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## Giant iatrogenic pseudoaneurysm of the brachial artery: A case report

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## ABSTRACT

**INTRODUCTION:** Pseudoaneurysms are a pulsatile hematoma caused by hemorrhage on soft tissues. It is an uncommon condition with many different etiologies. We report a case of a giant pseudoaneurysm caused by iatrogenic injury on the brachial artery.

**PRESENTATION OF CASE:** A 42 year-old male was submitted to our Vascular Surgery service with an enlargement of the right upper limb and a history of myocardial infarction. 60 days before the patient reached our service, he was submitted to a cardiac catheterization performed by another medical team, since the catheter was placed on the right brachial artery near the cubital fossa, we suspected an iatrogenic pseudoaneurysm, which was confirmed by his clinical history and physical exam. It was opted to treat the pseudoaneurysm with an implant of polytetrafluoroethylene prosthesis. There were no complications whatsoever and the patient was discharged.

**DISCUSSION:** Pseudoaneurysms are more common after interventional procedures than diagnostic procedures, although brachial artery pseudoaneurysms are rare. Complications of pseudoaneurysms can cause serious threat to the afflicted limb and the patient's life. The management of any pseudoaneurysm is dependent on its size, location and pathogenesis.

**CONCLUSION:** Pseudoaneurysms develop slowly and should be diagnosed as early as possible in order to avoid complications and a better outcome. Due to an increase in recent endovascular procedures and the fact that brachial artery puncture is being performed more routinely, incidence of brachial artery pseudoaneurysms among overall population may rise.

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## 1. Introduction

Pseudoaneurysm (or false aneurysm) is a pulsatile haematoma that may be formed by hemorrhage in soft tissues. It has a fibrous encapsulation and a communication between the ruptured vessel and the fluid space [1,2].

It can be caused by a great number of different diseases (Ehlers-Danlos syndrome, mycotic aneurysms, Kawasaki's disease, osteochondromas and others), trauma (such as humeral fractures) and even iatrogenic causes [2].

Brachial artery pseudoaneurysms (BAP) are rare and they are usually caused by luxations, fractures of the upper limb, and due to iatrogenic causes (e.g. puncture of the artery with the objective of collecting peripheral blood for laboratory analysis) [3,4]. Pseudoaneurysms are more frequent in the lower limb vessels [2].

Complications of pseudoaneurysms include local pain, rupture, neuropathy and local skin ischemia. It may also result in local sepsis and abscess formation which may rupture and cause subsequent hemorrhage [3,4].

We report a case of BAP caused by a brachial artery puncture and discuss its diagnostic modalities and minimally invasive treatments. This work has been reported in line with the SCARE guidelines criteria [5].

## 2. Presentation of case

A 42 year-old male was submitted to a cardiac catheterization due to acute coronary artery disease. The catheter was placed after the right brachial artery was punctured at the distal third of the right arm, near the cubital fossa. The patient needed the procedure in order to evaluate and treat myocardial infarction and ischemia. 60 days after the procedure, the patient was admitted in a vascular surgery service with a pulsatile mass on the punctured area. The circumference of the aforementioned region was of 52 cm (Fig. 1).

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**Fig. 1.** The brachial artery pseudoaneurysm. The large pseudoaneurysm can be seen preoperatively.



**Fig. 2.** Surgery of the pseudoaneurysm. The polytetrafluoroethylene prosthesis is shown.

The patient presented pain and function loss of the distal extremity of the right upper limb. The patient reported that he couldn't access the health care institution to evaluate its clinical condition after the primary exam. Diagnosis of BAP was confirmed by the patient history of catheterization and his physical exam.

The pseudoaneurysm was treated with an implant of a polytetrafluoroethylene prosthesis (6 mm) due to the loss of a large segment of the brachial artery (Fig. 2). We opted not to use vein grafts as the patient did not present adequate vessels for replacement.

### 3. Discussion

Pseudoaneurysms are formed when an arterial puncture site does not seal after catheterization, which allows blood at arterial pressure to jet into the perivascular tissues, thus forming a pulsatile hematoma. Pseudoaneurysms lack a fibrous wall and are constrained by the surrounding hematoma and soft tissues [4].

The etiology of pseudoaneurysms can be classified into three different types: congenital (1); associated with other diseases (2) (such as Ehlers–Danlos syndrome, mycotic aneurysms, Kawasaki's disease, osteochondromas, polyarteritis nodosa, Menkes disease, Behçet disease and others); or due to trauma/iatrogenic causes (3) (such as humeral and supracondylar fractures, angiography, artery puncture, endovascular surgeries, drug abuse) [2].

BAP is a rare condition which occurs in less than 0.04% of cases (Sheiman et al. [11]; Mrad et al., 2016). Recent papers report an incidence of BAP formation due to iatrogenic causes (puncture or diagnostic exams) between 0.3% and 0.7% of patients [6,7].

Risk factors for pseudoaneurysms are anticoagulation, obesity, diabetes mellitus, large sheath size, faulty puncture technique, brief manual compression, arterial hypertension, difficulty to compress puncture sites, heavily calcified arteries and hemodialysis [8,9].

The BAP usually develops slowly. It may take days, months or even years to develop symptoms or be detected clinically [2]. Thus is imperative to monitor the patient after vascular diagnostic procedures and endovascular treatments. We believe that the large mass on the patient's afflicted limb was due to his lack of access to a health care institution.

Rupture, hemorrhage, reduction of radial and ulnar pulse amplitude, cold intolerance, cyanosis, pallor ischemia and necrosis are a few of BAP complications. Furthermore, paresthesia on the median nerve dermatomes, nerve injury and venous edema of the distal extremities can be common due to expansion of the mass and subsequent compression of those structures [4,6,9,10].

Use of the brachial artery instead of the femoral artery may be advantageous, since there is a decrease of post-procedure nursing requirements, decrease in bed rest time, a better patient comfort and the lower percentage of complication rates [6]. Although there is a debate whether the complication rates are truly lower than of those procedures performed on the femoral artery (as the brachial artery was not so commonly used beforehand) [10,11].

Diagnosis of a pseudoaneurysm can be performed by arterial Doppler ultrasonography (US), contrast-enhanced computed tomography angiography, and magnetic resonance [1,2].

The US will show the presence of blood flow or thrombus within the pseudoaneurysm, the size of the neck of the pseudoaneurysm, the integrity of the adjacent vessels, and the presence of loculations. Moreover, this method is faster, less expensive and more available in medical institutions [2].

The main signs of a pseudoaneurysm on realtime B-mode US are an echo-poor soft tissue mass adjacent to the artery at the site of the puncture. Doppler evaluation shows an arterial flow within the mass. Color Doppler US is the most useful method to confirm blood flow within the pseudoaneurysm. Spectral waveforms and color Doppler imaging usually shows a characteristic "to-and-fro" and "ying-yang" flow patterns in the neck of the pseudoaneurysm [1,12].

Ultrasonounds are also important during follow-up of patients after treatment, as it can confirm complete removal, thrombosis, or recurrence. It can also be used as an aid in the compressive treatment of pseudoaneurysms [9,10].

The treatment of any pseudoaneurysm is dependent on its size, location and pathogenesis. Resection, ligation, reanastomosis or vein graft interpositioning can be used as surgical measures, although endovascular stent-graft implants, embolization of sac, embolization of distal and proximal arterial segments and thrombin injections can be performed as well [2,4,6].

Open surgery was preferred in this particular case due to the rapid expansion of the pseudoaneurysm, which caused compression of the brachial artery and led to distal ischemia. Furthermore, neuropathy of the median nerve caused by compression was also a decisive factor for surgery. Ideally, a primary bypass should be performed with vein grafts instead of prosthetic material (which should be avoided if possible). However, as the patient's veins were not suitable for an arterial replacement, we opted to use a polytetrafluoroethylene prosthesis.

Treatment of a pseudoaneurysm can be also performed by compression of the afflicted vessel, although it is difficult to compress the brachial artery due to its mobility and shape of the humerus [11].

The coagulation of aneurysms by percutaneous embolization with thrombin was first described by Cope and Zeit in 1986 in which they injected thrombin directly into the aneurysm [13]. Studies showed that this treatment modality can be used to treat pseu-

doaneurysms with high rates of success, as the thrombin converts inactive fibrinogen into fibrin, which participates directly in the formation of thrombus [13–15]. However, this method requires US follow up (24 h after the procedure) in order to verify its success. Recurrence can be treated with further injections [14,15]. Although rare, complications such as thrombosis may happen [6,11].

Even though brachial artery accesses are less invasive than femoral, they still possess certain complications such as pseudoaneurysms, fistulas and median nerve injury due to new access techniques [7].

Our case displays the consequences of delay in diagnosis and treatment of a BAP. This delay was caused by social and economic issues which developing countries may possess. Moreover, a more precise knowledge of minimally invasive procedures is essential to an adequate treatment with subsequent reduction of complication rates.

#### 4. Conclusion

Brachial artery pseudoaneurysms are rare even though its rates are rising due to the increase in less invasive techniques. Furthermore, as it is a slow progressive condition it is imperative to diagnose it as soon as possible in order to prevent complications as well as the risk of infection of the afflicted limb. Thus, knowledge of this condition is essential to physicians and surgeons alike. This case is a reminder that delay in diagnosis contributes to an enlargement of the mass thus causing more difficulties in its treatment. The patient developed a giant pseudoaneurysm due to socio-economic issues, as he was unable to obtain medical assistance, which is a common issue in developing countries and communities with a less favorable economic position.

#### Conflict of interest

The authors declare no conflicts of interests.

#### Funding

There were no funding sources for this study.

#### Ethical approval

Does not apply.

#### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. Furthermore, no personal information regarding the patient is present in this study.

#### Authors contribution

Admission, diagnosis and treatment: Leite/Pires M.  
Getting consent from the patient: Chagas/Oliveira.  
Data analysis: Leite/Pires M/Pires L/Chagas/Oliveira.  
Review of the literature: Leite/Pires L.  
Writing of the paper: Leite/Pires L/Chagas/Pires M.  
English translation: Pires L/Leite/Oliveira.

#### Guarantor

I, Tulio Fabiano de Oliveira Leite, accept full responsibility for the work and the conduct of the study, had access to the data, and controlled the decision to publish.

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