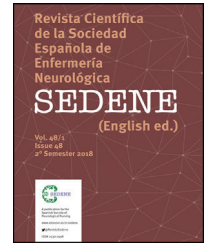




Enfermería Neurológica (English ed.)

www.elsevier.es/rcsedene



BRIEF ARTICLE

Femoral artery pseudoaneurysm after endovascular procedure in stroke patients: Case series

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Received 7 November 2022; accepted 4 April 2023

KEYWORDS

Pseudoaneurysm;
Femoral artery;
Injection site
reaction;
Endovascular
procedure;
Stroke

Abstract

Background: Femoral artery access site complications are uncommon but likely to become more frequent with the increased use of endovascular procedures in stroke patients.

Aims: This study aims to describe the clinical, diagnosis and treatment features of a consecutive case series of femoral artery pseudoaneurysms (FAP).

Methods: A retrospective case series was performed for consecutive patients diagnosed with FAP at our institution between January 2016 and January 2020. Variables regarding patient demographics, endovascular procedural features and PAF description, diagnosis, treatment and outcomes were included.

Results: We identified a total of 9 cases in a 5-year period; six happened after acute endovascular therapy for stroke, 2 after diagnostic arteriography and 1 after subarachnoid hemorrhage related ruptured aneurysm embolization. Most patients experienced local symptoms but in 3 cases the PAF was incidentally discovered during the stroke diagnostic study. Only 1 of the patients experienced severe anemia related to the PAF. Regarding treatment, local compression and patient rest was enough in 2 cases, thrombin percutaneous injection was used in 3 patients and open surgery in 3. Nurse reports included evaluation of the groin status (pain, lump, bruise) prior to the PAF diagnosis in six patients.

Conclusions: The clinical presentation of FAP after endovascular procedure is heterogeneous and its diagnosis and management may be challenging. Systematic assessment of the groin after EP in stroke patients could help in prompt diagnosis and treatment of this complication.

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PII of original article: S2013-5246(23)00009-0

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PALABRAS CLAVE

Pseudoaneurisma;
Arteria femoral;
Reacción en el punto
de inyección;
Procedimientos
endovasculares;
Accidente
cerebrovascular

Pseudoaneurisma de arteria femoral asociado a procedimiento endovascular en pacientes con ictus. Serie de casos

Resumen

Introducción: El pseudoaneurisma de arteria femoral (PAF) es una complicación local de los procedimientos endovasculares (PE). Su incidencia en pacientes con ictus es baja, pero en aumento por el incremento de estas técnicas en los últimos años.

Objetivo: Describir una serie de PAF ocurridos en pacientes con ictus sometidos a PE en los últimos cinco años en un servicio de neurología.

Método: Estudio observacional retrospectivo de pacientes con ictus que han sufrido PAF tras un PE en un intervalo de 5 años (2016–2020). Se describen las características clínicas de los pacientes que sufrieron la complicación, las del PE, las del PAF y su manejo diagnóstico y terapéutico.

Resultados: Se incluyeron 9 casos de PAF de los cuales 6 ocurrieron tras trombectomía mecánica en ictus agudo. Tres fueron hallazgos asintomáticos y en uno de los casos el paciente presentó rotura del aneurisma con anemia secundaria y necesidad de transfusión sanguínea. Tres casos precisaron cirugía abierta, otros tres inyección de trombina y en dos casos la compresión y el reposo fueron suficientes. En 6 de los casos los evolutivos de enfermería dejaron constancia y alertaron del estado de la ingle (hematoma, bultoma, dolor) previo al diagnóstico de PAF.

Conclusiones: El PAF asociado a PE en pacientes con ictus tiene una presentación clínica y manejo diagnóstico y terapéutico variables, pero puede pasar inadvertido y tener consecuencias graves para el paciente. La valoración inguinal sistemática tras PE en los pacientes con ictus permitiría sospechar esta complicación de forma precoz y adelantar su tratamiento.

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Introduction

Stroke is a highly prevalent pathology with significant morbidity and mortality. The approach to this disease has undergone a radical change in recent years with the incorporation of endovascular (EP) procedures as a diagnostic and, above all, therapeutic tool.¹

The common femoral artery is the most commonly used endovascular access site and the inability to seal the site correctly can lead to various complications, such as groin haematoma, arteriovenous fistula, arterial dissection, femoral artery pseudoaneurysm (FAP), thrombosis or localised infections.¹ Among these complications, FAP stands out for its relevance, as it involves the development of an encapsulated repermeabilised pulsatile haematoma in communication with the lumen of the damaged vessel.

Both the size of the introducer and the closure system vary according to the EP. At the Hospital Universitario Donostia (HUD), 4F calibres are used for arteriographies and embolisations, and 6F for thrombectomies; With regard to the system, in the case of embolisations and thrombectomies, the Angioseal® device is used, which is a closure system consisting of an anchor that has a compressive effect and a collagen sponge that reinforces haemostasis, and in the case of diagnostic arteriographies, manual or mechanical compression is used with or without the non-invasive Neptune® haemostatic patch. When the introducer is removed, manual compression is performed for no less than 10 min, a compression dressing is applied and maintained along with rest for 24 h, and the patient is instructed

not to flex or mobilise the punctured limb for 6 h after the EP.

In HUD, in line with published post-EP nursing care protocols,^{2–4} apart from compression, rest and checking distal pulses (indications for interventional radiology), the nursing assessment protocol consists of observation and palpation of the access point, as well as temperature and colour of the extremity during the 24 h after EP and dressing change.

This study aims to describe a series of stroke patients undergoing EP who have developed FAP.

Methods

We conducted a retrospective observational descriptive study of a series of cases with a diagnosis of FAP after EP occurring in stroke patients admitted to a neurology department of a tertiary hospital, with a reference population of 718,000 inhabitants. The case study recommendations of the CARE guidelines were followed.

Initially, and to identify cases, a search was performed using the ICD9 diagnostic code 4432 ‘‘aneurysm of the lower extremity artery’’ and the requirement of having been previously admitted to the neurology service during the time interval between 1 January 2016 and 31 December 2020. Subsequently, the medical records of the patients identified were reviewed to verify that they met the required criteria: patients with stroke, undergoing EP and who had suffered subsequent FAP as a complication.

Of the cases finally selected, the electronic medical records were reviewed and the following variables grouped into three sections were obtained:

- 1 Patient variables: sex, age, pre- and post-PE antithrombotic treatment.
- 2 EP variables: time interval between EP and FAP, pathology justifying the performance of EP, duration of EP in minutes, size of introducer used and percutaneous arterial closure system used.
- 3 FAP variables: size and shape, mode of diagnosis, whether there are nursing records on the follow-up of the groin area, complementary test used for diagnosis, which may be Doppler ultrasound, computed tomography (CT) or direct arteriography; clinical impact of the FAP on the patient, including whether there has been related anaemisation or other consequences; treatment performed on the FAP, time interval between diagnosis and treatment and whether there has been follow-up after admission of the FAP.

This research study was submitted to and approved by the clinical research ethics committee of the Gipuzkoa health area (CEIC of the Hospital Universitario Donostia) with the Protocol Code: MAR-PSE-2021-01. The data included in the study were treated confidentially.

Results

Nine cases of FAP met the inclusion criteria. Four patients were female and the median age was 70 years (RIC: 65–73.5). Two patients were anticoagulated and four on antiplatelet therapy prior to EP. Table 1 describes the characteristics of all cases.

Of the diagnosed FAPs, six (66.6%) occurred after mechanical thrombectomy for acute ischaemic stroke, one occurred after endovascular embolisation of an intracerebral aneurysm and two occurred after diagnostic arteriography.

Both diagnostic arteriography and embolisation were performed on a scheduled basis and stroke treatments were performed on an emergency basis. The median duration of EP was 42.5 min (RIC: 35–81). A total of 507 mechanical thrombectomies were performed during the 5 year study period and 6 PAF were found post-EP, resulting in an incidence of 1.183%.

The size of the introducer used was at the discretion of the radiologist, and the most commonly used was 6F in diameter. The closure system used was manual compression without a patch in one of the arteriographies and mechanical compression with a patch in the other; the Angioseal® percutaneous arterial closure device was used for both aneurysm embolisation and thrombectomy.

Regarding the characteristics of the FAPs, the size was highly variable, with a diameter of less than 1 cm in the smallest case (case 4) and 7.5 cm in the largest (case 7). In six of the cases FAP was diagnosed before 8 days after EP, but there were two diagnosed at 13 days and one at 35 days.

In 6 of the 9 patients there were local symptoms (bruise, lump or pain) described in the nursing charts of the electronic history, which the patient referred to or the nurse

Table 1 Clinical data of FAP cases.

	Age	Sex	Antithrombotic type of EP Ttm.	EP duration (min)	EmEP	FAP size/shape	EP-FAP interval (days)	Local symptoms	Treatment	
1	70	Woman	Double AG	Aneurysm embolisation	40'	No	5.3 cm	2	Yes	Surgery × 3
2	52	Woman	No	Diagnostic arteriography	Not shown	No	Neckless 1.5 cm	13	Yes	Thrombin + compression
3	64	Man	OAC	Mechanical thrombectomy	100'	Yes	Short neck 2 cm	13	No	Thrombin × 3 + STOP OAC
4	75	Woman	No	Mechanical thrombectomy	45'	Yes	Neckless 7 × 8 mm	1	Yes	Rest + compression
5	72	Man	Double AG	Mechanical thrombectomy	35'	Yes	Neckless 45 × 19 mm	2	Yes	Thrombin
6	72	Man	OAC	Mechanical thrombectomy	35'	Yes	Bilobed with narrow neck 1.7 cm	5	Yes	Rest + compression + STOP OAC
7	79	Hombre	No	Mechanical thrombectomy	81'	Yes	1 cm long neck 7.5 cm in diameter	35	No	Rest + surgery + STOP AG
8	70	Hombre	Simple AG	Mechanical thrombectomy	51'	Yes	2.8 × 2.5 × 3 cm Short neck	8	Yes	Rest + surgery
9	76	Mujer	Simple AG	Diagnostic arteriography	40'	No	12 mm in diameter	1	No	No

AG: Anti-aggregation; EP: Endovascular procedure; FAP: Femoral artery pseudoaneurism; OAC: Oral anticoagulation.

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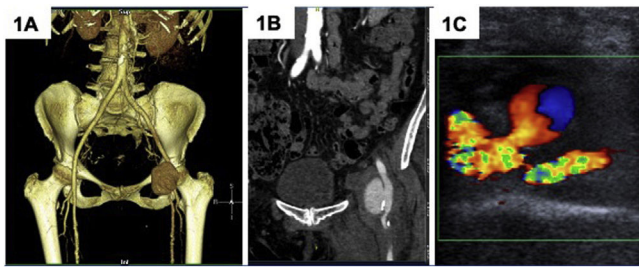


Figure 1 A-B) Cao 1. CT angiography shows at the level of the left common femoral artery a large FAP of 5.3 cm maximum diameter with communication with the neckless artery. C) Case 2. Arterial Doppler shows a small collection of 1.5 cm in diameter medial to the right distal common femoral artery; it presents filling with back-and-forth arterial flow and has a short neck.

reported. Three cases were incidental findings in CT scans performed for other reasons. All symptomatic patients had a significant associated bruising, accompanied by pain in two cases and lumps in two others.

Arterial Doppler of the lower extremities was the test that confirmed the presence of FAP in five of the cases, and CT angiography was performed in two cases (Fig. 1).

With regard to the treatment received, rest and compression was performed in four cases (44.4%), which was effective and sufficient in two of them, and the other two required open surgery. In one of them (case 1) surgery was performed up to three times. This patient had a FAP of 5.3 cm in diameter without a neck that ruptured with heavy bleeding and secondary anaemia, requiring red blood cell transfusion. Closure of the FAP was complicated, requiring two reinterventions. Three patients were treated directly with a thrombin injection, which was effective in one patient. Another required a second injection, which was effective. In a third patient, after three unsuccessful attempts with thrombin, anticoagulation was discontinued before the fourth thrombin injection, which was successful. One of the cases was treated directly with surgery and in another case no targeted treatment was performed because the FAP was a finding and was thrombosed at the time of diagnosis (case 9).

Seven of the cases were followed up by Doppler ultrasound after treatment.

Discussion

We have presented 9 FAP cases in this article which occurred in stroke patients admitted to the neurology department within a period of 5 years.

The clinical presentation was heterogeneous, with three asymptomatic cases found in imaging tests performed for another reason and one case of maximum severity that presented with FAP rupture, the need for surgery on three occasions and secondary anaemisation with the use of red blood cell transfusion. All cases had accompanying severe haematoma, a common sign in FAPs but of little diagnostic value, as it is common after all EPs to a greater or lesser degree.

In most of the patients in this series, the nursing charts recorded the condition of the groin or the patient's com-

plaints, highlighting the role of nursing in suspecting and advancing the diagnosis of this complication.

Therapeutic management is variable and depends mainly on the characteristics of the FAP itself. Some pseudoaneurysms may be subclinical and resolve spontaneously, but may become complicated and require more or less aggressive treatment, including: blind compression of the FAP neck, ultrasound-guided compression, collapsing and producing thrombosis at this level, direct thrombin injection or open surgery.⁵ In closed neck cases, closure by less invasive procedures such as local compression or thrombin injection is more feasible, but in more open cases the need for open surgery is more frequent.⁶

Diagnosis can be made by ultrasonography, which has become a highly sensitive, non-invasive, non-contrast technique that can be performed at the bedside.

Finally, the incidence is low and varies between .2% and 3.8% of patients undergoing EP depending on the series and study method. The results of our study fall within the described incidence. However, it has gone from being an unknown complication in neurology services to an increasingly frequent occurrence, with the striking increase in the use of EPs in stroke patients in recent years. Therefore, it requires a thorough understanding of this complication and professionals familiar with it for its diagnosis and therapeutic management.⁷

As mentioned above, published protocols on post-EP care are similar to the one used in our centre, but limited to the first 24 h after the procedure and only refer to observation for bleeding and bruising. This review of cases shows that this complication can develop beyond the first 24 h and, therefore, the current protocols would be insufficient and would fall short of the time required to detect it.²⁻⁴

In conclusion, EP-associated FAP in stroke patients has a variable clinical presentation and diagnostic and therapeutic management, but may go unnoticed and have serious consequences for the patient. Taking into account the results of this study and in order to suspect this complication early and anticipate its treatment, the implementation of a more exhaustive and prolonged post-PE groin care protocol is necessary, thus increasing the quality of the neurological nurse's care and patient safety. Care that we have already included in our protocol following this study.

Funding

Without funding.

Acknowledgements

Our thanks to the neurology and neuro-radiology team of the Hospital Universitario Donostia.

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