

CASE REPORT

Temporary carotid shunt embolism for popliteal artery

Embolia de shunt carotídeo temporário para a artéria poplítea

Leonardo Pires de Sá Nóbrega¹, Alcides José Araújo Ribeiro¹, Cláudio Eluan Kalume²

Abstract

The displacement of a shunt to a more distal arterial branch, along a path, is a rare complication. Vascular ultrasound can be presented as an excellent diagnostic modality for identifying the site of embolization of intravascular foreign bodies. The authors report a rare case of temporary shunt migration, implanted in the left common carotid artery, to left popliteal artery. The authors also describe the use of arterial vascular ultrasound to find the point of embolization, with an exact dermatography, that was essential to an easily surgical approach through a restrict and precise access way.

Keywords: carotid common artery; popliteal artery; ultrasonography doppler color.

Resumo

O deslocamento de um *shunt* para um ramo arterial mais distal, percorrendo um longo trajeto, é uma complicação rara. A ultrassonografia vascular pode se apresentar como uma excelente modalidade diagnóstica para identificar o sítio de embolização de corpos estranhos intravasculares. Os autores relatam um caso raro de migração de um *shunt* temporário, implantado na carótida comum esquerda, para artéria poplítea esquerda. Descrevem, ainda, a utilização do ecocolor doppler arterial que, além de localizar o ponto de embolização, com uma dermatografia exata, foi fundamental para que a abordagem cirúrgica transcorresse com facilidade através de uma via de acesso restrita e precisa.

Palavras-chave: artéria carótida primitiva; artéria poplítea; ultrassonografia doppler em cores.

Introduction

The occurrence of intravascular foreign bodies (FB) is rare. Most cases of embolization occur in the deep venous system and the FB usually migrates to structures such as the superior vena cava, right ventricle, pulmonary artery or a combination of such structures¹. FBs are less frequently found in the aorta or any of its branches; however, the higher frequency of percutaneous endovascular procedures has caused an increase in the number of cases of intra-arterial FB cases, most frequently stents, catheters and fragments of guide wire². The displacement of a temporary shunt to a more distal arterial branch is a rare complication³. This case report describes the authors' experience with the use of arterial Doppler ultrasonography to find a segment of nasogastric tube, used as a temporary carotid shunt, that had migrated to the left popliteal artery.

Case report

A male 36-year-old patient, victim of multiple self-inflicted stab wounds, was evaluated and treated by a general surgery team in the Emergency Room of a secondary care hospital. Penetrating wounds injuries were diagnosed in the abdomen, chest, and left cervical region. Initial care consisted of chest tube drainage, laparotomy and left neck exploration.

Laryngeal and left common carotid artery (LCCA) injuries were found at surgical exploration of the neck. The general surgeon, after dissecting the LCCA proximal and distal stumps, placed a temporary carotid shunt made of a 8.5 cm long segment of a #16 nasogastric tube, that was secured in place with silk sutures around the proximal and distal carotid stumps. This way, vessel patency was satisfactorily maintained. The laryngeal injury was treated with simple sutures and tracheotomy.

Study carried out at the Hospital de Base do Distrito Federal (HBDF) – Brasília (DF), Brazil.

¹Staff Surgeon at the Angiology and Vascular Surgery Service, HBDF and Clínica de Veias – Brasília (DF), Brazil.

²Chief of the the Angiology and Vascular Surgery Service, HBDF – Brasília (DF), Brazil.

Conflict of interests: nothing to declare.

Submitted on: 03.27.11. Accepted on: 09.15.11.

J Vasc Bras. 2011;10(4):330-334.

After hemodynamic stabilization, the patient was taken to the vascular surgery unit of a tertiary care hospital, for specialized treatment of the LCCA injury. At operation, it was concluded that interposition of a graft was not required, as a primary repair was possible by doing an end-to-end anastomosis between the LCCA stumps. However, at the moment of removing the fixation of the carotid shunt, it was inadvertently released into the aortic arch. At the end of carotid repair, the patient was stable, with palpable pulses in all limbs.

In order to identify the site to where the temporary shunt had embolized, abdominal, pelvic and lower limb vascular ultrasound scans were performed, using a Aplio® duplex scanner (Toshiba America Medical Systems, Inc. Tustin, California, USA), which employed multi-frequency linear transducers of 6-11 and 6.2-12.0 MHz. The foreign body (FB) was located in the left superficial femoral artery (SFA). At the exam, an initial assessment using mode B (Figure 1), it was possible to detect not only the FB inside the left SFA, but also the acoustic shadow it cast along its length. After that, using the power doppler (Figure 2), it was possible to identify blood flowing through the FB, confirming its patency.

As the surgical intervention to remove the FB was possible only hours later, another Doppler ultrasound exam was performed with the objective of marking its exact location and making the procedure easier. The second exam, performed with a 1.9-6.0 MHz multi-frequency convex transducer, showed that the FB had migrated to the left proximal popliteal artery. (Figures 3 and 4).

Thus, with the mark made precisely on the skin of the lower thigh (Figure 5), the surgeons made a relatively small incision and, through a medial access, did not have any problem to dissect the proximal third of the left popliteal artery. The FB was removed from the arterial lumen, via transverse arteriotomy (Figures 6, 7 and 8). Fogarty® catheters nº 3 and 4 (Edwards Lifesciences Macchi, São Paulo, SP, Brazil) were used to remove fresh thrombi from the popliteal artery, followed by proximal and distal instillation of a saline solution with heparin. After completion of the procedure, the patient had palpable distal pulses in the left lower limb. The patient was transferred back to the General Surgery ward 24 hours later, to continue treatment. He was placed in anticoagulation therapy and had no neurologic sequelae at the time of discharge from the hospital.

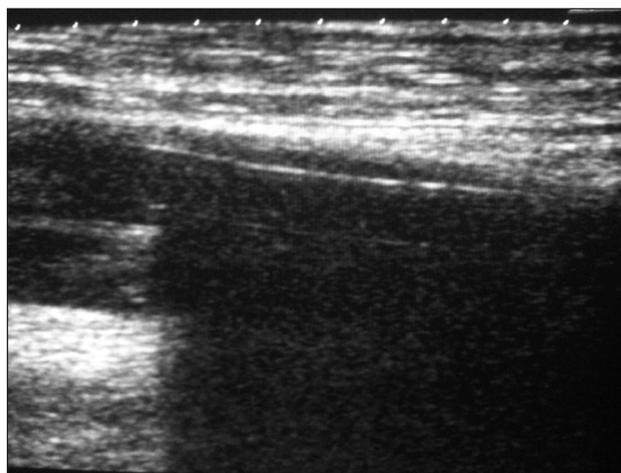


Figure 1. Mode B: foreign body into the left superficial femoral artery (note the posterior acoustic shadowing).

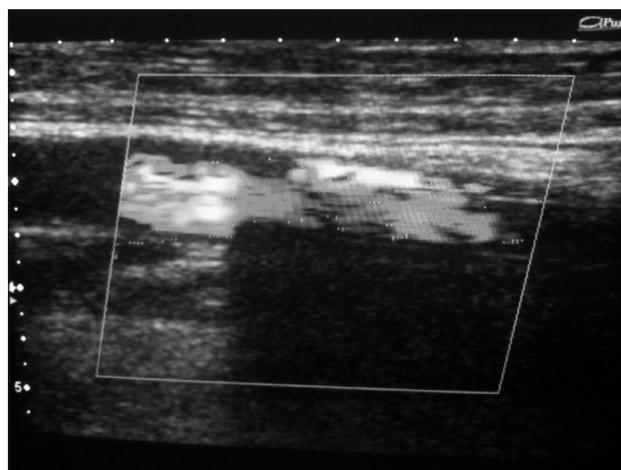


Figure 2. Mode B + power doppler: foreign body into the left superficial femoral artery (note the flow narrowing when going through the FB).

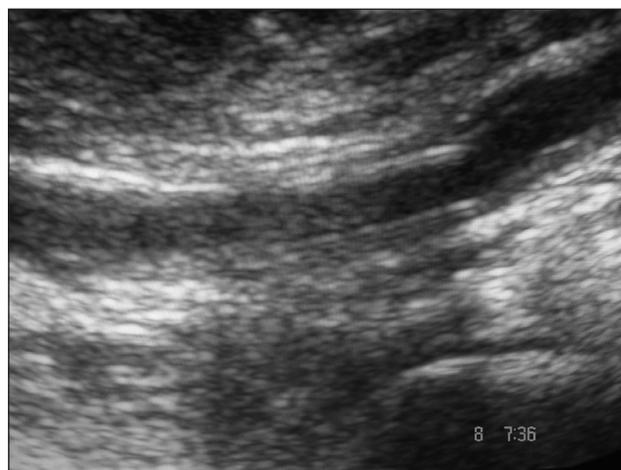


Figure 3. Mode B: distal end of the foreign body into the left popliteal artery.

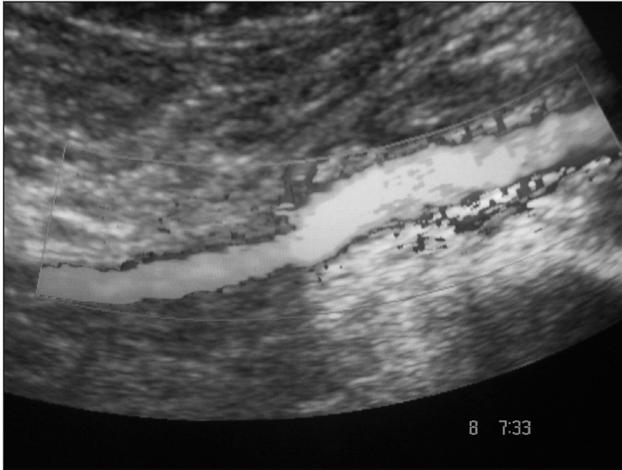


Figure 4. Mode B + power doppler: distal end of the foreign body into the left popliteal artery.

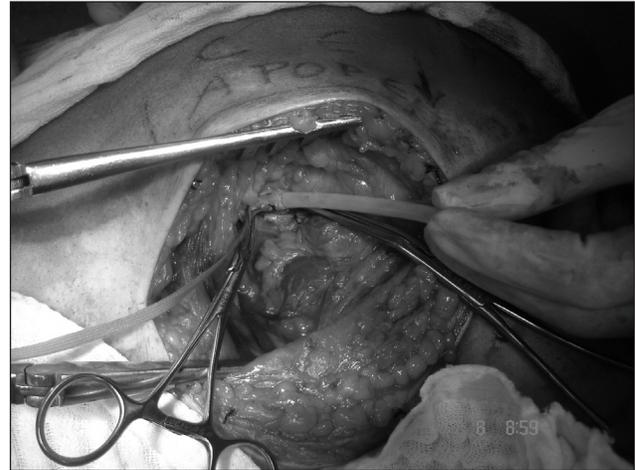


Figure 7. Removal of the foreign body from inside the left popliteal artery lumen.



Figure 5. Dermatology showing the foreign body (CE, in the illustration) migration from the left superficial femoral artery (AFSE, in the illustration) to the ipsilateral popliteal artery (APOPE, in the illustration).



Figure 8. Foreign body: nasogastric probe segment.

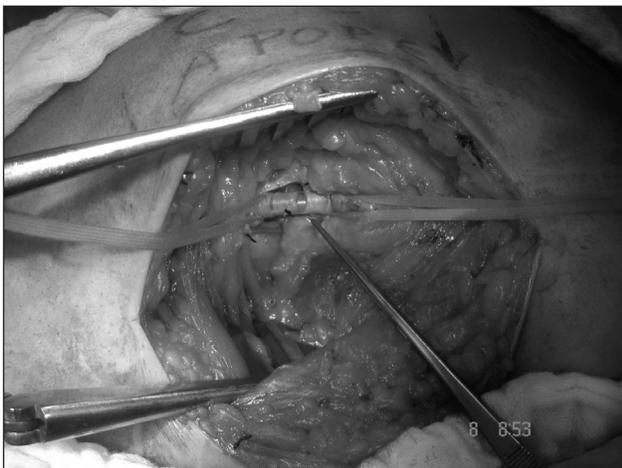


Figure 6. Transverse arteriotomy of the left popliteal artery with the nasogastric probe in its lumen (note that the incision was compatible with the preoperative marks on the skin).

Discussion

Intravascular shunts are artificial conduits introduced into the lumen of an injured blood vessel to temporarily restore flow, until the definitive reconstruction is feasible. It can be regarded as a damage control technique. In this case report, the general surgery team elected to use a 8.5 cm long segment of #16 nasogastric tube. The shunt material selection is a question of individual preference, as any sterile, smooth, rigid synthetic tube of proper caliber can be used as a temporary shunt³.

Temporary intravascular shunts main complications are thrombosis and displacement. The former is more frequent and can be a natural consequence of the procedure, if the temporary shunt is not removed

and the vessel injury definitively repaired. The latter, shunt migration to a more distal arterial branch, is a rare complication, with few cases reported in the medical literature³.

Embolization within the vascular system depends on several factors, such as: point of entry, the effects of gravity and patient's position at the moment of the accident. A FB end location depends upon its size and rigidity, as well as the flow patterns in vessels through it travels (Figure 9). FB migrations to remote locations are rare in the medical literature¹.

The clinical picture of arterial FB embolization depends on its location and the acute manifestations are well known to any physician: pain, paresthesia, coldness, paleness and no pulses distally to the occlusion site. Those findings were not present in this case, as the FB was a tube with a patent lumen, as documented by Doppler ultrasonography, thus rendering the patient asymptomatic⁴.

As there was no clinical indication of the FB location, a thorough scanning with arterial vascular ultrasound was recommended, a method that has already been used in some situations to detect intra-arterial FBs, especially in studies analyzing stents that had migrated from their original sites⁵⁻⁷. In the specialized medical literature consulted by the authors, no case report was found in which abdominal, pelvic and lower limb scanning was used to detect a temporary shunt that had migrated to a more distal artery. Arteriography would be a good option in case the FB could not be found by ecocolor Doppler ultrasonography. Although the FB is radiotransparent, it could have been identified from indirect signs, but involving higher cost and morbidity associated with the procedure^{1,2}.

FBs from the thoracic or abdominal aorta usually migrate to arteries of the lower limbs. The left lower limb is affected three times more often than the right, which might be explained as the result of the left common iliac artery coming out of the central axis of the aorta at a more acute angle (30°) than the right common iliac artery (45°)^{8,9}.

As the FB initially migrated to the LSFA, its location was easily determined by color Doppler ultrasound of lower limbs, which used linear transducers. The identification of flow through the FB, with the power Doppler, confirmed the LSFA patency, justifying palpable pulses in the left dorsalis pedis and posterior tibial arteries.

As there was no possibility of prompt surgical intervention, a new Doppler ultrasonogram was extremely

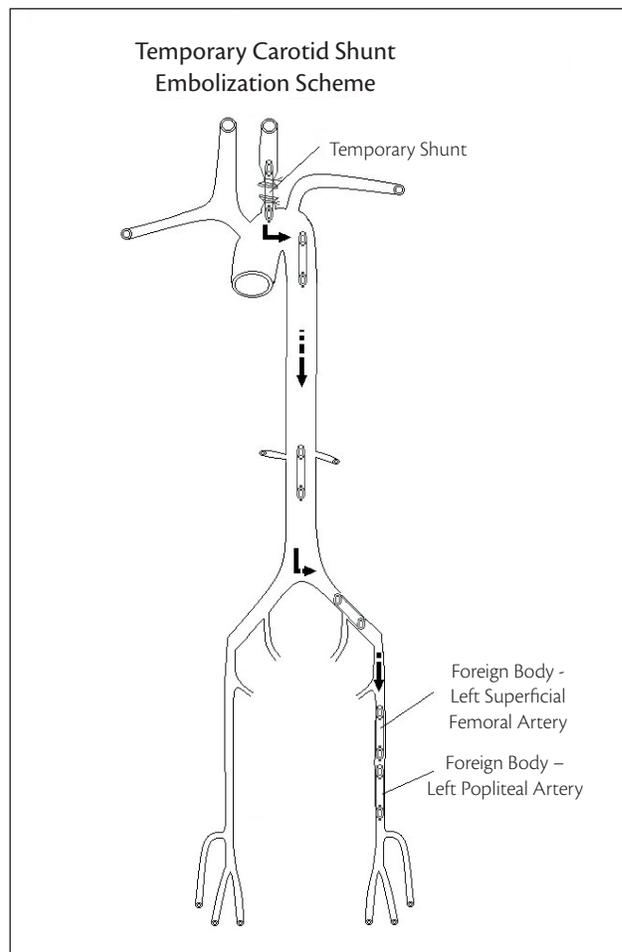


Figure 9. Scheme showing the long path of the temporary shunt.

opportune, as it showed the FB had migrated to the popliteal artery. In the second exam, a technical problem occurred during the proximal popliteal artery identification, due to thick thigh musculature, which was overcome with the utilization of a 1.9–6.0 MHz multi-frequency convex transducer. The precise marking of the FB location was essential for an easy surgical approach, without the need to enlarge the incision. Percutaneous removal of the FB would not have been possible due to the unavailability of materials that could be used to retrieve it and the FB size and caliber^{2,3}.

We conclude that the temporary carotid shunt is a good method to maintain carotid flow and the Doppler ultrasonography is a non-invasive, quick, low-cost diagnostic choice method, that can easily identify the topography of the FB embolization sites, and it provides exact location of FB embolus, allowing a surgical intervention through a smaller and more precise incision.

References

1. Uflacker R, Lima S, Melichar AC. Intravascular foreign bodies: percutaneous retrieval. *Radiology*. 1986;160(3):731-5.
2. Mafecka B, Kutarski A, Zabek A, et al. Percutaneous removal of endocardial implantable cardioverter-defibrillator lead displaced to the right pulmonary artery. *Cardiol J*. 2010;17(3):293-8.
3. Hirshberg A, Scott BG. Controle de danos no trauma vascular. In: Rich NM, Mattox KL, Hirshberg A, editores. *Trauma Vascular*. Rio de Janeiro: DiLivros. 2ª ed. 2006. p. 184-5.
4. Iyisoy A, Kursaklioglu H, Celik T, et al. Coronary stent embolization into right common femoral artery - the role of computed tomography angiography. *Clin Cardiol*. 2009 Jul;32(7):E9.
5. Ashar RM, Huettl EA, Halligan R. Percutaneous retrieval of a Wallstent from the pulmonary artery following stent migration from the iliac vein. *J Interv Cardiol*. 2002;15(2):101-6.
6. Wijesinghe LD, Coughlin PA, Gill K. An unusual cause of femoral embolus. *Cardiovasc Surg*. 2000;8(4):287-8.
7. Prabhudesai A, Khan MZ. An unusual cause of femoral embolism: angioseal. *Ann R Coll Surg Engl*. 2000;82(5):355-6.
8. Patel KR, Cortes LE, Semel L, Sharma PV, Clauss RH. Bullet embolism. *J Cardiovasc Surg (Torino)*. 1989;30(4):584-90.
9. Burkitt DS, Dhasmana JP, Mortensen NJ, Wisheart JD. 'Bullet embolism' to the popliteal artery following air rifle injury of the thoracic aorta. *Br J Surg*. 1984;71(1):61.

Correspondence

Leonardo Pires de Sá Nóbrega
SEPS 715/915 – Conjunto A – Bloco D – Ed. Pacini, salas 317 e 318 – Asa Sul
CEP 70390-155 – Brasília (DF), Brazil
E-mail: leonardo.nobrega@gmail.com

Author's contributions

Conception and design: LPSN
Analysis and interpretation: LPSN
Data collection: LPSN
Writing the article: LPSN
Critical revision of the article: AJAR
Final approval of the article*: LPSN, AJAR, CEK
Statistical analysis: N/A
Overall responsibility: LPSN
Obtained funding: LPSN

* All authors have read and approved the final version of the article submitted to J Vasc Bras.