Endovascular Surgery, Open Surgery, and Primary Amputation in Nonagenarians Presenting with Critical Limb Ischemia

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Background: The aim was to report the midterm outcome for nonagenarians with critical limb ischemia (CLI) and to identify factors affecting survival or limb salvage rates.
Methods: Nonagenarians who underwent endovascular surgery (ES), open surgery (OS), or primary amputation (PA) for CLI between 2005 and 2014 were included. Cox regression model identified factors affecting survival and limb salvage.
Results: ES was performed in 116 patients (119 limbs), OS in 73 patients (73 limbs), and PA in 54 patients (57 limbs). Mean follow-up was 10.38 months. There was no difference in survival between ES, OS, and PA groups: survival rate was 51.2% at 1 year and 38.9% at 2 years after ES, 48.3% at 1 year and 39.6% at 2 years after OS, and 50.6% at 1 years and 40.8% at 2 years after PA ($P = 0.58$). There was no difference in limb salvage between ES and OS groups: limb salvage rate was 88.2% and 77.8% at 1 and 2 years after ES and 87.3% and 77.6% at 1 and 2 years after OS. Coronary artery disease (hazard ratio [HR] 1.54; confidence interval [CI] 1.04−1.08; $P = 0.01$) was risk factor for death. Fully dependent state was risk factor for death (HR 4.2; CI 3.55−4.87; $P < 0.001$) and major amputation (HR 5.3; CI 1.32−1.67; $P < 0.001$). In fully dependent patients, 1-year and 2-year survival rate was 28.9% and 20.6%, respectively, and 1-year and 2-year limb salvage rate was 61.2% and 44.5%, respectively.
Conclusions: With acceptable early and late mortality, limb salvage and maintenance of functional status and level of independent living, revascularization in nonagenarians is effective as long as the patient is not fully dependent.

INTRODUCTION

As a result of increasing life expectancy, patients aged older than 90 years with critical limb ischemia (CLI) can be referred to vascular units.[1] The management of CLI in these elderly patients can be challenging because they may have extensive arterial lesions while bearing serious medical comorbidities that may affect the surgery outcome.[1] As a consequence, general practitioners sometimes hesitate to refer these particular patients to surgical units, believing that revascularization would be too aggressive in these elderly patients. However, it has been well demonstrated that CLI octogenarians who have successful revascularization show better quality of life and longer survival than patients treated with primary amputation (PA) or conservatively.[2] It has also been highlighted that revascularization is justified in elderly patients because limb preservation allow to maintain ambulatory status and independent living.[3−5]

Endovascular surgery (ES) should be considered the first-line option in elderly patients because it is associated with better outcome than open surgery

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(OS) in terms of survival and limb salvage.[6–8] However, despite continuous advances in endovascular techniques allowing the treatment of more complex and longer lesions, there are still many CLI patients who cannot be treated by ES.[9] OS still remains an option in these patients with extensive lesions, particularly in the setting of CLI because it is essential to restore blood flow until distally.

The aim of this study was to assess the evolution of treatment strategies over a 10-year period in nonagenarians presenting with CLI, to report the midterm outcome of revascularization procedures and to identify factors affecting survival or limb salvage rates.

METHODS

Study Design

All consecutive patients aged older than 90 years who underwent ES, OS, or PA for CLI in the setting of infrainguinal lesions between January 2005 and December 2014 in our institution were included in this retrospective descriptive study. Demographic data, procedural details and postoperative outcome were collected prospectively into the department's database and examined retrospectively.

Preoperative Data

The preoperative data recorded included age, gender, cardiovascular risk factors, comorbid conditions (coronary artery disease, cerebrovascular disease, pulmonary disease, or renal disease), preoperative autonomy level, and indications for surgery (rest pain or ulcers, duration of symptoms, hemodynamic evaluation).

Smoking history was defined as smoking cessation for more than 1 year before hospital arrival. Diabetes was considered as hyperglycemia requiring oral medication or insulin treatment. Coronary artery disease was defined as a previously documented myocardial infarction and/or ongoing angina pectoris, or previous coronary surgery (bypass or endovascular). Cerebrovascular disease was defined as either a previous stroke or previously diagnosed dementia (Alzheimer's disease, vascular dementia, or permanent cognitive impairment). Pulmonary disease was defined as a ratio between the 1-sec forced expiratory volume and the forced vital capacity less than 0.7 L. Renal disease was defined as estimated glomerular filtration rate $<$ 30 mL/min.

Autonomy level was defined according to Parker score.[10] The Parker score was measured at admission in all patients because it was a systematic interview performed by the nurses and noted on the patient admission record. When Parker score is $\geq$6, it means that the patients are nondependent, he can get about their homes and walk outdoors without help. When Parker score $<$ 2, the patient is fully dependent and needs help for all daily life activities. Parker score ranging from 2 to 5 indicates that the patient is partially dependent; he does not need assistance at home but cannot walk outdoors alone (Table I).

CLI was defined as rest pain or nonhealing ulcers, lasting for more than 2 weeks and supported by hemodynamic parameters such as ankle-brachial index (ABI) and/or toe perfusion pressure according to TASC II recommendations.[11]

Procedural Data

Procedural data included data concerning lesion characteristics (outflow vessel, TASC classification), treatment strategy (type of surgery, graft materials), and initial results.

Our policy was to perform ES as first-line option when possible, OS either for complex and calcified lesions or after failed ES and PA in fully dependent patients without any possibility of healing associated to infection and/or uncontrollable pain. When ES was performed, each vessel was sized visually, and stenosis or occlusion was dilated by inflating the selected balloon for 1 min at nominal pressure. Stenting was performed in case of residual stenosis or dissection in femoropopliteal (FP) lesions and avoided if possible in below-the-knee (BTK) lesions. When OS was performed, autologous vein grafts were used whenever possible, and the quality and suitability of the saphenous vein was assessed by duplex ultrasonography preoperatively for each patient. The aim of the revascularization procedures was to restore 1 vessel runoff to the foot.

Postoperative Data

The following postoperative parameters were recorded: 30-day mortality (death within 30 days of operation), 30-day morbidity (morbidity within 30 days of operation), and postoperative length of hospital stay. Morbidity was defined as surgery-related morbidity (revascularization thrombosis, hemorrhagic complication, operative site infection, amputation) or systemic morbidity (renal, pulmonary, cardiac, or neurologic failures).

Follow-up program consisted of clinical and hemodynamic examination with ABI or skin perfusion pressure measurements and duplex scan at 1, 6, and 12 months and then annually. The 30-day