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Anesthesia Practice for Hip Fractures in the Elderly at University Hospital Aristide Le Dantec of Dakar, Republic of Senegal

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Abstract: *Aim*: to describe the perioperative management of hip fractures in the elderly at Aristide Le Dantec University Hospital, in Dakar. *Materials and Methods*: It was a single-center retrospective study, over 24 months, in the surgical emergency rooms of the university hospital Aristide Le DANTEC in Dakar. We Included anyone person aged at least 65 years and over, who had undergone emergency hip surgery. The epidemiological, preoperative, intraoperative and immediate postoperative variables were analyzed on Excel 2019. *Results*: We collected 105 patients with a mean age of 75.2±7.7 years and 61.9% of women. The average of hospitalization delay was 3.7±5.6 days. Extracapsular hip fracture represented 58.1% of patients. 92.4% of the patients had an admission-surgery delay greater than 48 hours. 52.4% of patients had a comorbidity, dominated by high blood pressure (37.4%) and diabetes (14.7%). The MET-Score had not been assessed. The class 2 of ASA classification (69.5%) and the level 1 of Lee's score (73.3%) were the most represented. Complete blood count and ECG were performed for all patients. Blood hemostasis test and Transthoracic Echography were not justified for 98.9% and 32% of patients, respectively. Perimedullar anesthesia was performed in 92.4% of patients. Continuous spinal anesthesia for 35.6% of patients. A peripheral nerve block for analgesia was performed for 11.4% of patients. 15.2% of patients suffered of an Intraoperative hypotension. One patient suffered of a total spinal anesthesia. 4.8% of patients received an intraoperative blood transfusion. The surgery lasted an average of 116.1±35.2 minutes. Postoperative pain (POP) was treated with paracetamol (100% of patients) and tramadol (66.7% of patients). 99.1% of patients were admitted to the post-intervention care room. *Conclusion*: The perioperative management of hip fracture in the elderly at the University Hospital Aristide Le Dantec reveals an excessive and unjustified prescription of paraclinical examinations, which delays operating time.

Keywords: Anesthesia, Hip Fracture, Elderly, Dakar

1. Introduction

A hip fracture (HF), or proximal femoral fracture, is a break in the upper region of the femur (thigh bone) between the subcapital region (the area just under the femoral head) and five centimetres below the lesser trochanter (a bony projection of the upper femur). [1]. HF has been recognized as the most serious consequence of osteoporosis because of

its complications, which include chronic pain, disability, diminished quality of life, and premature death. [2]. They account for the majority of fracture-related health care expenditure and mortality in men and women over the age of 50 years [3] and they will cost $9.8 billion in the United States and $650 million in Canada estimated annual health care by of the year 2040 [4] With rising life expectancy throughout the globe, the number of elderly individuals is increasing in every geographical region, and it is estimated that the incidence of hip fracture will rise from 1.66 million in 1990 to 6.26 million by 2050 [2]. Indeed, the worldwide HF incidence is estimated at more than 4.5 million annual cases and more than 20 million people will be living with a history of HF in 2050. [5]. In Africa, number of elderly people is expected to increase from 5.5% in 2012 to four times more in four decades [6]. In Senegal, the elderly represents more than 5.4% of population and the average life expectancy is 57.5 years [7]. However, a few studies are available from Africa on the incidence of HF [2]. In Morocco, a total of 150 HF in the over-50-year-old population in the Province of Rabat during 2002 was reported [8]. During 8 months in 2009, 105 cases of HF in individuals aged 50 years were recorded at Owerri in Nigeria [9]. In 2007, Paruk *et al* recorded 87 HF at Durban, in Republic of South Africa [10]. In Côte d'Ivoire, Krah *et al* found 85% of HF in subjects aged 65 and over admitted to the Traumatology and Orthopedics Department at the University Hospital of Yopougon from 2004 to 2009 [11] for limb fractures. A total of 435 HF were recorded for the 3-year period from 2009 to 2011 in Botswana [12].

Elderly people suffering of HF lose their physical and social autonomy and their life expectancy crumbles compared to people of the same level of autonomy and socio-economic free from HF [13]. Also, international medicals societies recommend surgery within 48 hours after HF in the elderly [14, 15], in order to reduce mortality, to allow a rapid return to previous autonomy and to avoid pathological cascade in the elderly [16]. These recommendations were written with the aim of reducing times and costs of perioperative assessment of HF in the elderly, as well as the length of the hospital stay. Thus, preoperative anesthetic assessment should be based on clinical examination at first sight, because performing additional preoperative examinations lengthens the operative time [17]. In Africa, few studies have been carried out on HF surgery in elderly [18, 19]. Our study aim is to describe the perioperative management of HF in the elderly at Aristide Le Dantec University hospital in Dakar, Senegal

2. Materials and Methods

We performed a descriptive, single-center and retrospective study, over a two years period, from January 2018 to December 2019, in the surgical emergency department of the University Hospital Aristide Le Dantec. We Included all patient at least 65 years old, who have had urgent surgery for an HF in the operating room of the surgical emergencies department of the University Hospital Aristide Le Dantec. We excluded patients who had have a revision surgery and those with pathological HF. Data were collected from anesthesia record of operated patients. We have excluded anesthesia records whose data were absent.

The parameters evaluated were: epidemiologic (frequency, age, sex), anesthetic (hospitalization delay, admission-surgery delay, comorbidities, current treatment, preoperative clinical status, metabolic score “MET-score”, Lee ‘score, American Society of Anesthesiologists “ASA” score, paraclinical examinations performed, type of anesthesia, anesthetic drugs used, complications observed, postoperative pain management, postoperative hospitalization management), surgical (type of HF, surgical indication, duration of surgery). Data analysis was performed with Microsoft Excel 2019 software. Quantitative variables were expressed as average ± standard deviation or median (interquartile range), and qualitative variables were expressed as a percentage or number.

The following definitions were used:

1. Hospitalization delay: was defined as the time between trauma onset and admission at surgery emergency department.
2. Admission-surgery delay: was defined as the time between admission day and surgery day.
3. Blood hemostasis test was considered as “justified” if this assessment was carried out according to French Society of Anesthesia-Resuscitation (SFAR) recommendations on routine preinterventionnals tests. [20]. Performing a routine blood hemostasis test is not recommended for HF surgery in the elderly.
4. Performing a preoperative transthoracic echocardiography (TTE) was considered as "justified" if the indication was carried out according to the recommendations of the Association of Anesthesiologists of Great Britain and Ireland (AAGBI) [15] and / or SFAR [14] for performing echocardiography before surgery for HF. For these two medical societies, echocardiography may be indicated: (i) if the Lee score > 1, (ii) to establish left ventricular function if the patient is breathless at rest or on low level exertion; or (iii) to investigate the severity of an ejection systolic murmur heard in the aortic area, particularly if significant aortic stenosis is suggested by two or more of: a history of angina on exertion; unexplained syncope or near syncope; a slow rising pulse; an absent second heart sound; or left ventricular hypertrophy on the ECG without high blood pressure (although clinical signs of aortic stenosis can be difficult to explicit).
5. Intraoperative hypotension was defined as a decrease in the systolic blood pressure by 25% from the baseline, or a systolic blood pressure below 100 mmHg.

A level III public medical center, Aristide le Dantec University Hospital is one of three reference centers in Dakar for medical management of musculoskeletal system pathologies. Their orthopedic trauma team is composed of six

orthopedic trauma surgeons. The hospital hosts an orthopedic trauma residency also. The Surgical Emergency Department has two operating rooms: one for visceral and septic emergencies and another one reserved for orthopedic trauma emergencies. The last one is equipped with an anesthesia respirator, a basic monitoring (electrocardiogram, intermittent non-invasive measurements of systemic blood pressure, pulse oximetry) and capnography, mucus suction pumps, a brightness amplifier and an orthopedic operating table. The anesthesia is carried out by Anesthesia Residents, supervised by a Senior Anesthesiologist. The perioperative protocol is under the responsibility of orthopedic trauma surgeon with multidisciplinary consultation (anesthesiologist, radiologist). All patients benefited of a pre-operative evaluation including their medical background, a clinical examination and / or paraclinical examinations, according to the wishes of the Anesthesiologist. In the operating room, all patients received standard monitoring: electrocardioscopy, non-invasive blood pressure, respiratory rate and peripheral oxygen saturation. Postoperatively, the patients were admitted to the post-interventional care room or intensive care unit.

3. Results

During the study period, 5,109 anesthesia were performed. A total of 105 patients were included, representing 2% of all surgical activity in the Department of surgical emergencies. The average age was 75.2±7.7 years (range: 65 and 95). Women represented 61.9% of patients and the sex ratio was 0.6. Extracapsular HF represented 58.1% of patients. The average hospitalization delay was 3.7±5.6 days (range: one hour and 30 days). The average admission-surgery delay was 11.4±17.3 days (range: 2 and 168 days) and 92.4% of the patients were operated beyond 48 hours after their hospitalization. Table 1 shows the epidemiological and perioperative data of the patients.

Table 1. *Epidemiological and clinical preoperative data of patients.*

	Effective (Percentage)
Gender	
Female	65 (61,9%)
Male	40 (38,1%)
Age group (years)	
65 to 74	54 (51,4%)
75 to 89	45 (42,9%)
≥ 90	6 (5,7%)
Type of hip fracture	
Extracapsular	61 (58,1%)
Intracapsular	44 (41,9%)
Hospitalization delay (hours)	
< 24	45 (42,9%)
Between 24 and 48	18 (17,1%)
> 48	42 (40,0%)
Admission-surgery delay (hours)	
≤ 48	8 (7,6%)
> 48	97 (92,4%)
Medical background	
High Blood Pressure	43 (37,4%)
Diabetis mellitus	17 (14,7%)
Cancer pathology	2 (1,7%)
Ischemic cardiomyopathy	1 (0,9%)
Seizures epilepsy	1 (0,9%)
Pulmonary tuberculosis	1 (0,9%)
Pre operative clinical status	
Normal	88 (83,8%)
Non-Stable HBP	7 (6,8%)
Hemiplegia	5 (4,9%)
Hyperglycemia	2 (1,8%)
Cardiac arrythmia	1 (0,9%)
Dyspnea at rest	1 (0,9%)
Lumbar spine scoliosis	1 (0,9%)
Metabolic equivalent (METs)	
	Not evaluated
ASA Score	
1	28 (26,7%)
2	73 (69,5%)
3	4 (3,8%)
Lee's Score	
1	77 (73,3%)
2	24 (22,9%)
3	4 (3,8%)

A comorbidity was identified in 52.4% of patients (n=55). High blood pressure (HBP) was the most common comorbidity with 37.4% (n=43), followed by diabetes mellitus with 14.7% (n=17). Clinical examination was anormal for 17 patients (16.2%). None-equilibrated HBP was the most common clinical abnormality at 6.8% (n=7). MET-Score was not evaluated for all patients. The ASA score and Lee's score were assessed in all patients. The ASA class 2 (69.5%) and Lee's score class I (73.3%) were the most represented. Table 1 shows epidemiological and clinical preoperative data of patients.

Complete blood count (CBC) was performed before surgery for all patients. The average of preoperative hemoglobin level was 11.6±1.7 g / dL (range: 7.8 and 16.6 g / dL). Preoperative anemia was found in 69 patients (65.7%), 42 women (64.2%) and 27 men (67.5%). The average of white blood cells (WBC) number was 8185.9±2581.1 per mm^3 (range: 1057 and 14700 per mm^3) and hyperleukocytosis was observed in 22.9% of patients. The average of platelets number was 249,000±89,635.8 per mm^3 (range: 112,000 and 533,000 per mm^3). A blood hemostasis test was performed in 99 patients (94.3%) and was not justified in 98.9% of patient. All results were normal.

An ECG was performed for all patients before surgery. Only 66 patients (62.9%) presented a pathologic ECG: heart chambers enlargements (47.6%), rhythm and conduction disorders (21.9%), ischemia and / or necrosis (19.1%). A transthoracic echocardiography (TTE) was performed in 50 patients (47.6%). It was not justified in 32% of patients (n=17). TTE indications were: a Lee's score > 1 (36%), rhythm and conduction disorders (20%), ventricular hypertrophies (6%), ischemia and / or necrosis (4%), dyspnea at rest (2%). In 36% of cases (n=3), TTE founded a hypertrophic cardiomyopathy (10%), a degenerative valve disease (8%), a non-obstructive subaortic septal ridge (8%),

an ischemic cardiomyopathy (8%) and a none-dilated cardiomyopathy (2%).

Hip osteosynthesis was performed for 63 patients (60%) and a bipolar hip prothesis was used for 42 patients (40%). Cefuroxime was the only molecule used for antibioprophylaxis. Perimedullar anesthesia (PMA) was performed for 97 patients (92.4%), general anesthesia (GA) for six patients (5.7%) and two patients (1.9%) received PMA completed by a GA. For GA, all patients were intubated (orotracheal intubation) with an intravenous induction. For PMA, continuous spinal anesthesia (CSA) was performed for 37 patients (35.6%) with one failure (2.7%) converted to AG and spinal anesthesia (SA) was performed for 67 patients (64.4%) with 5 failures (7.5%) leading to conversion to GA. For 12 patients (11.4%), a peripheral nerve block was associated: an iliofascial block (11 patients) and a femoral block (1 patient).

Intraoperative incidents were reported in 21 patients (20%). Intraoperative hypotension was reported for 16 patients (15,2%). Hyperglycemia was noted in four diabetic patients (3.8%). Total spinal anesthesia was reported for one patient (0.9%). The intraoperative blood loss averaged 230.2±109.5 ml (range: 50 and 500 ml). Intraoperative blood transfusion was used in 4.8% of patients (n=5). The average of surgery duration was 116.1±35.2 minutes (range: 60 and 275 minutes). The average of GA duration was 190.7±109.1 minutes (range: 60 and 440 minutes). The average of sensory block level duration was 193.3±41.9 minutes (range: 120 and 330 minutes). Table 2 indicates intraoperative data and anesthetics drugs used in our series.

Table 2. *Intraoperative data and anesthetics drugs used in our series.*

	Effective (Percentage)
Type of surgery	
Hip osteosynthesis	63 (60%)
Bipolar hip prothesis (BHP)	42 (40%)
Type of anesthesia	
Perimedullar anesthesia (PMA)	97 (92,4%)
Spinal anesthesia (SA)	*67 (64.4%)*
Continous Spinal anesthesia (CSA)	*37 (35.6%)*
General anesthesia (GA)	6 (5,7%)
PMA prolonged by GA	2 (1,9%)
Peripheral nerve block	12 (11.4%)
Anesthetic drugs used	
Sedative	
Propofol	7 (6,7%)
Neuromuscular blocking drugs	
Suxamethonium	3 (2,8%)
Vecuronium	7 (6,7%)
Opiates	
Fentanyl	105 (100%)
Maintenance	
Halothane	7 (6,7%)
Intraoperative complications	21 (20%)
Intraoperative hypotension	16 (15,2%)
Hyperglycemia	4 (3,9%)
Tachycardia ≥ 120 bpm*	2 (1,9%)
Total spinal anesthesia	1 (0,9%)
Blood transfusion	5 (4,8%)
Admission in intensive care unit	1 (0,9%)

*Beats per minute.

Among six patients who benefited of general anesthesia, five were extubated in operating room. After surgery, 104 patients (99.1%) were admitted to recovery room, and one patient (0,9%) was admitted to intensive care unit for an anesthetic complication (total spinal anesthesia). No complications were observed in the recovery room.

All patients received systemic intravenous analgesia initiated intraoperatively at the onset of skin closure. The patients had received, in decreasing order of frequency of administration: paracetamol (100%), tramadol (66.7%), non-steroidal anti-inflammatory drugs (38.1%) and nefopam (33.3%).

4. Discussion

We performed a single-center retrospective study. A retrospective study exposes to an information bias or "measurement bias". Only based on anesthesia registers and files, without possibility to access to trauma-orthopedic files of patients, we did not have information on trauma circumstances (Fall after syncope, domestic accident, road traffic accident, etc.), on patient autonomy before trauma, on therapeutic compliance with current treatments). A single-center data collection does not allow us to extrapolate our results to patients from other Dakar hospitals involved in medical management of hip fracture. However, these results provide a basis on which to build a future prospective, multicenter study with a much more data.

The average age of our patients was 75.2±7.7 years and the sex ratio was 0.6 in favor of women. In South Africa, Paruk et *al* [10] reported an average age of 76.5 years with a sex ratio of 0.4 for an inclusion age of 60 years. Rath et *al* [21] recruited at 50 years in India and reported an average age of 66.5 years and a sex ratio of 1.2 in favor of men. In Benin, Tidjani et *al* reported an average age of 56 years, despite a minimum age of 28 years [19]. With the India exception, a country with a high male birth rate for socio-cultural reasons, our results confirm the international trend making age as the first risk factor for hip fracture, followed by female sex due to a greater life expectancy for women [14].

During the study period, only 7.6% of patients were operated during the 48 hours following their admission, against 54% at the Firenze University Hospital [22], and 30% for Rath et *al* in 2017 in India [21]. We notice a disparity between our data (7.6%), those of India (30%) and those of Italy (54%) concerning respect of international guidelines on admission-intervention delay of 48 hours at most for a hip fracture surgery. This difference can be explained by the difference in purchasing power between residents of each three countries. Diémé et *al* [23] estimated the cost of diagnosing all fractures in elderly at the University hospital Aristide Le Dantec at more than 6,526 USD; surgical treatment and hospital stay amounting to more than 48,584 USD. The second reason could be linked to an excessive and not “justified” prescription of preinterventionnals tests. Indeed, blood hemostasis test was carried out in 94.3% of patients, was not “justified” in 98.9% of patients and normal

for all patients. The low purchasing power for our patients and families time wasted paying this not "justified" blood test are one of factors which lengthens admission-surgery delay.

TTE was performed in 47.6% of patients, not "justified" in 32% of patients and normal in 36% of patients. Performing an ETT at university hospital Aristide le Dantec requires waiting for programming from the Cardiology department. ETT costs 44 USD. We face both financial and time-related pitfall for our patients. This could lengthen admission-surgery delay. This excessive prescription of pre-interventional tests has already been reported by Gaye et *al* in patients waiting for a scheduled surgery at university hospital Le Dantec [24].

In this elderly population with high cardiovascular risk, cardiovascular assessment requires, in addition to Lee's score and MET-Score, to performing an ECG on admission [15]. No study has demonstrated the benefit of routine preoperative or even clinically-guided TTE [25]. None of the patients in our study received a MET-Score assessment and majority of patients (73.3%) had a Lee's score level 1. All patients received a systematic ECG. However, we report a high TTE completion rate at 47.6%, with 34% of not "justified" TTEs and 64% of completed TTEs showing a normal result. This discordant finding between the mostly stable clinical cardiovascular status of patients and the achievement of TTE for more than half of the patients, with normal results in most cases, could reflect a failure to comply with international guidelines on patient cardiovascular assessment, and especially on performing TTEs before surgery for hip fracture in the elderly.

In our study, 92.4% of patients benefited of Perimedullar anesthesia (PMA), 5.7% benefited of general anesthesia (GA) and 1.9% benefited of PMA completed by a GA. In Tunisia, Mnif *et al* performed GA in 41% of patients aged 60 and over operated on for hip fracture, and spinal anesthesia (SA) in 59% of patients [18]. In India, Rath *et al* performed 98% PMA versus 2% GA in 50 years and older subjects, victims of hip fracture in Delhi [21]. In 2002, the Escort study in France found 42% of PMA, 54% of GA and 4% of mixed techniques [26]. Our practices are similar to Rath team practices in Delhi. Safety and security of PMA, especially continuous spinal anesthesia (CSA) allowing local anesthetic doses reduction, could justify the frequent use of PMA in our practices. However, all the literature does not show a superiority of PMA compared to GA [17].

Intraoperative hypotension was reported for 16 patients (15,2%). Our results are similar to Ba et *al* results [27] who found 13.33% of intraoperative hypotension in elderly undergoing emergency surgery at university hospital Aristide le Dantec in 2015. Malima et *al* [28] found 56% of intraoperative hypotension in elderly patients who benefited of spinal anesthesia in South Africa in 2019. In this South African study, all patients were operated on under conventional spinal anesthesia and the occurrence of intraoperative hypotension was correlated with increasing local anesthetic doses. Indeed, a titration of local anesthetic doses (Continuous spinal anesthesia) was carried out for 35.6% and 14.8% of the patients, respectively in our study and Ba's study. This could explain the lower prevalence of intraoperative hypotension within these studies in comparison to Malima's study.

We report blood loss on average of 230.2±109.5 ml. Intraoperative transfusion was performed in only 4.8% of our patients. However, our study found a high rate of preoperative anemia in 65.7% of patients. This great disparity in blood transfusion, very low in our study (4.8%), and on high (28.7%) in Australia [29] and very high (100%) in the Netherlands [30] is difficult to explain. Indeed, the retrospective nature of our study does not allow us to give the precise reasons for the low rate of blood transfusion in our study while we reported a higher prevalence of anemia (65.7%) compared to Australian (44.8%) and Dutch (42.5%) studies. We report an average hemoglobin level of 11.6 g/dL for all patients, which could not explain this low transfusion rate. In addition, the majority of patients were classified ASA 1 or 2. Patients' intraoperative blood loss, estimated at 230 ml on average, could justify this low blood transfusion rate despite the high prevalence of anemia.

In our study, only 11.4% of patients benefited from multimodal analgesia combining systemic analgesics and peripheral nerve block. Previous studies had already highlighted this low proportion of locoregional analgesia at university hospital Aristide Le Dantec [31]. This is a real problem for enhanced recovery after surgery (ERAS). Indeed, postoperative pain (POP) is one of main targets of ERAS in elderly people operated for a hip fracture in order to limit surgical stress and its impacts on metabolic, cardiac, pulmonary, digestive and general functions [32]. In addition, POP is one of risk factors for postoperative cognitive dysfunction [33]. Iliofascial block and femoral block occupies a fundamental place, both preoperatively and postoperatively [14, 33, 34]. However, this low share of peripheral nerve blocks for analgesia in our study can be explained by their high costs related to consumables and especially their unavailability in a lot of Sub-Saharan African countries [35].

5. Conclusion

We included 105 patients. The patient average age was 75.2±7.7 years and women represented 61.9% of patients. 58.1% of patients presented an extracapsular hip fracture and a hip osteosynthesis was performed for 60% of patients. None of our patients had benefited of MET-Score assessment. 69.5% of patients were classified ASA 2. 73.3% of patients were evaluated Lee's score level 1. Perimedullar anesthesia (PMA) was performed for 92.4% of patients, general anesthesia (GA) for 5.7% of patients and 1.9% of patients received PMA completed by a GA. For 11.4% of patients, a peripheral nerve block was associated. Intraoperative hypotension was reported for 15,2% of patients. Intraoperative blood transfusion was used in 4.8% of patients. All patients received systemic intravenous

analgesia including, at least, paracetamol (100% of patients). Our study showed limitations in the anesthesia practice for HF: the hospitalization delay was beyond 48 hours for 40,0% of patients, the admission-surgery delay was beyond 48hours for 92.4% of patients, metabolic equivalent was not evaluated in preoperative assessment, TTE was not justified for 32% of patients, 98.9% of blood hemostasis test carried out were not recommended and peripheral nerve block represented an insufficient part in the management of postoperative pain.

Conflicts of Interest

All the authors do not have any possible conflicts of interest.

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