ORIGINAL ARTICLE

Clinical Outcome of Drug-Eluting Balloon Endovascular Treatment for Femoropopliteal Lesions in Patients with Intermittent Claudication

Resultado clínico del tratamiento endovascular con balón liberador de fármaco en el paciente claudicante con enfermedad femoropoplítea

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ABSTRACT

Background: Restenosis continues to be the great challenge of endovascular therapy, and drug-eluting balloons (DEB) have been developed to reduce it. The aim of this study was to analyze the results of this therapy.
Methods: A retrospective analysis of 40 limbs with femoropopliteal lesions treated with DEB was conducted in patients with intermittent claudication.
Results: Technical success was obtained in the 40 (100%) limbs treated, without evidence of serious complications related with treatment, and with 92.5% of asymptomatic limbs during the follow-up period of 11.1 months. In three limbs, a new angioplasty was performed due to symptomatic recurrence.
Conclusions: The drug-eluting balloon has proven to be a useful, safe and effective tool for the treatment of de novo and in-stent restenosis lesions; however, TASC C-D lesions require the use of greater number of stents.

Key Words: Neointima - Hyperplasia - Drug-Eluting Balloons – Intermittent Claudication – Femoral artery - Popliteal

RESUMEN

Introducción: La restenosis continúa siendo el gran desafío de la terapia endovascular, por esa razón, se han desarrollado balones liberadores de fármaco (BLF) con la finalidad de reducir la restenosis. El objetivo de este trabajo es analizar los resultados de esta terapia.
Material y Métodos: Se realizó un análisis retrospectivo de 40 extremidades de pacientes claudicantes con lesiones femoropoplíteas tratados con BLF.
Resultados: Se obtuvo el éxito técnico en las 40 (100%) extremidades tratadas con una media de seguimiento de 11,1 mes sin evidencia de complicaciones graves relacionadas con el tratamiento con un 92,5% de las extremidades asintomáticas durante el seguimiento. En tres extremidades se realizó una nueva angioplastia por recidiva sintomática.
Conclusiones: El BLF ha probado ser una herramienta útil, segura y eficaz para el tratamiento de lesiones de novo y restenosis intrastent; no obstante, en las lesiones TASC C-D se requiere la utilización de un mayor número de stents.

Palabras clave: Hiperplasia neointimal - Balones liberadores de drogas – Claudicación - Lesiones femoropoplíteas.

Abbreviations

DEB	Drug-eluting balloons	**SENS**	Self-expandable nitinol stents
ISR	In-stent restenosis		

INTRODUCTION

Endovascular treatment currently represents the initial revascularization therapy in patients with peripheral vascular disease due to its low morbidity and mortality and fast recovery. (1)

Although multiple therapeutic modalities have been developed, the Achilles heel of endovascular treatment continues to be long-term patency, especially in the femoropopliteal region, inducing greater number of reinterventions to maintain satisfactory

Rev Argent Cardiol 2018;86:263-265. http://dx.doi.org/10.7775/rac.v86.i4.10539

Received: 09/24/2017 – *Accepted:* 03/11/2017

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clinical outcomes. The main mechanism affecting patency is the development of neointimal hyperplasia; (2) thus, drug-eluting balloons (DEB) and stents have been developed, with paclitaxel as the most used drug due to its proven antiproliferative effect. (1, 3)

The aim of this study was to analyze the clinical outcomes of endovascular treatment with DEB for femoropopliteal lesions in patients with intermittent claudication.

METHODS

A retrospective descriptive study of 40 limbs was performed in 38 patients with femoropopliteal lesions and associated intermittent claudication, treated with DEB between October 2012 and January 2016.

The inclusion criteria were femoropopliteal lesions with vascular Rutherford II and III intermittent claudication. (4).

Lesions were categorized according to the Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC) classification (5) and in-stent restenosis (ISR) according to the Tosaka classification. (6)

The treatment of choice was DEB angioplasty, or DEB plus self-expandable nitinol stents (SENS) post-angioplasty in patients with residual stenosis >30%, or dissection compromising blood flow.

Patients were controlled at 1, 3, 6, 12 months and annually, when interrogation and physical examination were performed.

The technical success of the procedure was defined as the presence of post-treatment residual stenosis <30% without dissection compromising flow.

Complications were divided into major and minor depending on the treatment adopted. Complications were major in patients requiring invasive treatments and minor in those in whom conservative treatments were used.

Symptomatic improvement was assessed according to the walking distance covered to onset of symptoms. Four groups were considered: asymptomatic, symptomatic with improvement (decrease of one or more degrees in the Rutherford classification), without improvement (no clinical change after treatment) and symptom worsening (increase of one degree in the Rutherford classification).

RESULTS

A total of 38 patients with intermittent claudication underwent endovascular treatment with DEB in 40 limbs with femoropopliteal lesions. Mean age was 70.45 years (range 49-86); 21 were women and 17 were men. The characteristics of the population are summarized in Table 1.

Table 1. Risk factors

Risks factors	N (%) limbs
Diabetes	8 (20%)
Hypertension	36 (90%)
Active smoker	10 (25%)
Ex-smoker	18 (45%)
Dyslipidemia	26 (65%)
Chronic kidney failure	4 (10%)
Ischemic heart disease	8 (20%)

Among the 40 limbs treated, 25 (62.5%) were de novo lesions and 15 (37.5%) ISR. According to the Tosaka classification, 2 (13.3%) of the 15 limbs with ISR were grade I, 7 (46.7%) grade II and 6 (40%) grade III. Nine (22.5%) of the total number of limbs treated had TASC A lesions; 11 (27.5%) TASC B; 11 (27.5%) TASC C and 9 (22.5%) TASC D lesions.

In 24 (60%) limbs, the only treatment was DEB and in 16 (40%) DEB plus SENS due to ISR or post-angioplasty dissection limiting flow, using a total of 69 DEB and 21 SENS. Among the 69 DEB used, 67 were IN.PACT Admiral (Medtronic Inc., Santa Rosa, CA) and 2 Freeway (Eurocor, Bonn, Germany).

Technical success was obtained in the 40 limbs (100%) treated. During the procedure, there was a single complication consisting of a distal embolus that was successfully aspirated with the catheter. After the procedure, a femoral pseudoaneurysm was produced, which was resolved by percutaneous embolization with thrombin.

At four months of follow-up a patient who had been treated for ISR in both limbs presented septicemia from a urinary focus, which colonized both femoral stents and developed multiple mycotic aneurysms in the stents' pathway, requiring bilateral vein femoropopliteal bypass with a 15-day interval between both procedures. The stents were patent and without evidence of ISR and the patient was asymptomatic at the time of surgery.

After DEB treatment, 35 patients received double antiplatelet therapy with aspirin 100 mg/day and clopidogrel 75 mg/day for 3 months, followed by aspirin 100 mg/day indefinitely, while 3 patients received oral anticoagulation and 100 mg aspirin for cardiac arrhythmia.

Follow-up was performed in all patients for an average of 11.1 months. During follow-up, 92.5% of the limbs were asymptomatic (Rutherford 0). In one patient a femoropopliteal bypass was performed in the two limbs (5%) due to mycotic aneurysms, with patent stents without restenosis and without symptoms of intermittent claudication. In 3 limbs (7.5%) a new treatment was performed due to symptomatic recurrence secondary to restenosis of the lesions treated at 21, 18 and 17 months from initial DEB treatment. Two of them were de novo lesions and one in-stent restenosis.

DISCUSSION

This study is the first series on DEB endovascular treatment of femoropopliteal lesions for patients with intermittent claudication published in Argentina.

Recent studies comparing bailout stenting vs. DEB show results in favor of the pharmacoactive balloon in terms of patency and lumen loss of the lesions treated. (3, 7, 8)

Tepe G et al. published a randomized trial comparing bailout stenting with DEB for the treatment of de novo femoropopliteal lesions during 12-month

follow-up. In that study, some of the parameters analyzed were primary patency, reoperation rate and clinical outcome in lesions with an average length of 8.9 cm. Primary patency was 89.8% for DEB vs. 66.8% for bailout stenting with a reoperation rate of 2.4% for DEB vs. 20.6% for bailout stenting, and with clinical improvement of 85.2% for DEB vs. 69.8% for bailout stenting. (8) In this same group of patients the follow-up period was extended to 24 months and it was observed that DEB results were sustained over time, with a primary patency of 78.9% for DEB vs. 50.1% for bailout stenting, with a reoperation rate of 9.1% for DEB vs. 28.3% for bailout stenting and a clinical improvement of 76.9% for the group treated with DEB vs. 59.2% for the group treated with bailout stenting.

Although in this work we did not evaluate patency, clinical outcome was analyzed, observing that at a mean 11.1-month follow-up, 92.5% of the treated limbs were asymptomatic.

Half of the patients had TACS C-D lesions, which explains the greater use of post-angioplasty stents with DEB. In 2 of the 3 (7.5%) limbs that underwent a reoperation, the primary lesions treated were de novo TASC A, and the remaining one, a TASC C and Tosaka II in-stent restenosis, which indicates that there was no higher rate of reoperation in long injuries. The explanation may be that half of the TASC C-D lesions were treated with DEB plus SENS, while in TASC A-B the combination of DEB plus SENS was only used in 30% of lesions.

Liistro et al. published a trial comparing the results of DEB vs. a control group of balloon with bailout stenting for the treatment of ISR in diabetic patients. After one-year follow-up, better results were obtained for DEB, with a restenosis and reoperation rate of 19.5% and 13.6% for DEB vs. 71.8% and 31% for balloon with bailout stenting, respectively. (9) Despite these results, they were not preserved with the passage of time, since after three years of follow-up the results are similar for both groups. (10)

Among the 15 limbs treated for ISR in our series, 7 had a follow-up of more than 12 months with an average of 22.5 months, all of which remained asymptomatic without need for reintervention after angioplasty with DEB.

Limitations of this work are the limited number of limbs treated and lack of patency assessment. However, in patients with intermittent claudication, clinical follow-up is a faithful reflection of patency since in the event of severe restenosis or occlusion of the treated lesions, these patients have symptomatic recurrence.

CONCLUSIONS

Drug-eluting balloon has proven to be a useful, safe and effective tool for the treatment of short TASC A-B lesions; yet, long-term results in long TASC C-D lesions remains to be known. However, based on our results, we consider that DEB is a good alternative for the treatment of extended lesions, specially, in case of ISR.

Conflicts of interest

None declared.

(See authors' conflicts of interest forms on the website/ Supplementary material)

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