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Percutaneous Transluminal Angioplasty for Critical Limb Ischaemia in Octogenarians and Nonagenarians

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Objective. To determine the early and late outcome of percutaneous transluminal angioplasty (PTA) for critical limb ischaemia (CLI) in patients aged 80 years and over.

Methods. Retrospective case note review of all patients aged 80 years and over who underwent attempted PTA for CLI between 1st January 1999 and 31st December 2000. Minimum follow-up was 12 months with a maximum of 42 months.

Results. One hundred and twenty-eight PTAs were attempted in 113 severely ischaemic limbs of 98 patients (36 men and 62 women of median age 84, range 80–97, years). Seventy patients had significant co-morbidity. The indication for revascularisation was rest pain in 47 procedures, ulceration in 66 and digital gangrene in 15. The anatomical segments involved were iliac ($n = 19$), superficial femoral ($n = 92$), popliteal ($n = 91$) and infrapopliteal ($n = 72$). The technical success rate was 108 of 128 (84%) procedures. Early technical complications occurred in 24 (19%) procedures: four major, 20 minor. The 30-day operative mortality rate was six of 128 (5%). The median (range) in-hospital stay was two (1–72) days. Early or delayed surgical revascularisation was required in 11 limbs and there were six major limb amputations during the study period. The 24-month patient survival rate was 59%. The 24-month primary and secondary symptomatic patency and secondary limb salvage rates were 52, 69 and 95%, respectively.

Discussion. PTA is safe, requires a short hospital stay, and is clinically effective in the majority of very elderly patients with CLI. Although minimally invasive, the relatively high peri-procedural mortality rate and low 24-month survival rate reflect the high co-morbidity of this group of patients.

Key Words: Critical limb ischaemia; Octogenarian; Angioplasty.

Introduction

As the life expectancy of the population increases, so more octogenarians and nonagenarians are being referred to the vascular surgeon for further management of critical lower limb ischaemia (CLI). These very elderly patients have a significantly higher incidence of cardio-respiratory co-morbidity and diabetes mellitus and a significantly shorter life expectancy than their counterparts without CLI.^{1,2} Successful revascularisation is associated with reduced peri-procedural mortality and prolonged life expectancy compared with primary major limb amputation, and can maintain or improve functional outcome in the majority of very elderly patients.^{1–5} Single centre series from North America of infra-inguinal bypass for CLI in octogenarians report a peri-operative mortality rate of 2–3% with 5-year limb salvage rates of 92%.^{1,2}

Population-based studies, however, report a 30-day mortality rate of 6% for elderly patients undergoing infra-inguinal bypass or percutaneous transluminal angioplasty (PTA) for CLI.⁶ In this institution, PTA has had an increasing role in the first-line management of patients with CLI^{7–9} such that, currently, it is the primary revascularisation procedure in over 85% of severely ischaemic limbs.⁹ This study examines the early and late results of PTA for CLI in octogenarians and nonagenarians.

Methods

Over the 2-year period between 1st January 1999 and 31st December 2000, all patients aged 80 years and over who underwent attempted PTA for CLI were identified retrospectively from the vascular unit database and their casenotes were reviewed.

CLI was defined as the presence of rest pain, ulceration or gangrene for more than 2 weeks duration with evidence of significant arterial disease identified

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by colour duplex ultrasonography or angiography. Ankle systolic pressure was not measured routinely. Lesions were classified according to the anatomical segment involved: iliac, superficial femoral, popliteal and infrapopliteal. Subintimal and transluminal angioplasty were performed under local anaesthesia in a dedicated angiography suite by two experienced vascular radiologists (AB and GF).¹⁰

Technical success, complications and long-term patency were evaluated according to the guidelines provided by the Joint Council of The Society for Vascular Surgery and the North American Chapter of the International Society for Cardiovascular Surgery.¹¹ Technical success was defined as recanalisation with 30% or less residual stenosis and antegrade flow at the end of the procedure. Symptomatic patency was defined as resolution of rest pain, or healing of ulceration, minor amputations or areas of gangrene.

Minimum follow-up was 12 months with a maximum of 42 months. The Kaplan–Meier method of life table analysis was used to determine patient survival rate, primary symptomatic patency rate (which was solely due to primary PTA), and secondary symptomatic patency and secondary limb salvage rates (which required one or more additional procedures). Primary and secondary symptomatic patency rates and secondary limb salvage rate were based on the number of limbs. Initial technical failures were included in the analysis.

Results

PTA was attempted in 113 severely ischaemic limbs in 98 patients (36 men and 62 women of median age 84, range 80–97, years) aged 80 years and over. Twelve patients were aged 90 years and over. Seventy patients had significant co-morbidity (Table 1). No patients had chronic renal insufficiency requiring renal replacement therapy.

A total of 128 PTAs were attempted: 113 primary, 13 secondary and 2 tertiary procedures. No limbs required primary stenting. The indication for revascularisation was rest pain in 47 procedures, ulceration in

66 and gangrene in 15. Sixty-four (50%) procedures were entirely subintimal, 35 were entirely intraluminal and 27 procedures employed both techniques. There were two failed attempts to obtain access in one limb with a flush superficial femoral artery (SFA) occlusion. The anatomical segments involved were iliac ($n = 19$), superficial femoral ($n = 92$), popliteal ($n = 91$) and infrapopliteal ($n = 72$). A single segment was angioplastied in 33 (26%) procedures, two segments in 45 (35%), three segments in 46 and four segments in two procedures. The primary technical success rate was 108 of 128 (84%) procedures and early technical complications occurred in 24 (19%) procedures (four major, 20 minor). Thirteen limbs required further intervention during the same hospital admission: three for complications and 10 for failed PTA. There were six groin haematomas, which resolved without intervention. Among eight vessel perforations, five resolved without intervention and three were coil embolised. One patient required urgent femoro-distal bypass after coil embolisation was complicated by acute occlusion of the angioplasty segment. Aspiration of distal embolism was performed in seven limbs and a 'push and park' manoeuvre¹² was used in three. In three patients, aspiration was complicated by thrombosis of the angioplasty segment; two patients required urgent femoro-distal bypass and two patients died, one after bypass surgery and one who was managed conservatively. Ten limbs required early intervention after failed PTA: infra-inguinal bypass ($n = 3$), common femoral endarterectomy ($n = 1$), femoral thrombectomy and iliac stenting ($n = 1$), SFA stenting ($n = 1$), chemical lumbar sympathectomy ($n = 1$), secondary PTA ($n = 1$), above knee amputation (AKA) ($n = 1$) and below knee amputation ($n = 1$).

The median (range) and mean duration of in-hospital stay was 2 (1–72) days and 8 days, respectively. Nine patients died within the same hospital admission as the initial procedure: the peri-procedural mortality rate was nine of 128 (7%) and the 30-day mortality rate was six of 128 (5%). The causes of death were cardiac events ($n = 6$), continuing CLI ($n = 1$), pneumonia ($n = 1$) and severe sepsis ($n = 1$). Three patients were aged 90 years and over, five had DM, and two had IHD with a history of previous MI. PTA failed or was associated with a major complication in four of these patients and two underwent successful emergency surgical revascularisation.

Fourteen patients developed recurrent CLI in 16 limbs during follow-up. One patient underwent infra-inguinal bypass one month after successful primary PTA but this failed and AKA was performed. Three further patients required AKA: at 3 months and 25 months after urgent infra-inguinal bypass for failed

Table 1. Patient co-morbidity

Co-morbidity	Number of patients
Hypertension	31
Ischaemic heart disease	14
Previous myocardial infarction	14
Previous stroke	8
Diabetes mellitus	33
Cigarette smoking-current	12
-reformed	34

primary PTA, and 9 months after successful primary PTA. Secondary PTA was performed in 12 limbs and tertiary PTA in two. Secondary PTA failed in three limbs: infra-inguinal bypass was required during the same hospital admission in one patient (see above) and at 7 and 9 months after successful secondary PTA in two patients.

The 12- and 24-month patient survival rates were 71 and 59%, respectively. The 12-month primary and secondary symptomatic patency rates were 65 and 80%, respectively. The 24-month primary and secondary symptomatic patency rates were 52 and 69%, respectively (Fig. 1). The 24-month secondary limb salvage rate was 95%.

Discussion

Octogenarians and nonagenarians with CLI represent an increasing proportion of a vascular unit's workload and, in this institution, account for almost one third of revascularisations for severe limb ischaemia.¹³ The management of these very elderly patients can be difficult as the majority have significant co-morbidity (71% in the present series) and many have multi-level arterial disease: in this series, 38% of PTAs involved three or four arterial segments and 26% of PTAs were to infrapopliteal vessels. Open, surgical revascularisation

is associated with significant risk: the peri-operative mortality rate reported in single centre series from the UK and North America varies from 2 to 12%¹⁻⁵ with a recent multicentre study from Sweden reporting a mortality rate of 6% for infra-inguinal PTA or bypass in patients aged 76 years and over.⁶

In this institution, PTA is the principal method of revascularisation in severely ischaemic limbs. The high primary technical success rate (84%) and low major complication rate (3%) in the present series were similar to those achieved in younger patients.^{9,13} The duration of hospital stay was short in the majority (median 2 days) and there was a low requirement for urgent surgical revascularisation. The peri-procedural mortality rate of 7% was similar to that reported by The Swedish Vascular Registry⁶ and was particularly high in nonagenarians where there were three deaths after 12 PTAs. CLI had been successfully treated by PTA or surgery in seven of the nine patients who died and the principal cause of death was cardiac events. The 24-month survival rate of 59% further reflects the high co-morbidity in these very elderly patients. The 24-month secondary symptomatic patency rate was 69% and over half of the 16 limbs which developed recurrent CLI during follow-up were treated successfully by further PTA. The 24-month secondary limb salvage rate was 95%, similar to that achieved by surgery.^{1,2}

In conclusion, the present study demonstrates that PTA is a safe and clinically effective minimally invasive alternative to surgical revascularisation in very elderly patients with CLI.

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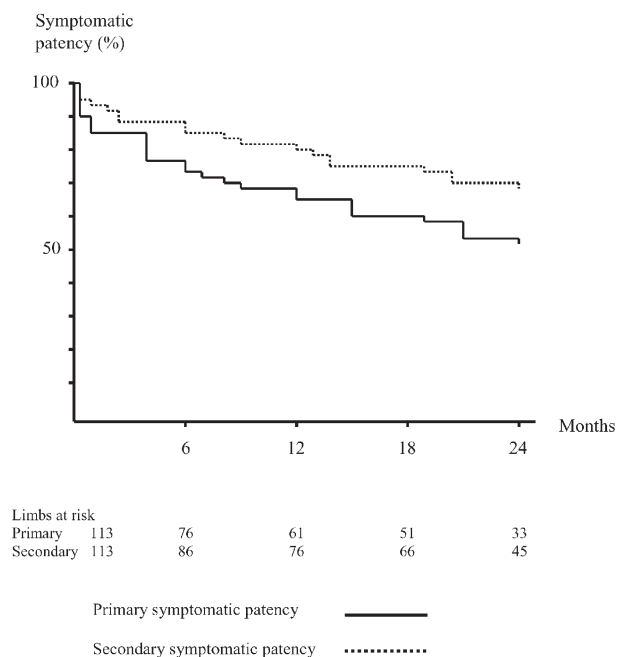


Fig. 1. Primary and secondary symptomatic patency of PTA by Kaplan-Meier method.

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