Percutaneous Transluminal Angioplasty of Popliteal Artery Steno-occlusive Atherosclerotic Disease at the King Hussein Medical Center: Two Year Primary Patency

Jan Al Shishani, 1*Sizeph Haddad, 2Kristi Janho 3

Abstract

Purpose: To evaluate the two year primary patency following the percutaneous transluminal angioplasty (PTA) used to treat popliteal artery steno-occlusive atherosclerotic disease in the King Hussein Medical Center (KHMC).

Methods: A retrospective single-center study, analyzing the patency of 92 PTA procedures of the popliteal artery performed in 86 patients. Follow up patency was assessed by clinical examination, the ankle-brachial pressure index, and color duplex scanning over two years.

Results: Two year primary patency following popliteal artery PTA was 76% for stenotic lesions versus 37% for occlusive lesions. There was no procedure related periprocedural mortality.

Conclusion: Popliteal artery PTA is performed effectively in the KHMC for patients with disabling intermittent claudication and critical lower limb ischemia with better results in stenotic lesions in comparison to occlusive lesions.

Keywords: Popliteal artery, Atherosclerosis, percutaneous transluminal angioplasty, critical lower limb ischemia, disabling intermittent claudication.

Introduction

Atherosclerotic peripheral arterial disease affects different segments of the arterial tree. Different modalities are present for treatment according to the involved segment and complexity of the disease including medical, endovascular and surgical treatments according to Trans-Atlantic Inter-Society Consensus (TASC) recommendations.1,3

Popliteal artery is not an exclusion, and atherosclerosis is the main steno-occlusive disease affecting it with endovascular intervention being one of its treatment options characterized by low morbidity and mortality and the possibility of performing it as an outpatient procedure or during short hospital stays.4-7

2. Interventional Radiologist, Interventional Radiology Department, King Hussein Medical Center, Amman, Jordan.

* Correspondence should be addressed to:
Jan Al Shishani
P. O. Box: 10081, Postal code 13181, Zarqa, Jordan.
E-mail: Jan_shishani@yahoo.com; christiejanho2001@yahoo.com

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Although there is no consensus on the optimal form of endovascular intervention used in this arterial segment, PTA is a primary endovascular option for such lesions. Still there is some confusion in the literature about it being the first treatment choice in this arterial segment.\(^8,9\)

Furthermore, attractive new technologies for popliteal artery steno-occlusive lesions ranging from transcatheter plaque excision to laser ablation, rotational atherectomy, cryoplasty, brachytherapy, and placement of drug-eluting stents are now becoming available with encouraging results.\(^9-12\)

This is a retrospective study that was performed to evaluate the two year primary patency of popliteal artery PTA in our institution the KHMC in Amman.

**Methods**

All the patients who underwent lower limbs PTA at the KHMC between November 2006 and April 2009 were reviewed. Of those, 92 PTA procedures were performed for the popliteal arteries in 86 patients. Forty seven limbs (51.1\%) had popliteal artery stenosis (1st group) and forty five limbs (48.9\%) had popliteal artery occlusion (2nd group). All procedures were performed either for disabling intermittent claudication (Rutherford class 3) or critical lower limb ischemia (Rutherford class 4-6).\(^13\) Aorto-iliac and femoral arterial segments in all patients were free from significant flow limiting lesions identified by angiogram or duplex scanning (peak systolic velocity (PSV) at stenosis / PSV upstream < 2.0, PSV < 200 cm/sec).\(^14,15\) There was at least one patent distal run-off artery down to the ankle. Patients with coexistent aorto-iliac or femoral significant disease and patients with absent patent distal sun-off artery were excluded from this study. Characteristics of the patients are shown in table (1).

All procedures were performed in the interventional radiology suite at the KHMC. Eighty seven procedures were performed by retrograde puncture of the contralateral common femoral artery (CFA) and the rest by antegrade puncture of the ipsilateral CFA. Those were the patients with unfavorable aortic bifurcation or local contralateral groin surgery. A 6-Fr sheath was used in all cases. A 0.038 hydrophilic wire was used to cross the lesions directed by a vertebral shaped catheter with those cases in which crossing by the wire failed being excluded from the primary patency results. Four and five mm diameter balloons were used for angioplasty. Systemic heparinization was performed in all cases (80 UI/Kg) (figures 1 and 2).

Patients were discharged the second day after the re-measurement of the ankle brachial pressure index and followed up in the vascular surgery clinic at 3, 6, and 12 months and then annually by a clinical examination and a duplex scan. During the follow up period, patients who had a recurrent flow limiting a significant popliteal lesion by duplex scan (peak systolic velocity (PSV) at stenosis / PSV upstream > 2.0, PSV = 200 - 400 cm/sec) which is the Washington university duplex criteria for peripheral vascular disease underwent a repeat PTA procedure and thus were excluded from the primary patency results.\(^14,15\) Patients with failed PTA procedures that were associated with clinical deterioration, both initially or during the follow up period, underwent surgical bypass procedures and were also excluded from the primary patency results. Patients were followed up for a mean period of two years.

**Table (1): Patient characteristics.**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Patients, %</th>
</tr>
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<tbody>
<tr>
<td>Age (years)</td>
<td>66 (range: 45-82)</td>
</tr>
<tr>
<td>Male: Female</td>
<td>65.21 (76%: 24%)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>57 (66%)</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>61 (71%)</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>39 (45%)</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>31 (36%)</td>
</tr>
<tr>
<td>Smoking history</td>
<td>67 (80%)</td>
</tr>
<tr>
<td>Disabling intermittent claudication</td>
<td>22 (26%)</td>
</tr>
<tr>
<td>Critical limb ischemia</td>
<td>64 (74%)</td>
</tr>
<tr>
<td>Popliteal stenosis</td>
<td>47 (51.1%)</td>
</tr>
<tr>
<td>Popliteal occlusion</td>
<td>45 (48.9%)</td>
</tr>
</tbody>
</table>
Table (2): Initial technical success and two year primary patency.

<table>
<thead>
<tr>
<th>Popliteal lesion</th>
<th>Initial technical success</th>
<th>Two year primary patency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Popliteal stenosis (group A)</td>
<td>89%</td>
<td>76%</td>
</tr>
<tr>
<td>Popliteal occlusion (group B)</td>
<td>58%</td>
<td>37%</td>
</tr>
</tbody>
</table>

Results

Initial technical success was 89% for stenotic lesions and 58% for occlusive lesions as five limbs having popliteal artery stenosis (1st group) and 19 limbs having popliteal artery occlusion (2nd group) failed the primary PTA procedure and thus underwent surgical bypass procedures (table 2).

Four patients developed minor groin hematoma at the access site that was treated conservatively and didn’t require blood transfusion or admission to hospital. There were no major complications.

During the follow up period, eight limbs from the 1st group and 12 limbs from the 2nd group developed a recurrence of significant steno-occlusive lesion. Out of those 20 limbs, 4 limbs underwent a successful second PTA procedure. The remaining 16 limbs failed this second PTA procedure. Out of those last 16 limbs, 12 limbs were associated with clinical deterioration (disabling intermittent claudication or critical limb ischemia) and underwent successful surgical bypass, whereas the remaining 4 limbs were not associated with clinical deterioration and the patients were followed up conservatively in our vascular surgery clinic.

During the follow up period, nine patients (three from the 1st group and six from the 2nd group) died and six patients (four from the 1st group and one from the 2nd group) lost follow up and all were excluded from the final results.

At 2 years, 26 limbs from the 1st group and 7 limbs from the 2nd group remained patent without disabling claudication or critical limb ischemia and without the need for any further intervention. Thus, primary patency results over two years were 76% for stenotic lesions and 37% for occlusive lesions (table 2).

Discussion

Over the last decade, the number of endovascular procedures performed on the popliteal artery has significantly increased but still there is no
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consensus on the optimal form of endovascular intervention used in this arterial segment. Different endovascular modalities were used for those lesions with different results.10,12,16-22

In our study, results of PTA for popliteal artery stenosis were encouraging and comparable to international studies such as the study of Ilias Dalainas and Giovanni Nano in which the primary patency after two years for popliteal artery stenotic lesions was 86% for intermittent claudication (IC) patients and 54% for critical limb ischemia patients.4 Furthermore, Popliteal artery PTA didn’t compromise further bypass surgery.9,23

Although results in the case of popliteal artery occlusion were less durable, still it may be reasonable to dilate such lesions for limb salvage indications in patients with prohibitive surgical risks, and it can be an option for patients without available saphenous veins for a venous graft.9

Recurrence of a significant steno-occlusive lesion was treated in our study as well as in some other studies by a repeat angioplasty with some further success suggesting the possible benefit for a second PTA attempt in those patients before proceeding to a surgical bypass procedure.5,23

Our experience shows better results of PTA in the management of popliteal artery stenosis compared to popliteal artery occlusion reflecting the need for further advances in the means of endovascular recanalization of a totally occluded popliteal artery to improve its outcome.

Conclusion

Popliteal artery PTA is performed effectively as a treatment option at the KHMC for patients suffering from disabling intermittent claudication or critical lower limb ischemia due to popliteal artery stenosis. Nevertheless, the results are not as promising in the case of popliteal artery occlusion.

References

قسمة الشرايين المأشبة لمرضى تصلب الشرايين في مدينة الحسين الطبية
جان الشيشاني، جوزيف حداد، كريستي جنحو
مدينة الحسين الطبية، عمان، الأردن

الملخص

الهدف: تم تقييم الحالات لمدة عامين بعد القسطرة عبر اللمعة بطرق الجلد (PTA) والتي تستخدم لعلاج التضيق والانسداد في مرضى تصلب الشرايين في مدينة الحسين الطبية (KHMC).

الطريق: تحققت السالكية الإجراءات 92 من الشريان المأشبية في 86 مريضًا. تم تقييم السالكية عن طريق الفحص السريري، ومؤشر ضغط الكاحل والعضد والمسح الشعاعي لمدة تزيد عن عامين.

النتائج: كانت السالكية الأولية بعد عامين 76% من الحالات التقيص مقابل 37% من الحالات الانسداد، ولم تكن هناك وفيات.

الاستنتاج: تم تنفيذ المأشبة الشريان بفعالية في KHMC. أفضل في حالات التقيص بالمقارنة مع آفات الانسداد.

الكلمات الدالة: الشريان المأشبي، ونصلب الشرايين، قسطرة عن طريق الجلد، تقلص التروية الحمراء في الأطراف السفلية، تعطيل العرق المقطع.