

# Evaluation of Post-Surgical Complications of Lower Limb Arteriopathy in the Elderly in a Geriatric Short-Stay Unit in Senegal

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## Abstract

**Background/Objectives:** Global ageing is associated with an increase in the frequency of peripheral arterial disease (PAD), which is often complex to manage postoperatively. The aim of this study was to describe postoperative complications of Lower limb arteriopathy in geriatric units. **Materials and Methods:** This was a retrospective, descriptive study from July 2019 to June 2022 of patients aged at least 65 years hospitalized in the geriatric unit of the FANN hospital for postoperative management of a Lower limb arteriopathy. Sociodemographic, clinical and evolutionary characteristics were collected and analyzed using Epi info version 7.2.6 software. **Results:** Forty patients met the criteria, representing 7.69% of hospital admissions. The average age was 77.5 years, with women in majority (75%). The mean time to geriatric admission after surgery was  $9 \pm 3$  days. Poly pathologies ( $\geq 3$  comorbidities) were present in 55% of patients. Cardiovascular risk factors were dominated by high blood pressure (85%), followed by mellitus diabetes (52.5%) and dyslipidemia (12.5%). Other associated comorbidities were dominated by heart disease (40%), followed by ischemic stroke (27.5%) and major cognitive impairment (27.5%). Excessive chronic arterial disease of the limbs was the predominant vascular diagnosis (80%) and amputation was the most common surgical procedure (62.5%), especially of the thigh (42.4%). Symptoms included refusal to eat (70%) and mental confusion (70%). The geriatric syndromes were mainly acute loss of functional independence (97.5%) and malnutrition (77.5%). The average number of acute diagnoses on admission was  $4 \pm 1$ , represented mainly by infectious diseases (31.5%), dominated by superinfection of the amputation stump (55%) and pulmonary infection (25%). Mortality rate was 22.5%. **Conclusion:** Post-surgical complications are frequent in the geriatric population, with a high mortality rate. Prior geriatric assessment would optimize postoperative results.

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## Keywords

Geriatrics, Senegal, Post-Surgery, Arteriopathies

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## 1. Introduction

The rapid ageing of the world's population is a well-established reality. This process is likely to be most accelerated in developing countries [1]. In sub-Saharan Africa, the geriatric population is set to rise from 31.9 million in 2019 to 101.4 million by 2050 [2]. The rapid ageing of the population, combined with changes in lifestyle (sedentary lifestyle, smoking, etc.), is accompanied by an epidemiological transition, with, in our context, the persistence of infectious pathologies and, above all, an increase in the prevalence of chronic pathologies, including arteriopathies. Around 200 million people worldwide suffer from lower limb arteriopathy (LLA) *i.e.* 10% of the global population [3]. This prevalence is estimated to have increased by around 25% between 2000 and 2010, particularly in low- and middle-income countries, with around 15 million cases in Sub-Saharan Africa. Rare before the age of 50, the prevalence of LLA increases exponentially from the age of 60 onwards, reaching 20% after the age of 80 [4]. Given the frequency of frailty and multiple pathologies in the elderly, diagnosis is often delayed, often leading to complex surgery with sometimes serious complications [5]. It also represents a heavy socio-economic burden, with a global cost estimated at 336 million euros in Germany between 2009 and 2011 [6]. In developed countries, several studies have been carried out on the post-operative outcomes of arteriopathy in the elderly, with geriatric dimensions integrated. In Senegal, a study evaluating the evolution of post-amputation complications for LLA was carried out in 2016 at the Thoracic and Cardiovascular Surgery Department (TCSD) of Fann Hospital [7]. However, this study involved a heterogeneous population and did not integrate geriatric dimensions. The geriatrics department of University hospital center of FANN frequently receives elderly patients in post-vascular surgery follow-up care. Rarely do these patients benefit from a prior geriatric assessment. It is in this context that we set out in this study to take stock of the current situation, with a view to improving the management of elderly patients in the perioperative phase of LLA. The general aim of our study was to describe the post-operative complications of LLA in elderly patients admitted to the geriatric short-stay unit of the department for follow-up care.

## 2. Materials and Methods

The study took place in the geriatrics department of University hospital center of Fann. It is located in Dakar, the capital of Senegal, which has 3,398,362 inhabitants out of a total population of 17,245,433. The capital alone accounts for 19.7% of Senegal's population [8]. Fann Hospital is a level 3 facility at the top of the national health pyramid [8] with a vocation for care, research and medical

training. It includes several specialized medical and surgical departments, making it an ideal setting for a cross-disciplinary field such as geriatrics, whose department was created in 2015. It is the first university-oriented department in the sub-region. Its activities include outpatient consultation, home visits, day hospitalization (3 beds) and a short-stay hospitalization unit with a capacity of 8 beds.

This was a retrospective, descriptive study over a 3-year period from July 1, 2019 to June 30, 2022 covering a population of 512 people aged at least 65 years hospitalized in the geriatrics department of the FANN University Hospital during this period. Included were all patients hospitalized following a transfer from the thoracic and cardiovascular surgery department (TCSD) of Fann Hospital for follow-up management of complications after surgery (amputation, angioplasty, thrombo-endarterectomy) whose indication was an ALL on the basis of an SPI < 0.9. Data were collected using a data collection form after free and informed consent had been obtained from the elderly patient or his/her legal representative. Sociodemographic (delay in admission to geriatric care after surgery, age, sex, mode of admission), diagnostic [Delay of admission after surgery; surgery type ; clinical manifestations on admission including grouping together functional, general and physical signs on admission to geriatric care; Biological signs (haemoglobin, white blood cell count, C-reactive protein (CRP); blood ionogram including natraemia, kalemia and chloraemia; creatinine and glomerular filtration rate according to the simplified MDRD formula; serum albumin); medical diagnoses] and evolutionary (length of stay, issues) variables were studied. The diagnosis of geriatric syndromes was made during the standardized geriatric assessment (EGS), using the MNA to assess nutritional status; GDS-15 items for mood; ADL and IADL to assess autonomy for daily and instrumental activities respectively; the Senegal Test to assess cognitive functions; the CAM to screen for acute mental confusion; the Zarit scale to assess the burden on the primary caregiver; and the FRIED phenotypic model to assess frailty. Data entry and analysis were performed using SPSS version 24.0 for Windows. Simple frequencies were calculated for categorical variables. The means that median and standard deviations were calculated for quantitative variables.

### 3. Results

#### ❖ Epidemiological aspects

During the study period, 520 patients were hospitalized, and forty (40) of them came from Vascular Surgery for post-operative management of LLA, *i.e.* a frequency of 7.69%. The average post-operative admission time to geriatrics was 09 days  $\pm$  3 days, with extremes of 2 to 32 days. Almost half the patients were admitted between 10 and 19 days post-operatively. The average age was 77.5  $\pm$  9 years, with extremes of 65 and 96 years. The 65 - 69 and 75 - 79 age groups were more representative, with 22.5% and 20% of patients respectively. Women predominated (75%), with a sex ratio of 0.33 (**Table 1**).

**Table 1.** Distribution according to general patient characteristics.

Studied variables		Numbers	Percentage (%)
<b>Age ranges</b> <b>Average age:</b> <b>77.5 ± 9 years</b>	65 - 69	10	22.5
	70 - 74	6	15
	75 - 79	8	20
	80 - 84	6	15
	85 - 89	5	12.5
	90 - 94	3	7.5
	95 - 99	2	5
<b>Gender</b> <b>Sex ratio W/M: 0.33</b>	Woman	30	75
	Men	10	25
<b>Cardiovascular risk factors</b> <b>Average: 2.5 ± 1</b>	HTA	34	85
	Mellitusdiabete	21	52.5
	Dyslipidemia	5	12.5
	Smoking < 5 years	3	7.5
	Hyper uricemia	2	5
	Alcoholism	2	5
<b>Other comorbidities</b>	Heartdisease	16	40
	AVCI	11	27.5
	Dementia	11	27.5
	Visual disorders	7	17.5
	Osteoarthritis	6	15
	Prostate diseases	2	5
	Pneumopathy COVID-19	2	5
<b>History of vascular surgery</b>	History of angioplasty	15	37.5
	History of amputation	5	12.5
<b>Level of physical activity in the 30 days prior to surgery</b>	Active in 30 days	8	20
	Sedentary	21	52.5
	Grabber	11	27.5
<b>Post-operative admission times in geriatrics</b> <b>Mean: 9 ± 3 extremes 3 and 32 days</b>	0 - 9	14	35
	10 - 19	18	45
	20 - 29	05	12.5
	>29	03	7.5

#### ❖ Diagnostic features

In our series, risk factors were dominated by hypertension (85%), followed by mellitus diabetes (52.5%) and dyslipidemia (12.5%). A poly pathology with at least 3 comorbidities was found in 55% of patients, with an average of  $3 \pm 1$  comorbidities per patient. Twelve percent (12.5%) of patients were previously

autonomous for activities of daily living 1 month prior to surgery. With regard to physical activity, more than half (52.5%) of patients were sedentary and around a third (27.5%) bedridden. Eighty percent (80%) of patients had been diagnosed with chronic arteriopathy of the lower and 20% with critical acute ischemia of the lower limbs (**Table 1**). Amputation was the most common surgical procedure (62.5%), with the thigh the most common site (42.4%) (**Table 2**).

Admission symptoms were dominated by general signs (50.6%), with refusal to eat and acute mental confusion at the forefront (70% each), followed by altered general condition (60%) and dehydration (57.5%). Physical signs came second with 33.19%, represented essentially by pressure sores in 30% of patients, followed by cardiac arrhythmia in 25% and the presence of a fecal impaction in 25%. Functional signs are less represented at 16.19%, consisting mainly of pain (85% of patients), followed by constipation (10%), dysuria and dysphagia (2.5% each) (**Table 3**).

Geriatric syndromes were dominated by loss of functional autonomy (92.5%), undernutrition (77.5%), acute mental confusion and frailty (67.5% each), immobilization syndrome (65%), depression (52.5%) and dementia (15%). The primary caregiver's burden was judged to be severe in 62.5% of patients, moderate in 27.5% and light in only 10%.

Biological manifestations were dominated by biological inflammation (100%), including constant elevation of CRP (100%) and hyperleukocytosis in 72.5% of patients. Ionogram disturbances were dominated by hyponatremia (37.5%), followed by hypokalemia (30%), hypernatremia (20%) and hyperkalemia (5%). Other biological abnormalities were anemia (87.5%), hypoalbuminemia (82.5%) and renal failure (40%).

The average number of acute medical diagnoses was  $4 \pm 1$  pathologies per patient. The main admission diagnoses were infectious diseases (31.5%), dominated by amputation stump superinfection (55%), infectious pneumonitis (25%) and urinary tract infection (15%). In second place were endocrine and metabolic disorders (29.6%), with hyponatremia predominating (37.5%), hypokalemia (30%) and diabetic decompensation (27.5%). Neurological disorders were less represented, with 3.08% consisting exclusively of acute ischemic stroke (**Table 4**).

**Table 2.** Distribution according to amputation topography.

Surgical procedures		Numbers	Percentage (%)
<b>Amputation</b> <b>n = 26 (62.5%)</b>	Thigh	11	42.4
	Medio-tarsal disarticulation (Chopart)	09	34.6
	Leg	03	11.5
	Toe disarticulation	03	11.5
<b>Angioplasty</b>		10	25
<b>Thrombectomy</b>		4	10

**Table 3.** Breakdown of clinical manifestations on admission.

	Symptomatology	Numbers	Percentage (%)	
<b>Functional</b> N = 40 (16.19%)	Pain	34	85	
	Constipation	04	10	
	Dysphagia	01	2.5	
	Dysuria	01	2.5	
<b>Generals</b> N = 125 (50.6%)	Refusal to eat	28	70	
	Acute mental confusion	28	70	
	Altered general condition	24	60	
	Dehydration	23	57.5	
	Mucocutaneous pallor	15	37.5	
	Non-specific inflammatory response syndrome	10	25	
	Hyperglycemia	06	15	
	Edema of lower limbs	04	10	
<b>Cardiovascular</b>	Cardiac arrhythmia	10	25	
	HTA	07	17.5	
	Contralateral MI ischemia	06	15	
	Cardiovascular collapse	05	12.5	
	Heart failure syndrome	01	2.5	
	Inguinal hematoma	01	2.5	
<b>Physics</b> N = 82 (33.19%)	<b>Digestive</b>	Fecal impaction	10	25
		Méléna	05	12.5
		Oral candidiasis	04	10
		Abdominal defense	01	2.5
<b>Lung</b>	Respiratory distress	05	12.5	
	Pulmonary crackles	07	17.5	
<b>Skin</b>	Pressure sores	12	30	
<b>Neurology</b>	Muscle deficiency	08	20	

#### ❖ Evolution

The mean length of stay (LOS) was  $11 \pm 5$  days, with extremes of 2 and 19 days. The outcome was favorable in 77.5% of cases, with a mortality rate of 22.5%. The main causes of death in our patients were septic shock in 5 patients, followed by unlabelled cardio respiratory arrest in 3 patients and massive ischemic stroke in one patient.

**Table 4.** Breakdown by acute medical diagnosis.

Systems reached (E = 162)	Pathologies	Numbers	Percentage (E = 40)
<b>Hematological</b> n = 16.04%	Poorly tolerated anemia	26	65
	Superinfection of the stump	22	55
<b>Infectious; n = 51; 31.5% of cases</b>	Infectious lung disease	10	25
	Urinary tract infection	06	15
	Superinfected eschar	05	12.5
	Oral candidiasis	04	10
	Infectious gastroenteritis	03	7.5
	Septic arthritis	01	2.5
	<b>Renal; n = 16, (10.1%)</b>	Acute renal failure	16
<b>Endocrine and metabolic disorders: n = 48; 29.6%</b>	Hyponatremia	15	37.5
	Hypokalemia	12	30
	Diabetic decompensation	11	27.5
	Hypernatremia	08	20
	Hyperkalemia	02	5
	Atrial fibrillation	07	17.5
<b>Cardiovascular</b> n = 16; 9.8%	Cardiac decompensation	05	12.5
	Deep vein thrombosis	03	7.5
	Hypertensive flare-up	01	2.5
<b>Neurological (3.08%)</b>	Ischemic stroke	05	12.5

#### 4. Discussion

The frequency of hospitalization in the geriatric ward of patients operated on for post-surgical follow-up care for LLA during the period was 7.69%. To the best of our knowledge, no study of postoperative follow-up in the geriatric short-stay unit of elderly patients operated on for LLA has been found in our context. Thus, the lack of geriatric data led us to carry out this pioneering work in Sub-Saharan Africa.

In our series, the mean age was  $77.5 \pm 9$  years, with the 65 - 69 and 75 - 79 age groups being more representative, accounting for 22.5% and 20% of patients respectively. Our average age is higher than that found by Niang *et al.* [7] in CTSD with 64.49 years, but close to most of the data in the literature. In Germany, a large study involving 41,882 patients with LLA identified a variable mean age of  $71.1 \pm 10.4$  years [5]. In the EPIDEMCA study (Epidemiology of Dementia in Central Africa), evaluating the prevalence of LLA in people aged over 65 in the Central African Republic and the Republic of the Congo, Désormais *et al.* [9] found an average age of  $73.1 \pm 6.4$  years. In the same study, the 65 - 69 and 70 - 74 age groups were more representative, with 36.8% and 26.1% respectively [10].

A study carried out in Madagascar found a lower average age of  $66.05 \pm 1.8$  years [11]. The advanced average age of our sample reflects the geriatric vocation of the center, but also the increasingly advanced level of aging in Senegal.

Cardiovascular risk factors in our patients were mainly hypertension (85%), followed by type 2 diabetes (52.5%), dyslipidemia (12.5%) and smoking (7.5%). Our data are similar to those found in a large German cohort [5] of 41,882 patients aged over 60 at the critical ischemia stage, with hypertension 64.6%, diabetes mellitus 48.8%, dyslipidemia 19.9% and smoking in 6% of patients. In the EPIDEMICA study, arterial hypertension 61%, smoking 22.7%, dyslipidemia 10.7% and diabetes 6.1% of patients were found to be risk factors for LLA [9]. In the series by Niang *et al.* [7] series, lower overall frequencies were found with diabetes 37.84%, hypertension 48.65% and smoking 24.32%. In a series of 6450 elderly patients with LLA, Meijer *et al.* [12] identified the following risk factors: hypertension 22.5%, smoking 20.7%, mellitus diabetes 8.05%.

Acute postoperative complications in our series were dominated by infectious diseases (31.5%), followed by metabolic disorders (29.6%) and anemia (16.04%). These figures are much higher than those reported by Niang *et al.* [7] who found mainly local complications (54% stump necrosis 40.54% and superinfection 13.51%) with fewer general complications (35% severe hypoglycemia 5.4% and pressure sores 5.4%). In a large German cohort [5] of the G-DRG system (German Diagnosis Related Groups system) aged over 60, complications were dominated by infections (35.7%), acute renal failure (2.8%) and myocardial ischemia (1.7%). The very high frequency of postoperative metabolic, renal and infectious complications in our series could be explained by several factors. On the one hand, advanced age is accompanied by changes predisposing to acute complications in the event of stress induced by surgery, often on a background of multimorbidities, as evidenced by the frequency of polyopathy (55%) in our patients. In fact, the changes induced by aging, together with the comorbidities and manifestations of arterial disease (especially pain and loss of autonomy), are accompanied by a reduction in muscle reserves, with frequent sarcopenia and frailty, as evidenced by our series, with undernutrition at 77.5% and frailty at 67.5%. Geriatric assessment is therefore essential prior to vascular surgery in the elderly. The advanced stage of arteriopathy in our patients may also explain the frequency of complications. Added to this is the delay in diagnosis due to the lack of systematic screening for LLA in elderly subjects at risk. Complications such as acute renal failure, myocardial infarction, infection, sepsis and death are significantly associated with advanced stages (Rutherford 6) of LLA (each  $P = 0.001$ ) [2], as they are in most of our patients.

The main geriatric syndromes found were loss of functional autonomy (92.5%), undernutrition (77.5%), acute mental confusion and frailty (67.5%). Undernutrition is common in the elderly, and conditions the prognosis of hospitalized patients [13]. A recent meta-analysis involving 5541 patients with LLA [14] identified a low geriatric nutritional risk index (GNRI) as a predictive factor for cardiovascular and local complications (RR: 2.26) and all-cause mortality (RR 2.38). Acute



mental confusion is a very common syndrome in the geriatric population, with a frequency approaching 25% in hospitalizations. Its prevalence is higher in post-operative care, with 22% in vascular surgery [15]. Apart from advanced age (OR 1.04), the other independent predictors of post-vascular surgery delirium were: a history of stroke/transient ischemic attack (OR 2.64) and depression (OR 3.56). Frailty is a geriatric syndrome defined by a state of age-related reduction in physiological reserves, making the subject vulnerable to pathological or iatrogenic aggression [6]. Morley *et al.* [16] identified frailty as a major independent predictor of functional decline and post-operative mortality. A modified 5-item frailty index (mFI-5) [17] identifies frailty as a risk factor for combined complications (OR: 1.22), 30-day mortality (OR: 1.60), postoperative myocardial infarction (OR: 1.79) and failure of long-term prosthesis use (OR: 1.17).

In our series, the mean length of stay (LOS) was  $11 \pm 5$  days with a mortality of 22.5%. Our LOS is close to that of Reineck *et al.* [5] on a study of a cohort of 41,862 patients, who found  $11.2 \pm 14$  days, with an overall mortality of 2.9%, varying from 3.4% to 8.3% in patients with Rutherford stages 5 and 6. However, Niang *et al.* [7] found a longer mean length of stay (47 days) with lower in-hospital mortality (13.5%). Our shortened LOS may be explained by our focus on acute geriatrics, and our mobile unit's organization of support at home after complications have been managed. The high mortality in our series could be explained by several factors, including: the existence of a selection bias, as patients received as a result of geriatric care were of advanced age from the outset, with general and geriatric complications that were often serious. Added to this was the absence of prior geriatric assessment by a geriatrician in the "leg team", as well as the high amputation rate (62.5% in our series) in patients admitted to geriatric care. Indeed, mortality is higher in patients who have undergone major amputation than in those treated by revascularization or conservative therapy. In the Netherlands, a large study [18] on 651 patients aged 70 or over who had undergone major amputation, survival was very poor, with mortality rates at 1, 3 and 5 years of 44%, 66% and 85% respectively. Identifying predictive risk factors could facilitate difficult decision-making. In addition to age, there was a trend in renal failure ( $P = 0.057$ ), heart failure ( $P = 0.063$ ) and Rutherford classification ( $P = 0.061$ ) as risk factors for death after major amputation. Other factors have been identified, such as diabetes sugar [19] functional dependence, tissue loss, poly pathology [20].

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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