



ORIGINAL ARTICLE

# Management of traumatic arterial pseudoaneurysms as a result of limb trauma



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## KEYWORDS

artery  
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endovascular  
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limb trauma;  
vascular surgery

**Abstract** *Background:* Traumatic arterial pseudoaneurysms (APAs) of the limbs are rare. Most published articles on this subject are case reports in the English literature. The exact epidemiology of APAs as a result of limb trauma is not well-known, and their management is not standardized. In most cases, the description of case reports is followed by a review of the literature, but no update with robust data has been previously published.

*Purpose:* Our objective was to summarize the current knowledge on the epidemiology, and diagnostic and therapeutic features of APAs as a result of limb trauma.

*Methods:* Literature searches on MEDLINE and EMBASE were performed using the keywords “traumatic artery pseudoaneurysm”. The referenced articles were selectively read, and the patient demographics, clinical presentations, and diagnostic and therapeutic modalities of 148 articles were reviewed.

*Results:* In total, 161 cases were analyzed. Overall, young adults represented the majority of the affected population (mean age:  $38 \pm 24$  years old), with a male preponderance (63%). The commonest presenting symptom was painful swelling (34%). Furthermore, arteriography was the most common imaging investigation used (52%). The mechanism of injury was dominated by blunt trauma (57%), and the commonest critical artery injuries included axillary-brachial (22%) and femoropopliteal trunks (16%). Moreover, PAs arising from small arterial branches were observed in 26% of the patients. The most important treatments included surgical repair (37%), endovascular procedures (29%), and ligation of the feeding vessels (26%). Post therapeutic courses were often uneventful (93%), and the morbidity (5%) and mortality (2%) rates were low.

*Conclusion:* Over the last decade, APAs related to limb trauma have increased and are often diagnosed after painful presentation of swelling and/or pulsatile mass. Angiography is an ideal option to confirm the diagnosis. Endovascular coiling is preferred in the treatment of PAs arising from small branches artery. Open surgical repair is the standard treatment for APAs arising from critical axial vessels.

Conflict of interest: None.

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## 1. Introduction

False aneurysm, also known as pseudoaneurysm (PA), occurs when a damaging force is applied to the arterial wall, allowing persistent extravasations of blood into the surrounding connective tissues that communicate with the arterial lumen.<sup>1</sup> Arterial PA (APA) is one of the most common vascular injuries. However, the occurrence of APAs as a result of limb trauma is rare. Most published articles on this subject are case reports in the English literature (Table 1). In most cases, the description of case reports is followed by a review of the literature, but no update with robust data has been published. The exact epidemiology of APAs as a result of limb trauma is not well-known, and their management is not standardized. The majority of literature reviews are often limited to the summarization of cases previously reported. In this systematic review, we summarized the current knowledge on the epidemiology and diagnostic and therapeutic features of APAs as a result of injuries to the upper and lower extremities.

## 2. Methods

### 2.1. Literature search strategy

The literature was reviewed by searching online medical databases (MEDLINE, EMBASE) for relevant studies published between January 1960 and February 2015 by using the descriptors "traumatic artery pseudoaneurysm" as a result of limb trauma. After reading the titles and some abstracts online, 161 articles were downloaded for complete reading. The referenced articles were selectively read, and this systematic review finally included 148 articles. Some articles (n = 13) were excluded because they reported iatrogenic false aneurysms encountered after bone fracture osteosynthesis.

### 2.2. Selection criteria

We included relevant articles with detailed information on the following parameters: patient demographics (age, gender), mechanism of limb trauma (penetrating injury, blunt trauma), clinical presentations, and diagnostic and therapeutic features. Subclavian and carotid APAs were excluded. In addition, abstracts and case series without specified information according to the stated selection criteria and post traumatic iatrogenic APAs were excluded.

### 2.3. Data extraction

All data were extracted from the article texts.

### 2.4. Statistical analysis

Patient data were collected in a Microsoft Excel database. Variables are reported as mean and/or median values (with ranges). All statistical analyses were performed using Epi Info 7™ software.

## 3. Results

We analyzed 161 cases of traumatic APAs as a result of limb trauma (Table 1). These selected case reports covered a 51-year period. Overall, 102 cases (63%) were published between February 2005 and February 2015 (10 years), 42 (26%) between January 1995 and January 2005 (10 years), and 17 (11%) between December 1963 and December 1994 (30 years). The included articles pertained to 126 male (78%) and 35 female (22%) patients, with a mean age of  $38 \pm 24$  years (range: 0.5–93 years). The sex ratio was 3.6, and children aged 0.5 to 15 years represented 17% (n = 28) of the patients. The median time between limb trauma and the diagnosis of the PA was 30 days (range: 0.04–19440 days). The most common clinical presentation was painful swelling (34%), followed by pulsatile mass (24%) and painful pulsatile swelling (24%). In addition, distal pulses were present in 98% of the patients. Associated physical findings included systolic bruit (n = 15), ecchymosis (n = 11), and thrill (n = 9). Furthermore, 20% of the patients presented with compartment syndrome (n = 3), rupture of the PA (n = 8), and nerve palsy (n = 21). Some false aneurysms were associated with an arteriovenous fistula (AVF) (n = 9). The hemoglobin level had decreased with anemia in 9% of the patients. The most frequently performed imaging study was arteriography (52%), followed by computed tomography angiography (CTA) (22%) and Doppler ultrasonography (DUS) (11%). Primary surgical exploration without any imaging investigation was reported in 10 patients, and the majority of them had penetrating wound and painful pulsatile mass (n = 9). Lower limb injury accounted for 57% of all APAs, and vascular injuries were frequently observed after trauma to the leg (23%), thigh (19%), and forearm (17%). The mechanism of injuries to the upper and lower extremities was a blunt trauma in 59% of the patients. Vascular injury involved many critical arterial trunks, including the axillary-brachial (22%) and femoropopliteal (16%) axes (Table 2). Moreover, PAs arising from small branches artery represented 26% of the patients. Limb trauma was associated with a bone fracture in 23% of the patients. Surgical repair (37%), endovascular procedures (29%), and ligation of noncritical vessels (26%) were the most common therapeutic modalities. Most APAs that developed on the axillary-brachial and femoropopliteal axes were surgically repaired (72%) (44/61). Endovascular procedures with stent-grafts (10/61) and coiling (4/61) were rarely practiced in the treatment of these truncal APAs. Among the embolized arteries, 81% (22/27) were located on small and nonessential arterial branches. Arterial ligation was performed particularly for smaller arterial

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