

Cases Report

Pediatric Traumatic Pseudoaneurysm: Three Cases Report

Kouzmane Ikram*, Issoufou Niandou Moussa, Naouli Hamza, Jiber Hamid, Bouarhroum Abdellatif

Hassan II University Hospital, Vascular surgery center, Fez, Morocco

Article History

Received: 23.11.2022

Accepted: 28.12.2022

Published: 10.01.2023

Journal homepage:<https://www.easpublisher.com>**Quick Response Code**

Abstract: Pseudoaneurysms are post-traumatic anomalies affecting the vascular layers occurring usually after a trauma. Their treatment, consensual in the adults, lacks guidelines in the pediatric population due to rare cases in children. We report three cases of pediatric pseudoaneurysms treated surgically in our hospital.

Keywords: vascular surgery, trauma, pseudoaneurysm, surgical anastomosis, pediatric surgery.

Copyright © 2023 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

A false aneurysm or pseudoaneurysm is defined by the discontinuity of the arterial wall creating a pocket contained by adjacent tissues. It distinguishes itself from a true aneurysm where the arterial wall is intact [1, 2].

They are often post-traumatic or iatrogenic and their diagnosis is established after a latency period within days or years from the initial trauma depending on how quickly the pseudoaneurysm is formed or of the symptoms' intensity.

Ultrasound with doppler shows its interest in the diagnosis with a sensibility attaining 97%.

Management modalities of post-traumatic pseudoaneurysm (PTPA) are not well known within the pediatric population due to a lack of consensus regarding open surgery, the challenging character of such approach and the absence of long term results.

Thus, the therapeutic approach, usually surgical, has come to consider newer alternatives [4, 5].

Techniques such ultrasound guided compression repair or embolization with thrombin have arisen. We report three cases of pediatric traumatic pseudoaneurysm managed within our institution.

Case N° 1

A 15 year old male of rural origin without previous medical history, who sustained a month prior to his admission a penetrating trauma to the internal face of the left leg's lower third resulting in a one centimeter wound that was sutured.

Evolution was remarkable by the apparition of a pulsatile mass regarding the scar which prompted referral to our academic center.

- Physical examination retrieved a well-defined mass posterosuperior to the internal malleolus, measuring three centimeters of diameter, superficial, painful, beating and without a thrill at palpation. The mass was blowing at auscultation, Fig 1.
- The limb was otherwise warm, peripheric pulses present and symmetric particularly the tibial posterior pulse.



Figure 1: Pseudoaneurysm inspection on physical examination (red arrow)

Arterial ultrasound found a hypoechoic structure taking the color doppler and communicating with the posterior tibial artery directly through a three millimeter opening. The structure measured three

centimeters, thus making us suspect a traumatic pseudoaneurysm of the posterior tibial artery. Moreover, there was no downstream flow disturbance, Fig 2.

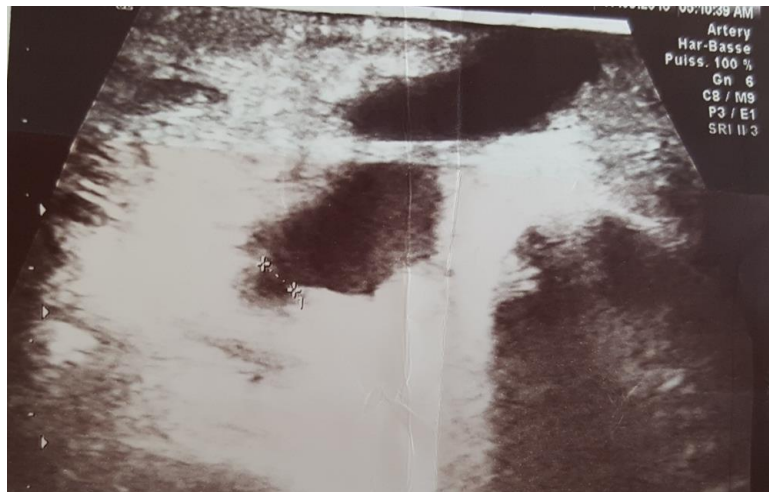


Figure 2: Sonographic image of the pseudoaneurysm

This patient underwent a surgical treatment, consisting of flattening the pseudoaneurysm (Figure 3)

with interposition of an autologous venous graft (Figure 4).

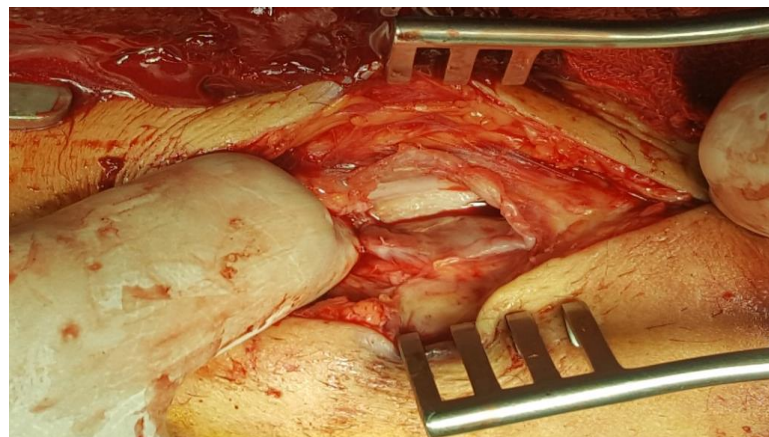


Figure 3: Surgical picture showing flattening of the pseudoaneurysm

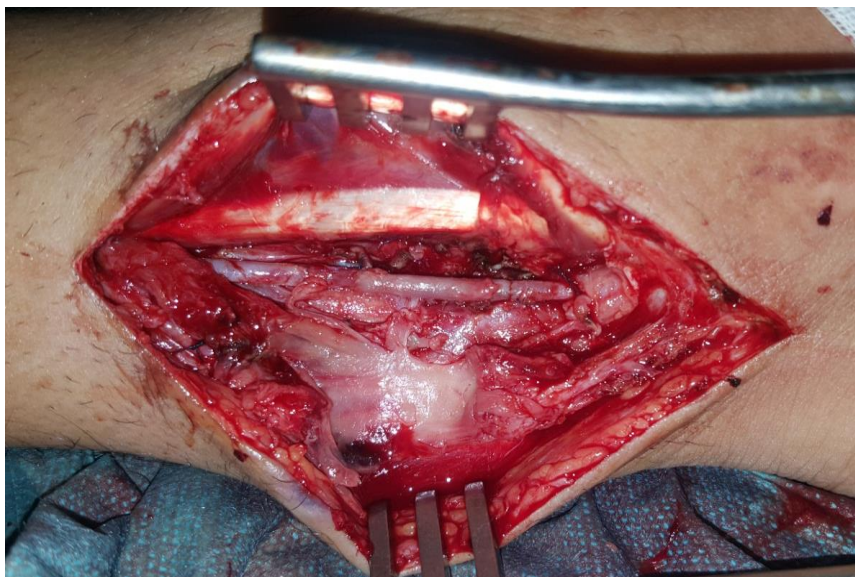


Figure 4: Surgical picture following flattening and bypass with a venous graft (inverted internal saphenous vein)

Patient was put on therapeutic anticoagulation with unremarkable follow up and a short term favorable evolution.

Case 2

A year old female who sustained three months prior to her admission a glass shard at the medial part of the ankle posterior to the malleolus.

She was admitted due a ruptured pseudoaneurysm of the posterior tibial artery. Physical

examination a pale patient, heart rate: 80 beats per minute, low blood pressure.

Limb examination showed a retro-malleolus spurt of blood with absence of posterior tibial pulse and an otherwise warm limb.

The patient was admitted to the operation room upon initial resuscitation and stabilization. Surgery consisted on posterior tibial artery resection with end-to-end anastomosis.



Figure 5: Surgical picture following termino-terminal anastomosis of the tibial posterior artery (black arrow)

Case 3

A fourteen year old female, without previous medical history, who was stabbed to internal part of the thigh three months prior to her admission, resulting in a puncture wound that was sutured.

She was admitted for management of a posttraumatic pseudoaneurysm of the superficial femoral artery with a post traumatic arterio-venous fistula.

Physical examination found a pulsatile thrilling mass at the lower third of the thigh. Limb was warm, popliteal and distal pulses were absent.

CT angiography showed a posttraumatic arterio-venous fistula between the superficial femoral artery and the femoral vein at its middle third supplying a pseudoaneurysm measuring 110*70 mm carrying a mural thrombus within its inferior pole, Figure 6.



Figure 6: Image scannographique du faux anévrisse de l'artère fémorale superficielle avec FAV en reconstruction 3 D

Surgical management consisted of flattening the superficial femoral artery pseudoaneurysm, excluding the fistula, and reestablishing continuity with an end-to-end anastomosis of superficial femoral artery.

Postoperative follow up was simple with popliteal and distal pulses recovered. Short-term evolution was unremarkable.

DISCUSSION

Vascular traumas in children and teenagers remains less frequent than those reported in adult, either 7% in Cormier Cohort [8] or 10% according to Gruss [9].

Indeed, all the published cohorts in the literature underline the scarcity of pediatric vascular trauma.

Post traumatic pseudoaneurysm formation in peripheral arteries is very rare and is generally a delayed sequelae of the initial trauma.

The exact epidemiology of these post-traumatic pseudoaneurysms is not well known, most published studies in this subject being case reports [2].

The diagnostic delay varied from a few days to a few months, but often remotely from the trauma.

The most retrieved clinical presentation is the apparition of a pulsatile mass with swelling which was the case of our patient.

Among other clinical signs are those related to the compression of nearby structures and give evidence of a complicated pseudoaneurysm: swelling, pain, paresthesia, acute limb ischemia, compartment syndrome, deep vein thrombosis and necrosis of the overlying skin.

Pseudoaneurysms can fissurate or rupture leading to hemorrhagic shock and death, thus requiring an urgent surgical intervention.

Physical examination finds a pulsating mass regarding the artery trajectory associated to a murmur at

auscultation and sometimes absence of peripheral pulses.

A thrill at palpation is a sign indicating an associated arterio-venous fistula [13]; an associated lesion which is very rare in the literature, representing 0 % in Debeugny serie [11] and 5 % in Evans serie [14].

The presence of inflammatory signes might be misleading as it may indicate a septic collection, though a thorough anamnesis and a rigorous physical exam can avoid such confusion which consequences can be dramatic [17].

Doppler ultrasound finds its interest in establishing the diagnosis with 97% sensibility. It shows the existence of a hypoechoic structure adjacent to the vascular axis, containing a typical swirling blood circulation, named the « ying-yang » sign, connected to the vascular lumen by a duct called the pseudoaneurysm's neck and supplied by a typical « come and go » blood flow pattern [16, 17]. Doppler ultrasound can further ascertain the pseudoaneurysm characteristics: size, compartments or lobes, neck's length and width [5].

CT-angiography has become the investigation of choice to detect pauci-symptomatic arterial lesions. It has become increasingly used in trauma, providing a global exploration and visualizing the lesion under every angle thanks to 3D reconstruction [12]. Moreover, it allows discussion of the surgical approach based on axial images.

Arteriography is a more expensive and invasive modality than other imaging techniques. It is useful in case of diagnostic uncertainty and mostly to guide an intervention na radiology procedure (embolization, covered endo prothesis) which represents today the mainstay treatment to arterial trauma.

Treatment choice of pseudoaneurysms depends essentially on their localization and on their size [2].

There is few data regarding management of pediatric post-traumatic pseudoaneurysms. Fewer even are the papers dealing with their endovascular management in this context.

Management, usually surgical, aims to avoid ischemic and thromboembolic complications, rupture or neurological compression.

Repair techniques are rather similar to those of the adult, the pseudoaneurysm requiring exclusion and arterial circulation restored with bypass using an autologous venous graft or arterial resection with end-

to-end anastomosis if the resection area can be limited to three centimeters [19].

Some particularities regarding the growing child are however worth considering [5, 6]:

- ❖ Favoring the use venous graft, circulation restoration (direct or segmental resection with end-to-end anastomosis and avoiding ligature.
- ❖ Bypass if necessary must be performed with autologous grafts (great saphenous vein or hypogastric artery) whereas prothetic material should be used as a last resort.
- ❖ Suturing must use interrupted stitches on well approximated edges to avoid anastomotic stenosis.

Currently, endovascular techniques such as ultrasound guided compression or embolization with thrombin injection are being used.

The first paper was published in 1999 about a pseudoaneurysm without an associated arterio-venous fistula which was successfully embolized with a coil [20].

Endovascular techniques aim to exclude the pseudoaneurysm from the circulation. They can be divided in two major categories: coil embolization and endovascular stenting.

Covered stents exclude false lumens and favors thrombosis allowing all the same a distal flow [2]. However, their use in small caliber arteries such as infra-popliteal arteries is limited by the lack of availability of small diameter stents and by their low permeability and hence high restenosis probability [21].

US guided compression was first described in 1991 by Fellmeth *et al.*, [22]. It is a technique effective on superficial localizations, but remains limited due to its frightening complication. Embolization with ultrasound guided thrombin injection is an other option [10].

Newer techniques certainly represent a less invasive therapeutic approach, especially in polytraumatic patients and urgent cases. The pediatric experience remains limited due to lack of short and long term data. Open repair remains the treatment of choice.

CONCLUSION

Pseudoaneurysms associated or not to arteriovenous fistula are the evolution of untreated arterial trauma. Their management is usually surgical. The suggested newer techniques seem rather safe and effective and have significantly reduced the morbimortality associated with conventional surgery.

Moreover, the scarcity of these lesions makes it difficult to conduct randomized-control trials.

REFERENCES

1. Darbari, A., Tandon, S., Chandra, G., Dwivedi, S. K., Kumar, A., & Gupta, A. (2006). Post-traumatic peripheral arterial pseudoaneurysms: our experience. *Indian Journal of Thoracic and Cardiovascular Surgery*, 22(3), 182.
2. Raheerantenaina, F., Rajaonahary, T. M. A., & Ratsimba, H. R. (2016). Management of traumatic arterial pseudoaneurysms as a result of limb trauma. *Formosan Journal of Surgery*, 49(3), 89-100.
3. Rezziki, A., Boutaouer, A., Benzirar, A., & El Mahi, O. (2015). Pediatric post-traumatic limb pseudoaneurysm: case report and literature review. *Archives de Pédiatrie: Organe Officiel de la Société Française de Pédiatrie*, 22(7), 733-736.
4. Peter, T. Y., Rice-Townsend, S., Naheedy, J., Almodavar, H., & Mooney, D. P. (2012). Delayed presentation of traumatic infrapopliteal arteriovenous fistula and pseudoaneurysm in a 10-year-old boy managed by coil embolization. *Journal of Pediatric Surgery*, 47(2), e7-e10.
5. Peter, S. D. S., & Ostlie, D. J. (2007). A review of vascular surgery in the pediatric population. *Pediatric surgery international*, 23(1), 1-10.
6. Ricco, J. B., & Fébrer, G. (2006). Traumatismes vasculaires des membres. *EMC: techniques chirurgicales-Chirurgie vasculaire*, 43(6), 25.
7. Heis, H. A., Bani-Hani, K. E., Elheis, M. A., Yaghan, R. J., & Bani-Hani, B. K. (2008). Postcatheterization femoral artery pseudoaneurysms: therapeutic options. A case-controlled study. *international journal of surgery*, 6(3), 214-219.
8. Cormier, J. M., & Firouzabadie, H. (1976). Lésions artérielles traumatiques chez l'enfant. *Ann Chir*, 30, 761-767.
9. Gruss, J. D. (1971). Lésions vasculaires chez l'enfant. *J Chir*, 102, 425-432.
10. Filali Ansary, M. (2017). Traumatismes Vasculaires Des Membres Chez L'enfant: Expérience Du Service Des Urgences Chirurgicales Pédiatriques De Rabat- Mlle. THESE, N: 79/17 Le 21/04/2017.
11. Debeugny, P., Canarelli, J. P., Bonnevalle, M., Lapasse, L., Luck, H., Huillet, P., & Boboyono, L. (1990). Traumatismes vasculaires chez l'enfant à propos de 94 observations. *Chir pédiatr*, 31, 207-216.
12. Wolf, Y. G., Reyna, T., Schropp, K. P., & HARMED, R. P. (1990). Arterial trauma of the upper extremity in children. *Journal of Trauma and Acute Care Surgery*, 30(7), 903-905.
13. Vlachou, P. A., Karkos, C. D., Bains, S., McCarthy, M. J., Fishwick, G., & Bolia, A. (2011). Percutaneous ultrasound-guided thrombin injection for the treatment of iatrogenic femoral artery pseudoaneurysms. *European journal of radiology*, 77(1), 172-174.
14. Evans, W., King, D., & Hayes, J. (1988). Traumatismes artériels de l'enfant: diagnostic et traitement. In *Annales de chirurgie vasculaire*, 2(3), 268-270.
15. Zitsman, J. L. (1998). Pseudoaneurysm after penetrating trauma in children and adolescents. *Journal of pediatric surgery*, 33(10), 1574-1577.
16. Mehta, K., England, E., Apgar, J., Moulton, J., Javadi, A., & Wissman, R. (2013). Post-traumatic pseudoaneurysm of the thyrocervical trunk. *Skeletal radiology*, 42(8), 1169-1172.
17. Huang, T. L., Liang, H. L., Huang, J. S., Yang, T. L., Chen, Y. J., Huang, P. Y., ... & Pan, H. B. (2012). Ultrasound-guided compression repair of peripheral artery pseudoaneurysm: 8 years' experience of a single institute. *Journal of the Chinese Medical Association*, 75(9), 468-473.
18. Himes, K., Bornais, A., Bittenbinder, E., & Cook, J. (2017). Posterior tibial artery pseudoaneurysm with arteriovenous fistula: impact of duplex ultrasound on diagnosis and treatment. *Journal for Vascular Ultrasound*, 41(1), 31-35.
19. Iakovlev, M., Marchand, J. B., Poirier, P., Bargoin, K., & Gouëffic, Y. (2014). Posttraumatic axillary false aneurysm after luxatio erecta of the shoulder: case report and literature review. *Annals of Vascular Surgery*, 28(5), 1321-e13.
20. Peter, T. Y., Rice-Townsend, S., Naheedy, J., Almodavar, H., & Mooney, D. P. (2012). Delayed presentation of traumatic infrapopliteal arteriovenous fistula and pseudoaneurysm in a 10-year-old boy managed by coil embolization. *Journal of Pediatric Surgery*, 47(2), e7-e10.
21. de Troia, A., Biasi, L., Iazzolino, L., Azzarone, M., Tecchio, T., Rossi, C., & Salcuni, P. (2014). Endovascular stent grafting of a posterior tibial artery pseudoaneurysm secondary to penetrating trauma: case report and review of the literature. *Annals of vascular surgery*, 28(7), 1789-e13.

Cite This Article: Kouzmane Ikram, Issoufou Niandou Moussa, Naouli Hamza, Jiber Hamid, Bouarhroum Abdellatif (2023). Pediatric Traumatic Pseudoaneurysm: Three Cases Report. *East African Scholars J Med Surg*, 5(1), 1-6