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REMOTE ENDARTERECTOMY WITH ENDOLUMINAL STENT IMPLANTATION: AN ALTERNATIVE PROCEDURE IN REVASCULARIZATION OF OBLITERATED FEMORAL ARTERY

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SUMMARY – Remote endarterectomy is an endovascular, minimally invasive approach in the treatment of obliterated femoral artery. Successful revascularization of the superficial femoral artery achieved by the procedure of remote endarterectomy using the Mollring Cutter device, followed by endoluminal stent positioning at the distal intimal flap, is described. A 72-year-old man with obliteration of the right femoral artery and intermittent claudication was operated on with this endovascular procedure. The operation lasted 70 minutes. The postoperative period was uneventful. A 64-year-old man with obliteration of the femoral artery and ischemic ulcers on the same leg underwent the same procedure, which took 68 minutes. Peripheral pulses were normal at discharge.

Key words: *Femoral artery, surgery; Endarterectomy, methods*

Introduction

The beginnings of femoral artery revascularization can be traced back to the early postwar years in 1947, in a paper by Joao Cid Dos Santos, who named the procedure "superficial femoral artery thromboendarterectomy"[1]. With gradual introduction of femoropopliteal bypassing by Kunlin in 1949, the bypass technique has gained predominance[2]. As early as 1967, Jorg Vollmar preferred semi-closed endarterectomy as a minimally invasive surgical procedure using a ring stripper. Also, mention should be made of the use of Dotter and Judkin's[3] coaxial catheter and Grünzig's procedure of percutaneous transluminal angioplasty from 1974[4], as considerable advancements in the field of endovascular technique.

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Endovascular surgery has gained definite affirmation through the invention of metal stents. A combination of the use of Mollring Cutter as a modification of Vollmar's ring stripper and stent application in the treatment of superficial femoral artery obliteration offers a novel solution in endovascular surgery[5].

Patients and Methods

The purpose of this presentation is to give brief description of the technique and to show the results obtained by presenting two of our patients.

A 72-year-old man presented with claudication in the right leg, which occurred after a short walking distance. Obliteration of the femoral artery was diagnosed by arteriography and remote endarterectomy was indicated on the basis of our surgical experience shared with F. Moll, the author of this surgical procedure. A standard procedure of identifying arterial structures in the right groin was per-

formed. Following i.v. administration of 100 U/kg heparin and clamping, longitudinal arteriotomy of about 2 cm was made in the common and superficial femoral artery. The endarterectomy plane was defined between the inner and outer arterial media, i.e. the plaque was separated from the arterial wall leaving the external elastic layer and adventitia. The entire diseased end-artery in the length of 28 cm was removed with Vollmar stripper and Mollring Cutter. The procedure was controlled under direct fluoroscopic observation with occasional contrast administration.

The positioning of a 4-cm long stent with a 7-mm diameter to secure the distal intimal flap followed. The arteriotomy in the terminal part of the common femoral artery and superficial femoral artery was closed with a polytetrafluoroethylene (PTFE) patch. Completion arteriography demonstrated an appropriate stent position and a widely patent endarterectomized artery. The procedure took 70 minutes to complete with a minimal blood loss.

A 64-year-old male patient was admitted to the Department for ischemic ulcers of the left foot and pronounced rest pain, i.e. in stage IV according to Fontaine. Arteriography showed obliteration of the femoral artery from the orifice to the end of the adductor canal. The same operative procedure was performed and a 33-cm long endartery segment was removed.

Following endarterectomy, an endoluminal stent (40 mm long and 7 mm in diameter) was placed to secure the distal intimal flap at the end of the endarterectomy. Control arteriography with contrast application showed excellent revascularization of the femoral artery. The arteriotomy in the common and superficial femoral artery was closed with an intervascular cardiovascular patch. The entire surgical procedure lasted for 68 minutes with negligible blood loss.

Both patients were anticoagulated with heparin for 3 days, followed by antiaggregation therapy with 100 mg acetylsalicylic acid (Andol 100). The patients were discharged on day 7 postoperatively with normal peripheral arterial pulse.

Discussion

Atherosclerotic arterial disease of the lower extremities is a very common event, especially after the age of 55. The prevalence of intermittent claudication as one of its major manifestations is 4.5% in the population of 55-74 years of age[6]. Some 3%-5% of patients with intermittent claudication will develop critical limb ischemia, i.e. critical ischemia of the extremity, which results in amputation in 25% of the treated patients[6,7].

The complete management of these patients, which includes both medical and surgical treatment modalities, comprises a wide array of actions within different medical specialties such as angiology, interventional radiology, vascular surgery, etc. Bearing in mind the high incidence of other atherosclerotic diseases such as coronary and carotid artery disease, all this highlights the complexity of the medical and economic aspects in treating atherosclerotic disease of the lower extremities.

The attempts to treat the occlusive disease of superficial femoral artery with semi-closed endarterectomy stem from the 1950s and 1960s. The procedure was gradually dismissed due to advancements in bypass techniques, including the use of autogenous greater saphenous vein and artificial prosthetic grafts. The main objection to this procedure was its inability to deal with the distal end of the endarterectomy, i.e. the distal intimal flap, which led to unexpected restenosis and occlusions. The current procedure introduces the possibility to perform a sharp cut at the distal end using the Mollring Cutter, which is followed by stent positioning to avoid difference in diameter at the distal edge. New radiologic techniques used during surgical procedures, i.e. intraoperative arteriography and the possibility of follow-up with color flow Duplex scanning open further possibilities to prevent restenosis.

The procedure of remote endarterectomy and intraluminal stent positioning represents an alternative solution in treating occlusions of the superficial femoral artery. To date, the treatment algorithm has comprised medical management of patients with claudication and, in case of medical treatment failure or clinical stage III or IV according to Fontaine, the use of bypasses, primarily the reverse

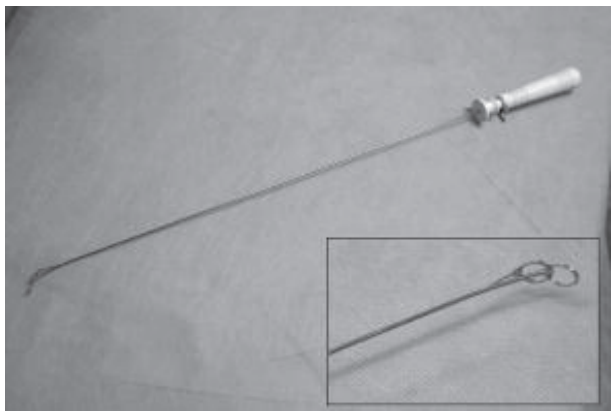

Fig. 1. Mollring Cutter, the loops of the ring strip cutter are shown in the inclusion figure.

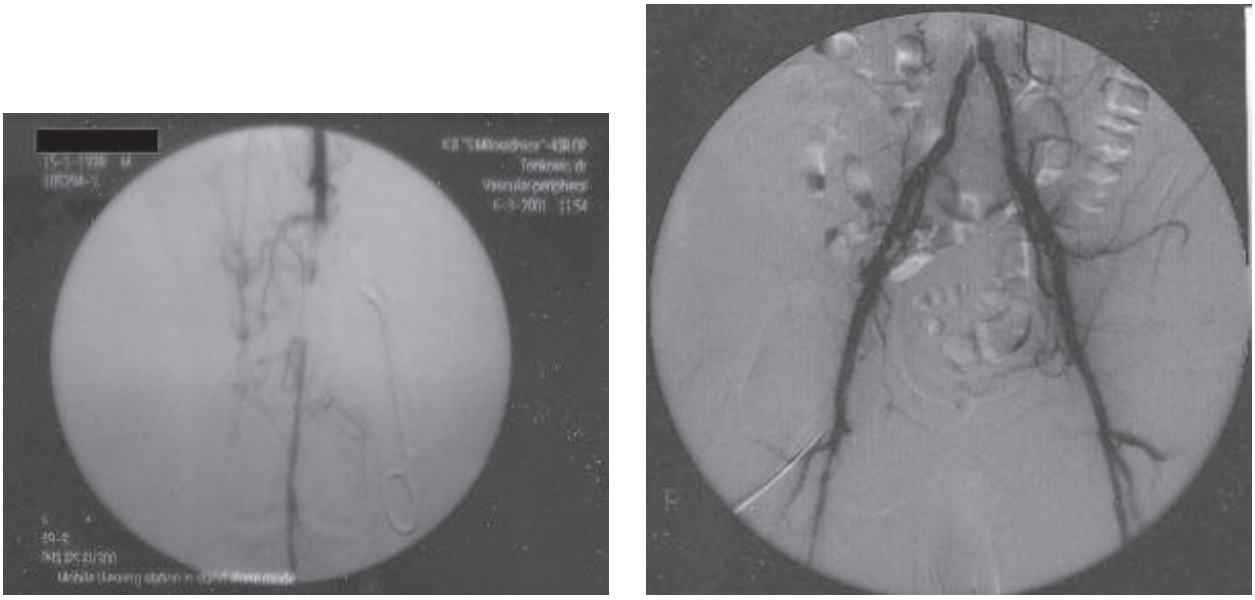

Fig. 2. Preoperative angiograms: A) aortic bifurcation with the iliac and femoral arteries; B) right superficial femoral artery; obliteration of a long segment within the adductor canal.

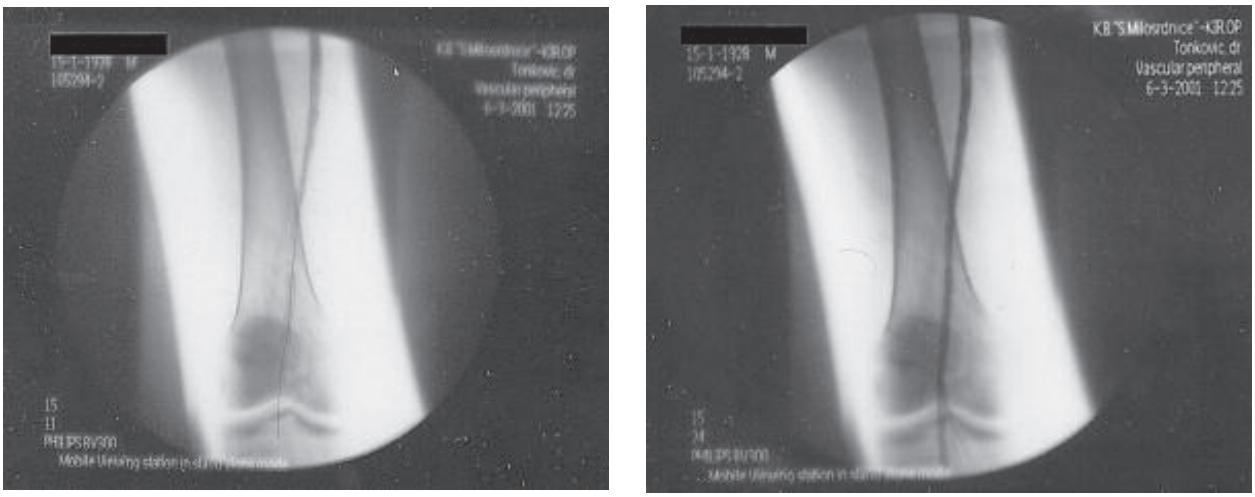

Fig. 3. Postoperative angiograms: A) visualization of the stent, minimal contrast administration; B) endarterectomized superficial femoral artery and stent after contrast administration.

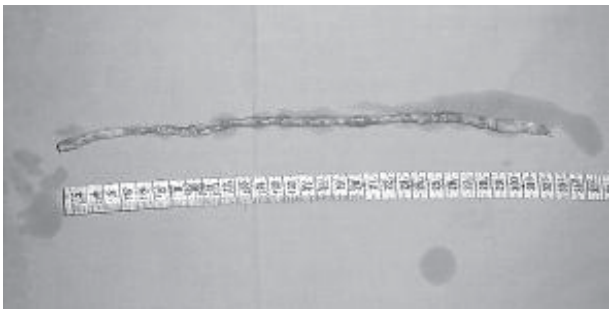

Fig. 4. The endarterectomized interior of the superficial femoral artery.

autogenous greater saphenous vein when possible to form a distal anastomosis onto the first segment of popliteal artery. In case the greater saphenous vein is not morphologically suitable for bypassing, a synthetic prosthetic graft of Teflon or Dacron is used. An important issue in revascularization attempts is the use of one type of bypass after the other has become occluded, irrespective of whether the first operative bypass procedure included the use of autogenous vein or artificial graft. Revascularization procedures in the femoropopliteal region often have a time limited patency, and percutaneous transluminal angioplasty in indicated

cases has a 5-year patency of 30%[8]. Reverse greater saphenous vein bypasses and artificial bypasses have a 5-year patency of about 60% and 40%, respectively[9].

The procedure of remote endarterectomy with subsequent endostent positioning is a surgical procedure that may represent the first and definite procedure. In case of femoral artery reocclusion, it leaves the possibility to perform at a later time one of the bypass techniques, which are in this way left unused. In other words, if every revascularization procedure is potentially time limited due to the known causes such as neointimal hyperplasia and atherosclerotic process, adding different surgical procedures provides an extension in the total revascularization period.

Remote endarterectomy with stent application is a new operative procedure, which has been reported as an initial experience only in 1995[5]. The results obtained at St. Antonius Hospital in Nieuwegein, the Netherlands, and demonstrated by the authors, are encouraging, showing the 2-year primary, primary assisted and secondary patency of 73%, 86% and 86%, respectively[10,11]. The procedure gains importance gradually due to the complementation of the operation with endoluminal stent application and reducing restenosis by brachytherapy[13], which will be presented with new results in the near future.

Our own experiences, despite the low number of cases and limited follow-up time, confirm the notion that the procedure of remote endarterectomy is an alternative procedure in revascularization of the obliterated femoral artery, which will enter the standard vascular clinical practice.

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Sažetak

UDALJENA ENDARTEREKTOMIJA S UGRADNJOM ENDOLUMINALNOG STENTA: ALTERNATIVNI POSTUPAK U REVASKULARIZACIJI OBLITERIRANE BEDRENE ARTERIJE

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Udaljena endarterektomija predstavlja endovaskularni pristup i minimalno invazivni postupak u liječenju obliteracije bedrene arterije. Prikazane su uspješno učinjene revaskularizacije površinske bedrene arterije primjenom postupka udaljene endarterektomije upotrebom Mollring Cuttera uz postavljanje endoluminalnog stenta na distalnoj stubi. Bolesnik u dobi od 72 godine s obliteracijom desne bedrene arterije te klaudikacijskim tegobama operiran je ovim endovaskularnim postupkom. Operacijski zahvat trajao je 70 minuta. Poslijeoperacijski tijek protekao je uredno. Bolesnik star 64 godine s obliteracijom bedrene arterije i ishemijskim ulkusom na istoj nozi operiran je istim postupkom. Kirurški zahvat trajao je 68 minuta. Pri otpustu imao je uredne periferne pulzacije.

Ključne riječi: *Femoralna arterija, operacija; Endarterektomija, metode*