in two pediatric patients. Two patients with the ages of 5 and 15 were admitted to our clinic with findings of palmar arch originated hypothenar and ulnar artery stemmed forearm pseudoaneurysms, respectively. Both patients underwent pseudoaneurysm sac excisions. Reconstruction of the first case was conducted with a primary microsurgical repair. In the second case, the defect was reconstructed with an interposed cephalic vein graft. No motor, sensory or vascular problems were observed during follow-up. In patients presented with a posttraumatic mass near an artery, pseudoaneurysm should be considered and proper treatment should be planned as soon as possible. It is important to ensure optimal circulation in the extremity which is still in the development stage, particularly in the pediatric population.

Key words: Pseudoaneurysm, upper extremity, pediatric patient, post-trauma.
mass in the injury zone. History revealed a glass injury in the ulnar distal side of the forearm one month prior to the admission. Hypoesthesia was detected on the distal ulnar nerve dermatome. Motor examination of the hand was normal. In Doppler ultrasonography (USG), a pseudoaneurysm sac was visualized (Fig. 1a). During surgery, a mass with dimensions of 7×3 cm, compressing on ulnar nerve was observed (Fig. 2a). Following excision, a defect of approximately 6 cm in length was formed. The artery was reconstructed with a cephalic vein graft harvested from the contralateral side. Thus, the circulation in hand was maintained at the optimal level.

**Case 2**

A 5 year-old male patient was presented with complaints of increasing swelling in the left hand hypothenar zone. There was a local increase of heat and presence of pulsation in the mass. A history of injury with a glass was noted in the same zone 14 days ago which was handled with a primary skin suture. The motor and sensory examinations

---

**Fig. 1.** Doppler image shows turbulent flow in ulnar artery pseudoaneurysm sac (a). Histological examination: section of the pseudoaneurysm sac. Fibrin on the surface, macrophages under fibrin and fibrous wall tissue rich in chronic inflammatory cells (b). [Color figure can be viewed in the online issue, which is available at www.elmikocerrahi.org]

**Fig. 2.** A pseudoaneurysm with dimensions of 7×3 cm is seen in the distal forearm (a). Ulnar side palmar-arch originated pseudoaneurysm is seen (b). [Color figure can be viewed in the online issue, which is available at www.elmikocerrahi.org]
were normal. An X-ray excluded a foreign object penetration or a fracture which may result from injury. A Doppler USG revealed a thrombus with turbulent flux inside the palmar arch. In surgery, the pseudoaneurysm was excised, and the damaged superficial palmer arch underwent primary repair with a 9/0 nylon suture (Fig. 2b). The excised piece was sent to pathology and the diagnosis was confirmed (Fig. 1b). The post-operative period was eventless.

Discussion

Although hand injuries occur very frequently, development of post-traumatic pseudoaneurysm is very rare. Pseudoaneurysm is formed on the arterial wall following partial laceration or incomplete traumatic injuries. As a result, extravasated bleeding causes periarterial hematoma which is surrounded with a fibrin wall. This collection expands in days and weeks and takes the form of a pulsatile mass.

Pseudoaneurysms generally occur following iatrogenic arterial damages. It most commonly occurs in the femoral artery following coronary arterial catheterization. They can also be encountered following formation of arteriovenous shunts, indwelling catheterizations and collection of arterial blood gases. Blunt traumas affecting arteries may also cause pseudoaneurysms. In literature, pseudoaneurysms occurring after traumatic hand injuries in the adult population have been reported in radial, ulnar and digital arteries. Chronic repeating trauma is the most common reason of ulnar arterial pseudoaneurysms. Single traumas are in the last place in etiology and occur very rarely. However, traumatic upper extremity pseudoaneurysms are very rare in the pediatric population.

Patients can present with complaints of growing masses in the trauma zone weeks after the trauma. There may be local increase of heat and sensitivity on the mass. It can also cause paresthesia due to the pressure generated on neighboring nerves. Pulsations are generally decreased with the pressure to be applied in proximal of the mass.

Medical history and physical examination are usually sufficient for diagnosis. However, Khan et al. stated that only half of the cases in literature were diagnosed accurately in the pre-operative period. Pseudoaneurysms may be confused with an abscess, epidermoid cyst, arteriovenous fistula, foreign objects, ganglion cysts, benign and malignant tumors. For instance, the first case was referred to us with a preliminary diagnosis of abscess from the center where he received his first treatment.

Misdiagnosis of the pseudoaneurysm can cause a delayed treatment and an extended recovery period. Furthermore, early diagnosis is important to prevent complications associated with pseudoaneurysms such as infection, neuropraxia, compartment syndrome, rupture and hemorrhage. More importantly, there is risk of distal thromboembolism. A possible distal thromboembolism may compromise the circulation in extremity and lead to ischemic abnormalities and even to gangrene and necrosis. Doppler USG is usually sufficient to ensure accurate diagnosis and to exclude other possible reasons such as abscess, cyst and neoplastic formations. In Doppler USG, diagnosis is made with dilatation observed in the artery with internal turbulent flux. Angiography and magnetic resonance angiography can also be used in diagnosis.

However, Doppler ultrasonography is the first-choice diagnostic instrument since it is non-invasive, does not have adverse effects and is usually sufficient.

Treatment can be divided into two groups as a surgical treatment and an interventional radiological treatment. Non-surgical treatment options are manual compression accompanied by ultrasound, embolization and thrombin injection. Surgical treatments are chosen depending on the localization and severity of the pseudoaneurysm. Following excision of a pseudoaneurysm; arterial ligation, primary repair or repair with vein grafts can be done. The primary objective in treatment should be maintenance of an optimal blood flow. It is particularly important in young patients to avoid any impact on the developing extremity from any arterial failure. In our first case, the partial arterial wall defect following excision was repaired with a direct microsurgical repair using 9/0 nylon. However, in the second case, the existing wide defect could be repaired with an interpositional vein graft to ensure arterial circulation.

In summary, traumatic pseudoaneurysms result from partial arterial damages which are unnoticed at the time of event. Therefore, more attention should be taken when handling injuries particularly in the zones proximal to the arterial structures. Exploration and close follow-up should be considered particularly if there is a deep incision, although the patient does not have a vast bleeding history. Following an accurate diagnosis, the priority should be prevention of complications and maintenance of circulation in extremity at maximum level, as was done with the two patients we presented above.

Conflicts of Interest: No conflicts declared.

References

1. Komorowska-Timek E, Teruya TH, Abou-Zamzam AM Jr, Papa D, Ballard JL. Treatment of radial and ulnar artery pseudoaneurysms using percutaneous thrombin injection. J Hand Surgery Am 2004;29:936-42.

2. Dzepina I, Unusie J, Mijatovic D, Bulic K. Pseudoaneurysms of the branchial artery following venipuncture in infants. Pediatr Surg Int 2004;20:594-7.
3. Hughes CD, Binette C, Babigian A. Pseudoaneurysm in the hand of a three-year-old boy: a case report. J Emerg Med 2012;42:87-9.
4. Poonai N, Lim R, Lynch T. Pseudoaneurysm formation following a traumatic wrist laceration. CJEM 2011;13:48-52.
5. TKhan UD, Page RE. Traumatic aneurysm of the digital artery: a diagnostic problem. Injury 1998;29:727-9.
6. Levis JT, Garmel GM. Radial artery pseudoaneurysm formation after cat bite to the wrist. Ann Emerg Med 2008;51:668-70.
7. Gimenez DC, Gilabert OV, Ruiz JG, Muns CY, Alter JB, Cubells MD. Ultrasound and magnetic resonance angiography features of post-traumatic ulnar artery pseudoaneurysm: a case report and review of the literature. Skeletal Radiol 2009;38:929-32.
8. Green DP. True and false traumatic aneurysms in the hand. J Bone Joint Surg Am 1973;55:120-8.
9. Ganchi PA, Wilhelmi BJ, Fujita K, Lee WP. Ruptured pseudoaneurysm complicating an infected radial artery catheter: case report and review of literature. Ann Plast Surg 2001;46:647-50.
10. Arriagada Irarrazaval C, Sonneborn Gross R, Sauré Maritano A, Soto Diez C. Posttraumatic pedal artery pseudoaneurysm: a case report. Case Rep Vasc Med 2012;2012:234351.
11. Franck D, Christophe S, Michel P. False aneurysm of the palmar arch in a child. J Pediatr Surg 2004;39:117-9.
12. Sakamoto A, Arai K. False aneurysm of the superficial palmar arch in a child: a case report. Cases J 2009;2:7985.
13. Brunelli G, Vgario A, Battiston B, Guizzi P, Brunelli F. Traumatic aneurysm of two proper digital arteries in the same patient: a case report. J Hand Surg Br 1988;13:345-7.