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Mortality Risk Factors of Emergency Surgery in Adults: A Longitudinal Study

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Abstract

Background: Emergency surgery is a challenge for the care. The purpose of the study was to study the risk factors for mortality in emergency surgery in adults.

Patients and Methods: It was a longitudinal and prospective study conducted from December 1st, 2017, to April 30th, 2018, in adults operated for a surgical emergency at the Central Hospital of Yaoundé. The variables studied were the operative indication, the operative risk, the anesthesia's technique, the complications, the risk factors for mortality. These data were analyzed with the Epi info software version 3.5.4 and the logistic regression was done using the Statistical Package for Social Sciences (SPSS) software version 20.0.

Results: We involved 283 patients. Sex-ratio was 0.2. The median age was 30.6 years and extremes of 18 and 83 years. Obstetric and gynecologic surgeries (76.4%) and digestive surgeries (14.8%) were the most frequent. ASA 2 class was the most represented (47.7%). Surgical risk was minor in 78.8% of cases. Intraoperative complications occurred during the maintenance period (77.9%). They were mainly cardiovascular (79.6%). Postoperative complications were predominantly infectious (33.8%). Fourteen deaths were recorded, with a mortality rate of 4.9% and the factors associated with these deaths were age > 65 years (42.9%), ASA class> 2 and the occurrence of complications.

Conclusion: One in 20 patients died during the perioperative period. The risk factors were related to the presence of comorbidities and the anesthesia's technique. An optimization of the care would improve the management of the surgical emergencies in the adult.

Keywords: Risk Factors; Mortality; Emergency Surgery

Introduction

The management of surgical emergencies in developing countries is often confronted with socio-economic problems, the clinical condition of the patient, the distance from healthcare facilities, self-medication, the lack of health education, late arrival in hospital structures, lack of medical transport, insufficient technical platform and adequate human resources. It is therefore a real challenge [1]. In sub-Saharan Africa, traumatic emergencies are the most frequent, with a predominance of Road traffic accidents [2]. The mortality rate after emergency surgery in adults remains high [3]. Over 3 million postoperative deaths occur worldwide per year. There are multiple methods for predicting which patients are at high risk of death or complications from surgery [4]. In Cameroon, Ngowé et al. [5] in 2007, found a mortality of 8.1% with a predominance of trauma [5]. Perioperative mortality depends on the urgency of the surgery, the type of surgery, the patient's preoperative condition, the time to treatment and the occurrence of complications [6-8]. Scott John et al in the United States reported that a patient undergoing emergency surgery was eight times more likely to die postoperatively than a patient

undergoing elective surgery [9]. With a major postoperative morbidity rate of around 15%, a short-term mortality rate between 1 and 3%, and a reproducible association between short-term morbidity and long-term survival, the impact of surgical complications on individual patients, healthcare resources, and society at large is clearly evident [4]. The aim of our study was to analyze the risk factors for mortality in emergency surgery.

Patients and Methods

This was a longitudinal and prospective study carried out from December 1, 2017, to April 30, 2018, in adults operated for a surgical emergency at the Yaoundé Central Hospital. After approval from the national ethics committee, was included in our study, any patient over the age of 18, admitted for emergency surgery in an operating room at the Yaoundé Central Hospital, and who have given their consent. The sampling was consecutive. Recruitment was carried out during the anesthetic consultation. The data recorded were the age, the sex, the past history, the operative risk (surgical and anesthetic), the operative indication, the anesthesia technique, the ASA, Altemeier and Boersma classifications. During the intraoperative period, in the operating room, the monitoring parameters (BP, HR, RR, SpO_2), the duration of anesthesia, the duration of the surgery, the operative procedure and the intraoperative complications were noted.

The postoperative phase was evaluated in the hospital wards and in the intensive care unit. The data collected were the parameters vital signs (BP, HR, RR, SpO_2, state of consciousness, temperature), postoperative complications. Postoperative follow-up continued until the 30th postoperative day. The variables studied were the operative indication, the operative risk, the anesthesia's technique, the operative complications, the mortality and risk factors for mortality. Early postoperative complications occurred within 6 hours of the operation. Late postoperative complications occurred beyond the first six hours. The data collected was entered, coded and analyzed using Epi info 3.5.4 version 2012. The continuous variables were expressed as mean with the standard deviation. Categorical variables were expressed by frequencies and proportions. The search for associated factors was performed by multivariate logistic regression analysis using Statistical Package for Social Sciences version 20.0 software (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 23.0 Armonk, NY: IBM Corp). This logistic regression model was able to determine factors associated with death and a p value <0.05 was considered statistically significant. The study was conducted in accordance with the basic principles of the Helsinki Declaration on research involving individuals.

Results

The sample size was 283 patients. The median age was 30.6 years with extremes of 18 and 83 years. The most represented age group was 18 to 29 (n = 160, 56.5%). The sex-ratio was 0.2. ASA 1 and 2 classes represented 90.5% of the workforce (n = 256). The average time to take charge was 265.5 minutes, or approximately 4h 43 minutes, with extremes of 8 minutes to 5 days. General anesthesia was the predominant technique (n = 144, 50.9%). Intraoperative complications were found in 61 patients (21.6%). Intraoperative complications mainly occurred during the maintenance period (n=141, 77.9%). They were cardiovascular (n= 144, 79.6%). Postoperative complications were predominantly infectious (n=27, 33.8%). The mortality rate was 4.9% (n = 14). Infection was the most common cause (n = 6, 42.9%). The factors associated with these deaths were age > 65 years (42.9%), ASA class > 2 and occurrence of complications (Table 1-5).

Table 1 : Patient's Characteristics.

Characteristics	Number (N=283)	Percentage (%)
Sex		
Female	236	83.4
Male	47	16.6
Type of surgery		
Gyneco-obstetrical	219	77.4
Digestive	43	15.2
Traumatology	11	3.9
Neurosurgery	6	2.1
ENT	3	1
Thoracic	1	0.4
ASA classification		
ASA 1	121	42.8
ASA 2	135	47.7
ASA 3	26	9.2
ASA 4	1	0.3

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Boersma's classification		
Minor risk	223	78.8
Intermediate risk	60	21.2
Operative indication		
Cesarean section	168	59.4
Laparotomy	79	27.9
Appendicectomy	11	3.9
Craniotomy	6	2.1
Osteosynthesis	6	2.1
Abscess drainage	4	1.4
Amputation	4	1.4
ENT surgery	3	1.1
Hernia	2	0.7
Anesthesia's technique		
General anesthesia	144	50.9
Spinal Anesthesia	139	49.1

Table 2: Intra-Operative Complications.

Intra-Operative Complications	Number (N=181)	Percentage (%)
Induction period (n=10, 5.6%)		
Hypoxia	3	1.6
Hypovolemic shock	2	1.1
Cardiac arrest	2	1.1
Difficult intubation	1	0.6
Bradycardia	1	0.6
Death	1	0.6
Maintenance period (n=141, 77.9%)		
Tachycardia	39	21.6
Hypotension	37	20.4
Bleeding	32	17.7
Hypertension	13	7.2
Hyperthermia	9	5
Hypoxia	5	2.8
Hypovolemic shock	3	1.6
Bradycardia	3	1.6
Awakening period (n=30, 16.5%**)**		
Delayed awakening	9	5
Hypoxia	6	3.4
Hypotension	6	3.4
Bradycardia	4	2.2
Bradypnea	2	1.1
PONV	2	1.1

Note: PONV: Postoperative Nausea and Vomiting.

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Table 3 : Postoperative Complications.

Postoperative Complications	Number (N=80)	Percentage (%)
Early complications (n=21, 26.3%)		
Hypoxia	5	6.3
Cardiac arrest	5	6.3
Hypovolemic shock	4	5
Bradycardia	3	3.8
Tachycardia	2	2.5
Bleeding	1	1.2
Oliguria	1	1.2
Late complications (n=59, 73.7%)		
Wound infection	10	12.5
Anemia	8	10
Malaria	6	7.5
Oliguria	5	6.3
Neurologic disorders	4	5
Respiratory disorders	4	5
Hypertension	4	5
Endometritis	3	3.8
Bleeding	3	3.8
Urinary infection	2	2.5
Respiratory infection	1	1.2
Fistula	1	1.2
Thrombophlebitis	1	1.2
Suture release	1	1.2
Peritonitis	1	1.2
Tachycardia	1	1.2
Others*	3	3.8

Others*: Enteritis, Chorioamniotitis, Phlebitis.

Table 4 : Causes of Death.

Causes	Number (N=14)	Percentage (%)
Sepsis	6	42.9
Cardiac arrest	5	35.7
Hemorrhagic shock	2	14.3
Intravascular hemolysis	1	7.1

Table 5 : Risk Factor of Mortality.

Risk factors	Death		p value	OR (IC 95%)
	Yes	No		
Age				
< 65 years	11 (4%)	265 (96%)	**0.04**	14.02 (0.84-204.5)
65 years and above	3 (42.9%)	4 (57.1%)		
ASA classification				
ASA 1-2	6 (2.3%)	250 (97.7%)	**<0.01**	142.8 (9.4-2164.6)
ASA 3-4	8 (29.6%)	19 (70.4%)		

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Intra-operative complications				
Yes	13 (21.3%)	48 (78,7%)	**< 0.01**	39.9 (4.8- 334.3)
No	1 (0.5%)	221 (99,5%)		
Postoperative complications				
Yes	12 (26.7%)	33 (73.3%)	**< 0.01**	28.2 (5.5- 144.9)
No	2 (0.8%)	236 (99.2%)		

Discussion

The study involved 283 patients predominantly female. The median age was 30.6 years. ASA classes 1 and 2 accounted for 90.5% of the cases. The surgical risk was minor (78.8%). Intraoperative complications occurred during the maintenance period (77.9%). They were mainly cardiovascular (79.6%). Postoperative complications were predominantly infectious (33.8%). The death rate was 4.9%, or 14 deaths. Factors associated with mortality were age>65 years, ASA class >2 and occurrence of complications. The preoperative data revealed a young population, the majority ASA 1 and 2 classes and a minor surgical risk. This was linked to the mapping of the Cameroonian population. This was a young population with few comorbidities. This was confirmed by others Cameroonian series. Ngowé et al found a mean age of 32.5 years [4]. Owono et al. found a minor (46.6%) and intermediate (53.4%) surgical risk in his sample [10]. General anesthesia was the predominant technique (50.9%). This is the technique most practiced in our context, specifically during emergency surgery. General anesthesia remains the safest emergency anesthetic technique even though it is responsible for many respiratory disorders [11]. Emergency general surgery is characterized by a comorbid, physiologically acute patient population with disparately high rates of perioperative morbidity and mortality [12]. The average time to take charge was 4 hours with extremes of 8 minutes to 5 days. It depended on the surgical indication and the socio-economic conditions of the patient. Ngowé et al. in Cameroon, found similar results [4]. The rate of occurrence of perioperative complications was high. The intraoperative complications were mainly cardiovascular. Late postoperative complications were infectious. This was linked to the socio-economic conditions and the non-optimal conditions of care. The surgical management of emergencies in emerging countries is very often confronted with socio-economic problems, the clinical condition of the patient, the remoteness of care structures, self-medication, lack of education. health, late arrival in hospital structures, lack of medical transport, insufficient technical platform and insufficient medical and paramedical staff [1]. The death rate was 4.9%. The main causes were infectious. This mortality depended on the operative indications, the preoperative preparation and the delay in treatment. These results were similar to those of several African series. The mortality rate after emergency surgery in adults remains high. A study carried out in Madagascar in 2016 revealed a mortality rate of 4.4% [3]. In Senegal in 2006, Gaye et al found a mortality of 4.3% [2]. Scott John et al reported that a patient who received emergency surgery was eight times more likely to die postoperatively than a patient who received elective surgery [9]. The main causes of death are linked to multiple traumas, time to treatment and the presence of septic shock [5,13,14]. Over 3 million postoperative deaths occur worldwide per year. Some of these may be avoidable through risk-assessment–based modification of treatment pathways, such as postoperative critical care admission [4]. Mortality rate for patients undergoing non cardiac surgery in Europe-based on the European Surgical Outcomes Study-is 4% with crude mortality rates varying widely between countries (ranging from 1.2% to 21.5%). By comparison, emergency surgery has poorer outcomes and a higher mortality rate with recent studies reporting the 30-day mortality to be between 14 and 15% [15]. Factors associated with mortality were age>65 years, ASA class>2 and occurrence of complications.

These results were linked to the anesthetic risk (ASA classification), the support delay and the low socio-economic status. These results are similar to those obtained in several studies [1,5,16]. Perioperative mortality depends on the emergency of the surgery, the type of surgery, the patient's preoperative condition, the time to treatment and the occurrence of intra and postoperative complications [6-8]. Analysis of the patients who died within three days of surgery showed an older age, a higher P-POSSUM, lactate, and ASA grade, and they were more physiologically compromised, with a lower systolic blood pressure, raised creatinine, and raised heart rate [17]. Increasing evidence suggests that postoperative mortality in both high and low/middle-income settings is due less to what happens in the operating theatre and more to our 'failure to rescue' patients who develop postoperative complications [18]. Preoperative risk prediction is important for guiding clinical decision-making and resource allocation. Clinicians frequently rely solely on their own clinical judgement for risk prediction rather than objective measures. The combination of subjective assessment with a parsimonious risk model improved perioperative risk estimation [4]. Emergency surgery outcomes in the UK were worse than those seen in the USA, suggesting an 8-fold increase in mortality in patients who had a predicted mortality rate of 0-5%. The report suggested that the differences could be overcome by better identification of high-risk patients; improved triage and preassessment; better intraoperative care; and improved postoperative care, including increased use of critical care [4]. Risk stratification tools facilitate a meaningful comparison of surgical outcomes between surgeons, hospitals and

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healthcare systems. In the perioperative setting, risk stratification tool can help to objectify the clinical triage process and to quantify probability of serious morbidity and mortality. Such tools can thus support surgical decision making and can aid in the informed consent process.

The provision of safe surgery is an international healthcare priority. Guidelines recommend that preoperative risk estimation should guide treatment decisions and facilitate shared decision-making [4]. The study presented certain limits, like the short duration of the data collection period. It had as a corollary a small sample size. This was different from the characteristics of the other studies. It was also a monocentric study. All this did not allow us to generalize our results at the national level.

Conclusion

One in 20 patients died during the perioperative period. The risk factors were related to the operative risk and the anesthesia's technique. An optimization of the care would improve the management of the surgical emergencies in the adult. There is a need to accurately stratify patient risk so as to make the most of limited resources and improve perioperative outcomes

Conflicts of Interest

The authors declare no conflicts of interest.

Author Contribution

All authors contributed to the development and conduction of this article. All authors have read and approved the final version of the manuscript.

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