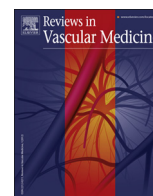




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Update on diagnostic and therapeutic features of peripheral artery pseudoaneurysms following orthopedic and traumatologic surgery



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ABSTRACT

Background and aims: Arterial pseudoaneurysms (PSAs) following orthopedic and traumatologic surgery are rare and most publications on this subject are case reports. No update based on robust data has been published previously. The management of this pathology is not codified. We wanted to summarize the current knowledge on diagnostic and therapeutic features of these iatrogenic vascular injuries.

Methods: Medline and EMBASE were queried for publications using the descriptors «artery pseudoaneurysm» and «orthopedic surgery». Articles referenced were read selectively and this review included 121 articles. Patient demographics, clinical presentations, diagnostic methods and treatment were reviewed.

Results: A total of 131 cases of arterial PSAs was analyzed. There were 82 men with an average age of 50 years old. The commonest clinical presentation was painful swelling (58%). Most patients underwent an arteriography (64%). Arterial injuries were frequently caused by knee arthroplasty (25%) and knee arthroscopy (24%). The most common vascular injuries included geniculate (27%) and popliteal arteries (26%). Surgical (53%) and endovascular (40%) procedures were the commonest therapeutic modalities. Postoperative courses were uneventful in 129 patients (98%).

Conclusion: Geniculate and popliteal artery PSAs are the most frequent vascular complications of orthopedic surgery. They must be evoked when faced with a painful swelling and/or pulsatile mass. Arteriography is an ideal option for confirming the diagnosis. It is often performed with embolization to treat small branches PSAs or with stenting graft for those arising from arterial trunks. Alternatively, surgical ligation or repair was still an option.

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1. Introduction

Pseudoaneurysm (PSA) also known as false aneurysm or pulsating hematoma is a saclike structure surrounded by periarterial tissue and blood clot that communicates with the arterial lumen and results from disruption of all layers of the arterial wall giving rise to an extravascular hematoma [1]. A false aneurysm also differs from a vessel dissection, which is marked by the presence of blood in between the vessel layers. Arterial PSAs related to orthopedic procedures represent a rare complication of vascular injuries. However, most publications on this subject are case reports followed by a brief review of the literature. Indeed, discussions based on literature reviews are often limited to the numeration of cases previously published. The exact epidemiology of these PSAs is not even determined and their treatment is not codified. We believed that treatment of arterial PSAs following orthopedic surgery is not similar to the repair of those occurring after arterial catheterization. Some data based on literature review and case series were published recently but most of them included only a few patients with lower limbs artery PSAs relating to upper thigh and knee surgery [2–5]. To date, there is little robust data to help guide physicians in management of these iatrogenic vascular injuries. The aim of this review was to summarize the current knowledge on diagnostic and therapeutic features of peripheral artery PSAs associated with orthopedic and traumatologic surgery.

2. Methods

2.1. Study identification

Articles published from 1964 to 2014 in the EMBASE, Medline and Cochrane databases were searched online. The descriptors used to find titles of possible interest were artery pseudoaneurysm or false aneurysm in combination with the terms orthopedic surgery including arthroscopy, arthroplasty, osteosynthesis and osteotomy. After reading the titles and some abstracts online, 124 articles were downloaded for complete reading. Articles referenced were read selectively and this systematic review finally included 121 articles. PSAs without surgical relationship and those secondary to exostoses or arterial catheterizations were excluded. A total of 131 cases of arterial PSAs related to orthopedic surgery was analyzed.

2.2. Criteria for inclusion

All articles included satisfied the following criteria: patient demographics, clinical presentations, diagnostic confirmation, therapeutic modalities and outcomes. Case series without specified information according to the aforementioned criteria were not included.

2.3. Statistical methods

Patient data were collected in a Microsoft Excel database. Variables are presented as median (with ranges) or mean. All the statistical analyses were made using Epi Info 7™ software.

3. Results

We analyzed 131 cases of arterial PSAs relating to orthopedic and traumatologic surgery (Table 1). These selected data covered a 50-year period. Overall, 74 (56%) were published from 2005 to 2014 (10-year), 47 (36%) from 1995 to 2004 (10-year), and 10 (8%) between 1964 and 1994 (30-year). There were 82 men (63%) and

49 women with an average age of 50.44 ± 21.19 years old (0.4–89 years). Six percent of patients were children (0.4–15 years). Median of interval time between surgery and aneurismal diagnosis was 30 days (1–5040 days). Non-pulsatile swelling (47%) and pulsatile mass (42%) were the commonest clinical presentations. These manifestations were associated with a localized pain in 58% of patients. Associated neurovascular complications included compartment syndrome ($n=2$), deep venous thrombosis ($n=2$), nerve palsy ($n=2$) and PSAs with arteriovenous fistula ($n=2$). A case of ruptured PSA was reported. The most common radiological investigation used for aneurismal diagnosis was arteriography (64%) followed by computed tomography angiography (CTA) (19%) and Doppler ultrasonography (DUS) (8%). Primary surgical exploration without any radiological investigation was reported in five patients. The most common vascular injuries included geniculate (27%) and popliteal (26%) arteries followed by tibial (21%) and femoral (15%) trunks with their branches. PSAs were most common after knee joint procedures including knee arthroplasty ($n=33$) and knee arthroscopy ($n=31$), followed by femoral osteosynthesis ($n=16$) and ankle joint surgery ($n=13$). Among knee arthroscopies with PSAs formation, 61% were related to meniscectomy and 23% anterior cruciate ligament reconstruction. Endovascular procedures ($n=52$) (40%) including coils embolization ($n=32$) and stenting graft ($n=20$), followed by surgical repair ($n=36$) (27%) and small vessel ligation ($n=33$) (25%) were the most therapeutic modalities. Twenty seven patients with small branches and non-critical axial vessels were treated by coils embolization without any complication (21%). The vast majority of arterial trunks (femoral, popliteal, tibial, brachial, radial) was repaired surgically ($n=32$) (24%) without any complication. Other arterial trunks ($n=18$) were treated by endovascular stenting graft, in which 14 were localized in the popliteal artery. Conservative treatment with ultrasound guided compression (USGC) concerned 9 patients. An unsuccessful treatment (with USGC) was reported. Anterior tibial artery was the vessel involved. In this case, a ligation of feeding vessel was performed after aneurysmectomy. One patient underwent an amputation of his arm injured. Following endovascular or surgical treatment, all patients were assessed clinically and 58 (44%) radiologically as well as by angiography or CTA and Doppler studies to document resolution of the PSA and the continuity of arterial flow across the repair site. The median follow-up period was 90 days (2–2520 days). Postoperative courses and outcomes at last follow up were uneventful in 129 patients (98%). Two patients presented a neuropathic sequela with foot drop and paresthesia. There was no recurrence and nor death.

4. Discussion

According to our knowledge, updated strategies in the management of arterial PSAs relating to orthopedic and traumatologic surgery were rarely reported. Currently, little study has been published previously [2–5]. These publications included 9, 13, 9 and 47 cases respectively. The latter was published in Brazilian language and has reviewed only arterial PSAs related to arthroscopic procedure in the knee. Our study is the second review analyzing lots of cases enrolled from varied orthopedic and vascular surgery departments throughout the world. During the last decade, we noted an increase of published case reports. The target population is often young adult with a masculine predominance. Pediatric cases are very rare.

Iatrogenic postsurgical PSA occurs when all 3 layers of the vessel wall are ruptured and the resultant hematoma is bounded by extravascular tissue. Time allowed between surgery and aneurismal diagnosis varies from an individual to other according to the artery involved and extent of arterial laceration. Most PSAs

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