

G Chir Vol. 27 - n. 1/2 - pp. 63-65  
Gennaio-Febbraio 2006

How I do it

## The role of popliteal artery embolectomy in the management of acute lower limb ischemia: our experience

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**SUMMARY:** The role of popliteal embolectomy in the management of acute lower limb ischemia: our experience.

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**Introduction.** *The Authors report their experience in the management of acute lower limbs ischemia through distal popliteal artery approach.*

**Patients and methods.** *Five popliteal embolectomy through a medial approach were performed; in one patient a posterior approach was carried out. Patients were included in two groups on the basis of ischemia duration: group A < 6 hours (3 patients) and group B > 6 hours (3 patients). Colour-duplex scan was performed in all the patients. The arteriotomy was closed with interrupted 7/0 monofilament polypropylene sutures.*

**Results.** *There were no peri-operative deaths. The primary limb salvage rate was 83.3% (5 patients). In one case (16.7%) a major amputation was performed. In one case (16.7%) a drop foot occurred.*

**Conclusions.** *The popliteal embolectomy is followed by excellent results and should be considered prior to thrombolysis or bypass graft revascularization. An appropriate use of duplex scan and a medial approach can lead to an high successful rates in terms of limb function and limb salvage also in cases with delayed ischemia.*

**RIASSUNTO:** L'embolectomia dell'arteria poplitea nel trattamento dell'ischemia acuta degli arti inferiori: nostra esperienza.

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**Introduzione.** *Gli Autori riportano la loro esperienza nel trattamento dell'ischemia acuta degli arti inferiori attraverso l'approccio diretto all'arteria poplitea distale.*

**Pazienti e metodi -** *Sono state eseguite 6 embolectomie dell'arteria poplitea attraverso un accesso mediale in 5 casi e per via posteriore in un caso. I pazienti sono stati suddivisi in due gruppi in base alla durata dell'ischemia: gruppo A < 6 ore (3 pazienti) e gruppo B > 6 ore (3 pazienti). In tutti i casi è stato eseguito un eco color-Doppler preoperatorio. L'arteriotomia trasversale è stata chiusa sempre in monofilamento 7/0 a punti staccati.*

**Risultati.** *Non si è osservata mortalità peri-operatoria. La percentuale di salvataggio d'arto è stata dell'83.3%. In un caso è stata eseguita un'amputazione di coscia, mentre in un caso abbiamo avuto un "drop foot".*

**Conclusioni.** *L'embolectomia per via poplitea dà ottimi risultati e dovrebbe essere sempre presa in considerazione prima di una terapia fibrinolitica o di un intervento di bypass. Un uso estensivo dell'ecocolore-Doppler e l'approccio mediale sembrerebbero garantire ottimi risultati in termini sia di salvataggio che di ripresa funzionale dell'arto anche in caso di ischemia tardiva.*

**KEY WORDS:** Popliteal artery - Embolectomy - Acute ischemia.  
Arteria poplitea - Embolectomia - Ischemia acuta.

### Introduction

Acute ischemia of the lower limbs due to arterial thromboembolism represents a critical condition with high rates of limb function loss or amputation. Emergency operations, by means of Fogarty catheter thromboembolectomy or intra-arterial thrombolysis, represents the treatment of choice; nevertheless, failure still occurs in large number of patients (1).

Despite the advances in revascularization techniques and cardiac and post-operative support, the

mortality and amputation rates remains high mainly in elderly patients and in those cases with distal embolization and consensual atherosclerotic involvement of the vessels and delayed revascularizations. Most cases of lower limb ischemia due to embolism are treated through a femoral artery approach under local anesthesia. In cases of embolus dislodgment to the popliteal trifurcation or in the distal segment of the tibial arteries, especially in the presence of atherosclerotic lesions, these procedures often fails to restore an adequate run-off.

Popliteal artery approach can be advocated in this cases, especially in patients with contraindications to intra-arterial thrombolysis or prior to bypass graft procedures.

We report our experience in the treatment of acute

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ischemia of the lower limbs due to popliteal embolism treated by embolectomy through a popliteal artery approach.

## Patients and methods

Between January 2003 and June 2005, 22 patients underwent surgical treatment for acute ischemia of the lower limbs due to embolism. There were 16 men and 6 women with age range from 55 to 82 years. Twelve of the patients were older than 75 years (54.5%). Risk factors were diabetes mellitus in 10 cases, hypertension in 14 patients and myocardial infarction in 12 cases.

Cardiac source of the emboli was found in all cases (10 cases with atrial fibrillation, 12 cases with previous myocardial infarction and positive echocardiography for auricular thrombus); there were no cases with multiple emboli. In six cases (27.2%) the location of embolus was the infrageniculate popliteal artery with involvement of crural arteries. Patients were included in 2 groups on the basis of ischemia duration: group A < 6 hours (3 patients) and group B > 6 hours (3 patients).

Prior to surgical treatment, colour-duplex scan was performed in all the patients and showed a complete patency of common femoral artery, profunda femoral artery and superficial femoral artery with the presence of hypoechogenic material in the distal popliteal artery at the level of its bifurcation, with no blood flow at the tibial arteries. In all cases there were no significant atherosclerotic lesions of the arterial wall.

In five cases we performed a popliteal embolectomy through a medial approach to the distal segment of popliteal artery, while in one patient a posterior approach was carried out. In all cases the tibio-peroneal trunk and the first portion of the anterior tibial artery were exposed. After full systemic heparinization, the proximal popliteal artery only was cross clamped. A transverse arteriotomy was carried out in all the cases in the most distal part of the popliteal artery, approximately 1-2 cm from its bifurcation. The embolectomy was performed proximally and distally with size 3 and 2 Fogarty catheters respectively. When a good run-off and run-in were obtained and no residual thrombus was observed, the arteriotomy was closed with interrupted 7/0 monofilament polypropylene sutures. Fasciotomies were carried out in all patients of group B.

All the patients received a complete heparinization during the postoperative course and then converted to oral anticoagulants.

## Results

There were no peri-operative deaths. One patient (16.6%) had an acute non lethal myocardial infarction.

There was one case (16.6%) with wound dehiscence. The primary limb salvage rate for this series was 83.3% (5 patients). In one of the three delayed cases (16.7%) a thigh amputation was performed for no reversible ischemic lesions and no possibility of revascularizations. In one case (16.7%) a drop foot occurred.

The mean follow-up was 16 months. Duplex-scan tests were performed at 1,3 and 6 months and then annually during the follow-up period. In no case we observed any residual hemodynamically significant stenosis at the artery suture point. During this period

all the patients were symptoms free with palpable distal arterial pulses.

## Discussion

Outcome of patients with popliteal embolism is often poor as compared to that of patients with femoral artery embolism (2). The failure of classic trans-femoral embolectomy can be attributed to the incomplete debridement of the clots in the distal popliteal artery and its branches. In fact, especially in cases with delayed ischemia, the popliteal embolus is frequently more adherent to the arterial wall. Furthermore, as showed by other Authors (3), the embolectomy catheter enter preferentially in the peroneal artery in the majority of the cases (89%) with residual thrombus remaining in the anterior and the posterior tibial arteries conditioning often an irreversible critical ischemia with limb loss. In addition, in the presence of atherosclerotic involvement, especially in diabetic patients, it is more difficult to obtain a complete clot debridement from the distal tibial arteries and therefore a limb salvage (4).

This anatomic consideration seems to justify a more aggressive and direct approach to the popliteal or to the tibial arteries in all of those cases where thrombus remains in the infra-popliteal arteries (5-8), as an alternative to intra-arterial thrombolysis or prior to bypass graft revascularization. In our experience, and according to other authors, we prefer a medial exposure of the distal popliteal artery and a direct exposure of each infra-popliteal vessels for 1-3 cm distally in order to obtain selective canulation and facilitate the catheter passage into each of the distal vessels (9,10). This approach required a more extensive exposure of the popliteal artery, division of the soleus muscle and ligation of the anterior tibial veins.

It is our opinion that this technique permits to achieve always a safe and good control of the arteries. Distal popliteal thromboembolectomy presents many advantage as compared to the proximal popliteal or to the tibial arteries direct approaches. This segment tends to be better preserved than the proximal popliteal artery or the distal tibial vessels and it is usually free from atheromatous degenerative lesions, with a sufficient calibre to perform an embolectomy or to permit an easy graft attachment (11). The medial route also permits to achieve a good and easy control of the run-off with the possibility to perform a bypass procedure in case of not satisfactory run-in or in cases with accidentally iatrogenic lesions and low inflow. Contrary, the posterior approach to the popliteal artery is often more difficult technically, requires a more extensive dissection in order to obtain a good control of distal tibial arteries with higher incidence

of nerve injury; furthermore in case of intra-operative inflow problems, bypass procedure becomes difficult to performe.

We performed always a transverse arteriotomy at the most distal portion of the popliteal artery, approximately 1-2 cm from it's bifurcation, which permits a direct and safe canulation of each vessel, avoiding the use of patch closure. All the arteriotomies were closed by means of interrupted 7/0 monofilament polypropylene sutures. In our opinion, in the presence of moderate involvement of the popliteal artery by atheromatous lesions, a transverse arteriotomy is easier to close without narrowing of the vessel, and it can be converted to longitudinal arteriotomy if arterial reconstruction is required.

No intra-operative angiographic study was performed in our series, in contrast with other Authors (12, 13). In fact, the possibility to perform a selective embolectomy of the tibial arteries and the direct observations of good run-off make this intra-operative exam non mandatory.

In our series, an extensive and accurate use of ultrasonography permitted the differentiation bet-

ween embolic and thrombotic occlusion and was able to show the presence of severe artery atherosclerotic changes conditioning the choice of thrombolytic therapy or a bypass graft procedures.

## Conclusions

The failure of transfemoral embolectomy in cases with popliteal or tibial arteries embolism may be the cause of high limb amputation rates among these patients. Although the role of popliteal embolectomy is not completely clear, in selective cases this method is often followed by excellent results. In fact, in cases of femoral embolectomy with no complete distal clot debridment and poor run-off, a popliteal embolectomy should be considered prior to thrombolysis or bypass graft revascularization.

In our experience an appropriatediagnostic use of duplex scan to select the patients and a medial distal popliteal approach with transverse arteriotomy can lead to a high successful rates in terms of limb function and limb salvage also in cases with delayed ischemia.

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