

Peri-Operative Morbidity and Mortality of Elderly Patients in Traumatology-Orthopedics in Bouaké

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Abstract

Introduction: Elderly subjects have physiological and clinical characteristics that make surgical management more complex and have a major impact on their prognosis. The primary objective of this study was to assess peri-operative hospital morbidity and mortality in the elderly. Secondary objectives were to identify factors predictive of death. **Methods:** This was a retrospective observational descriptive and analytical study carried out over 02 years, based on hospitalized patient records. It concerned patients aged 65 or over who had undergone surgery or for whom an indication for surgery had been given, all pathologies included. A total of 138 files were collected. The mean age was 74.15 years. Diabetes (n = 52; 37.68%) and arterial hypertension (n = 38; 27.54%) were the most common comorbidities. The reasons for hospitalization were mostly degenerative (n = 56; 40.58%) and traumatic (n = 49; 35.51%) pathologies. Preoperative delay, intraoperative and postoperative complications, hospital stay, evolution (mode of discharge), time of occurrence and presumed cause of death were studied. Univariate (p < 0.2) and multivariate (p < 0.05) binary logistic regression were performed to search for risk factors for death. **Results:** The mean preoperative delay was 5.53 days (1 - 23). Intraoperative complications were mainly hemodynamic instability (n = 26, 18.8%). Postoperatively, the main complications were anemia (n = 62; 48.44%) and glycemic imbalance (n = 28; 21.86%). Average hospital stay was 13.4 days. Age (>75 years), the existence of comorbidities, degenerative pathologies, ASA score > 2, delay in treatment > 3 days, the occurrence of complications and the blood transfusion requirement were the independent predictors of the occurrence of death in the multifactorial analysis. **Conclusion:** Peri-operative

morbidity in the elderly was influenced by age (>75 years), the existence of comorbidities, degenerative pathologies, ASA score > 2, time to treatment > 3 days, the occurrence of complications and the blood transfusion requirement.

Keywords

Comorbidity, Elderly Patient, Mortality, Surgery

1. Introduction

The increase in the elderly population is a worldwide demographic phenomenon, particularly in developed countries where life expectancy is higher thanks to medical advances [1]. This gradual aging of populations is accompanied by a significant increase in elderly trauma and other pathologies requiring surgical management [2]. In France, fracture of the proximal femur in the elderly is a frequent reason for consultation, and some 60,000 fractures are operated on every year [3] [4]. In Bouaké, elderly patients (>60 years) accounted for 16.6% of admissions [1] [5]. These patients often present multiple comorbidities, with the corollary of degenerative and infectious pathologies that decompensate their comorbidity. Evanoa *et al.* [6] estimated that after the age of 70, a person has at least 5 comorbidities. This multimorbid state reflects the vulnerability of the elderly and favors the decline of physiological functions [6]. These particularities complicate their surgical management and increase the risk of complications and death in the peri-operative period. Hospital mortality is an indicator of hospital performance. The mortality rate for elderly subjects is estimated at 28% after trauma, and 48% for elderly diabetics [6] [7]. In 2021, the overall mortality rate in the trauma department of Bouaké's university hospital center was estimated at 3%, with more than half of deaths occurring in subjects over 60 years of age [8] [9]. Some studies have noted higher mortality rates in elderly trauma patients compared to younger adults with similar [10] [11]. Risk factors for mortality identified in the elderly during surgical management in the literature are essentially advanced age, male gender, and high ASA score [6] [12] [13]. The analysis of factors predictive of mortality is important, as it helps to improve the overall management and quality of care of surgical patients [14]. In Côte d'Ivoire, geriatric medicine is booming. However, there are no specific local data on mortality in elderly patients treated in Traumatology-Orthopedics. The primary objective of this study was therefore to assess peri-operative hospital morbidity and mortality in the elderly. Secondary objectives were to identify factors predictive of death.

2. Methods

This was a retrospective observational, descriptive and analytical study of inpatient records. The study was carried out in the Traumatology-Orthopedics Department of the University Hospital of Bouaké from January 2022 to December

2023. It involved patients aged 65 or over who had undergone surgery or for whom an indication for surgery had been given, all pathologies combined. Patients who had undergone surgery in another health facility and were admitted to our department for a complication, or whose medical records were incomplete, were not included. During the study period, 138 patients were recorded out of a total of 1412 admissions, representing a prevalence of 9.77%. There were 72 men and 66 women, a sex ratio of 1.09. The mean age was 74.15 (65 - 97). The ASA (American Society of Anesthesiologists) score assessed the preoperative health status of patients [15]. **Table 1** shows the epidemiological, clinical and therapeutic characteristics of the patients.

Table 1. Epidemiological, clinical and therapeutic characteristics of patients.

Variables	n	%
Comorbidity		
none	47	34.06
Diabetes	36	26.09
HTN*	25	18.12
HTN + Diabetes	13	9.42
COPD*	4	2.90
CRF* + Diabetes	3	2.17
Prostatic adenocarcinoma	3	2.17
Cataract	3	2.17
HIV*	2	1.45
CRF	2	1.45
Pathologies		
Trauma	49	35.51
Degenerative	56	40.58
Infectious	31	22.46
Tumor	2	1.45
ASA Score		
ASA 1	24	17.39
ASA 2	49	35.50
ASA 3	39	28.26
ASA 4	26	18.85
Type of surgery		
Amputation	36	26.09
Osteosynthesis	35	25.36
Hip prosthesis	14	10.14
Necrosectomy	15	10.87

Continued

Skin grafting	07	5.07
Abscess draining	14	10.14
Tumor removal	02	1.45
Others	15	10,87

*HTN: Hypertension; *COPD: Chronic obstructive pulmonary disease; CRF: Chronic renal failure; *HIV: Human immunodeficiency virus.

Data were collected from hospitalization records and anesthesia charts. The parameters studied were preoperative delay, intraoperative and postoperative complications, hospitalization delay, evolution (mode of discharge), time of occurrence and presumed cause of death. Anemia was defined as a hemoglobin level below 12 g/dl [16]. Glycemic imbalance was defined as blood glucose ≤ 1 g/l or >2 g/l in a known diabetic subject on medication for diabetes. Glycated hemoglobin (HbA1C) was not taken into account during hospitalization, but for the follow-up of diabetic patients on discharge.

2.1. Statistical Analysis

Data processing was carried out using SPSS version 25 software. Descriptive statistics were carried out for quantitative and qualitative variables. A two-stage binary logistic regression was performed to search for risk influencing death at the $P < 0.05$ significance level. A prior univariate analysis was performed to search for a measure of association between independent variables and death at the threshold $P < 0.2$ in order to reduce bias between variables. The independent variables were age, gender, existence of comorbidity, type of pathology, ASA score, time to treatment, type of anesthesia, time to hospitalization, occurrence of complications, time to death and need for blood transfusion.

2.2. Ethical Considerations

Data were collected in strict compliance with patient anonymity and confidentiality. The information provided was used solely for the purposes of the study.

3. Results

The mean preoperative time was 5.53 days (1 - 23). Seventy-eight patients (56.52%) were operated on after 3 days. Intraoperative complications affected 38 (27.5%) patients. Postoperatively, 78 patients (56.5%) experienced one or more complications. A total of 128 complications were observed. Complications are listed in **Table 2**. Cognitive disorders were represented by disorientation in time and space, episodic memory disorders, illusions and hallucinations.

A blood transfusion was performed preoperatively for a hemoglobin level below 9 g/dl and postoperatively for a hemoglobin level below 8 g/dl or in the event of signs of intolerance. Transfusion was performed pre-operatively (n = 12; 8.6%), postoperatively (n = 15; 10.8%), and pre- and postoperatively (n = 35; 25.3%).

Table 2. Distribution of intra and postoperative complications in patients.

Complications	intra operatoire (n; %)	Post operatoire (n; %)
Hemodynamic instability	(26; 18.84%)	
Delayed wakening	(9; 6.52%)	
Drug allergy	(3; 2.17%)	
Anemia		(62; 48.44%)
Glycemic imbalance		(28; 21.86%)
Surgical site infection		(12; 9.38%)
Cognitive disorders		(10; 7.81%)
Breathing difficulties		(6; 4.69%)
Pressure ulcers		(5; 3.91%)
Cutaneous necrosis		(5; 3.91%)

Intraoperative transfusion depended on the indication. Postoperatively, below 8 g/dl hemoglobin, oral antianemic therapy was instituted. Average hospital stay was 13.39 days (2 - 90). The proportion of patients discharged with a positive medical opinion was 71.74% (n = 99).

Mortality was estimated at 28.26% (n = 39). All patients who died had presented at least one postoperative complication. **Table 3** shows the characteristics of the patients who died.

Table 3. Characteristics of patients who died.

Variables	n (n = 39)	%
Age		
≤75 years	20	52.3
>75 years	19	48.7
Pathologies		
Trauma	8	20.5
Infectious	10	25.6
Degenerative	19	48.7
Tumor	2	5.2
time of death		
pre-operative	8	20.5
intra-operative	4	10.3
Post operative	27	69.2
ASA Score		
ASA 1	3	7.7
ASA 2	5	12.8
ASA 3	11	28.2
ASA 4	20	51.3

Continued

anaesthesia type (n = 31)		
general anaesthesia	13	41.9
Spinal anaesthesia	18	58.1
Cause of death		
Sepsis	9	23.1
Anemia	7	17.9
Pulmonary embolism	4	10.3
CVA*	2	5.1
Glycemic imbalance	15	38.5
hemorrhagic shock	2	5.1

*CVA = cerebral vascular accident.

In the univariate analysis, age, the existence of comorbidities, degenerative pathologies, ASA > 2 score, therapeutic delay (>3 days), the existence of complications and the need for blood transfusion were the factors associated with death ($p < 0.2$). The results of binary regression are summarized in **Table 4**. Age (>75 years), comorbidities (yes), type of pathology (degenerative), ASA score (>2), time to treatment (>3 days), complications (yes) and need for blood transfusion were predictive of the occurrence of death ($p < 0.05$).

Table 4. Binary regression results.

Independent variables	Analyse unifactorielle		Analyse multifactorielle	
	ORb (IC 95%)	p-value	ORa (IC 95%)	p-value
Age (>75 ans)	1.32 (0.06 - 3.23)	0.16	4.01 (0.32 - 11.3)	0.01
Gender (Male)	1.11 (0.88 - 3.12)	0.25		
Comorbidity (yes)	2.11 (1.33 - 19.77)	0.07	3.25 (0.00 - 17.38)	0.04
Type of pathology (degenerative)	2.03 (0.30 - 1.56)	0.12	1.63 (0.02 - 15.48)	0.02
ASA Score (>2)	1.59 (0.97 - 9.16)	0.09	3.56 (0.28 - 90.47)	0.00
Anaesthesia (ALR)	3.33 (2.36 - 16.81)	0.34		
Therapeutic delay (>3 jrs)	3.17 (0.01 - 0.45)	0.19	2.67 (1.26 - 46.39)	0.01
Hospitalization delay (>14 jrs)	1.44 (0.36 - 26.50)	0.37		
Complications (Yes)	1.78 (1.81 - 14.10)	0.06	8.02 (0.01 - 77.56)	0.00
Time of death (Post-operative)	5.28 (7.59 - 11.50)	0.68		
Blood transfusion (Yes)	5.74 (1.55 - 12.34)	0.05	2.31 (3.50 - 96.10)	0.70

CI: Confidence interval; p: p-value; OR: Odds ratio (a = ajusté; b = brut).

4. Discussion

The primary objective of the present study was to evaluate in-hospital perioperative morbidity and mortality in elderly patients. Secondary objectives were to identify

factors predictive of death. Intraoperative complications were mainly hemodynamic instability (18.84%). Postoperatively, more than half the patients (56.52%) presented at least one complication. Mortality was 28.26%, with 69.2% of deaths occurring postoperatively. Age > 75 years, co-morbidities, type of pathology (degenerative), ASA score > 2, delay in treatment (>3 days), occurrence of complications and need for transfusion favoured the occurrence of death.

The preoperative delay was long for most patients (56.52%). This long delay could be explained by several reasons in the local context. The insufficient number of operating theatres, the patients' lack of financial means and the time taken to correct the disorders caused by their comorbidities are other reasons for the delay in surgical management in our context. Operative delay remains a debated factor and varies according to the series [17]. It plays an important role, as demonstrated by the meta-analysis of Simunovic *et al.* [18], in which the mortality rate dropped significantly with decreasing operative delay (72, 48 and 24 hours; $p = 0.01$). This long delay was therefore a negative factor for the prognosis of elderly patients. Indeed, the study by Collin *et al.* found that an operative delay of more than 48 hours increased the risk of death 6 months after surgery by 1.5 times in geriatric patients with proximal femur fractures [17]. These results corroborate those of our study (OR 2.67, $p = 0.01$). Improving the healthcare system, strengthening the technical platform and providing efficient health coverage could help to reduce the time to surgery in elderly, as well as their morbidity and mortality.

Intraoperative complications were frequent and mostly represented by hemodynamic instability. This intraoperative hemodynamic instability was probably linked to the patients' comorbidities and pathologies. Hypertension and diabetes were the most common comorbidities. Both pathologies progress to organic lesions, metabolic and degenerative complications [19] [20]. Surgical intervention in these patients requires intraoperative hemodynamic optimization. This involves maintaining a blood pressure adapted to organ perfusion and avoiding hypertensive peaks, in order to reduce cardiovascular and hemorrhagic complications [19]. Perioperative risk in the elderly must consider comorbidities, expected complications for each type of surgery and the quality of care provided for this pathology [21]. There is no consensus on the ideal type of anesthesia for the elderly. In fact, no study has demonstrated a morbidity-mortality benefit between locoregional and general anesthesia [22] [23]. Nevertheless, regardless of the anesthetic technique chosen, it is recommended that anesthetic doses be used by titration in the elderly subject [23]. In this study, the type of anesthesia did not influence mortality ($p = 0.11$).

Post-operative complications were numerous and dominated by decompensation of tarsus and anemia. This anemia was very often related to an infectious pathology and required pre- and intraoperative blood transfusion. The need for preoperative blood transfusion is a major factor in the risk of death in the elderly [2] [24]. In a study carried out in Taiwan region, patients who received more blood transfusion (greater than 3 units) had a higher risk of mortality than those

who received less (OR, 3.0; 95% CI, 1.94 - 4.56; $p < 0.001$) [2]. In this study, blood transfusion was also identified as a predictor of mortality.

Infectious complications ($n = 12$) and cognitive impairment ($n = 10$) were also found in these elderly postoperative patients. Diabetic patients are more likely to develop infectious complications [8] [25]. Diabetes was the most common comorbidity in the present study. This could explain the frequency of postoperative infectious complications. Postoperative delirium is an acute disorder of attention and cognition that increases perioperative mortality in the elderly, particularly after trauma [26]-[28]. Risk factors for these postoperative cognitive disorders have been identified by some authors, as in this study. These included age > 75 years, pre-existing cognitive impairment, infection, hydroelectrolytic disorders, blood transfusion and high losses [29]-[31]. Age, infection and the need for transfusion were factors observed in the present study.

Mortality was high ($n = 39$; 28.26%), and death occurred most frequently in the postoperative period. Intra-hospital mortality varied between 1% and 3.7% in the context of trauma in the elderly [1] [32]. It reaches 24.1% at one year post-op for proximal femur fractures [32]. In-hospital mortality in our study is higher than in the literature. This can be explained on the one hand by the difference in methodology. This study considers all pathologies, whether traumatic, infectious or degenerative. Medical expenses are fully borne by the patient, who very often has no fixed source of income, which delays treatment. Technical facilities, especially for the intensive care of these fragile patients, are inadequate. On the other hand, working conditions in our context could explain this mortality rate. Patients consult us late, sometimes after traditional treatment has failed. The study of mortality factors makes it possible to define lines of prevention and establish a protocol for the management of patients [33]. The risk factors identified in the present study were age > 75 years, the existence of comorbidities, degenerative pathologies, ASA > 2 score, therapeutic delay > 3 days and the existence of complications. Advanced age has been identified by many authors as an independent risk factor for increased mortality [1] [6] [10]. Postoperative morbidity increased linearly with age (+0.71%/year), with a morbidity rate of 51% in the over-80 s [34]. According to Turrentine *et al.* [35], post-operative mortality increased exponentially with age, with a mortality rate of 7% in the over-80 s and almost 12% in the over-90 s. Mortality was higher in patients with comorbidities. Diabetes is a disease with serious consequences due to its complications, which make it a disease with greatly increased morbidity and mortality compared to the general population [36]. After ten years of diabetic progression, the frequency of postoperative complications increases, and is accompanied by numerous degenerative lesions, including cardiovascular damage, which makes the perioperative management of diabetic patients even more serious and difficult [36]. Comorbidities influence the ASA score, which was used to assess the patient's preoperative status. A high ASA score increased the risk of death (OR = 3.56; CI: 0.28 - 90.47, $P = 0.00$). ASA score > 2 was found to be predictive of mortality in the elderly by several authors [6]

[12] [17]. Particular attention should be paid to stabilizing comorbidities in the elderly in the peri-operative period. A better organization of patient care and enhanced staff skills could help reduce mortality, especially in the postoperative period. This study has its limitations. It is retrospective and monocentric. This study represents the first in the local context to investigate predictive factors of mortality in the elderly in Traumatology-Orthopedics. It therefore constitutes a useful database for orthogeriatrics.

5. Conclusion

Peri-operative complications were numerous. These included intraoperative hemodynamic instability, anemia and postoperative decompensation of pre-existing defects. Mortality was high. Predictive factors identified were age > 75 years, comorbidities, degenerative pathologies, ASA score > 2, time to treatment > 3 days, complications and blood transfusion requirement. Early and, above all, multi-disciplinary care involving effective management of defects and frailty could improve the vital prognosis of geriatric patients.

Conflicts of Interest

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

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