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Management of Post-Operative Complications in a Resuscitation Department in Sub-Saharan Africa

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Abstract **Original Research Article**

Introduction: Post-operative complications are a major public health problem that can compromise the success of surgery by extending the duration of hospitalization and therefore increase the cost of care and the postoperative morbidity and mortality rate. ***Objective:*** To evaluate the management of post-operative complications in an intensive care unit (ICU) in Senegal. ***Methodology:*** We conducted a retrospective, descriptive and analytical study over a period of 24 months (January 1st, 2022 to December 31th, 2023). We included all patients aged at least 15 years who had been operated and secondarily transferred to ICU for post-operative monitoring or following the management of perioperative complications. ***Results:*** The frequency of post-operative complications was 15.5%. The average age was 46.7 years with extremes of 16 and 103 years. The sex ratio was 0.38. A medical history and a pathology were found in 28.7% and 31.6% respectively. Etiologies were dominated by obstetric emergencies in 34.6% including pre-eclampsia and its complications in 16.8%, postpartum hemorrhages in shock in 14.8% and abdominal emergencies in 30.7% including peritonitis in 15.8%. Surgery was urgent in 64.4%. Classes ASA 2u and Altemeier 4 were predominant with 41.6% and 41.5% respectively. Preoperative preparation was performed in 16.8%. General anesthesia was performed in 83.2%. Post-operative complications were infectious in 21.4%, cardiovascular in 19.3% and renal in 17.2%. The management consisted of vascular filling in 26.7%, oxygen therapy in 76%, catecholamines in 28.7%, blood transfusion in 31.6%, mechanical ventilation in 16.8%, heparinotherapy in 84.1% and antibiotic therapy in 55.4%. The duration of hospitalization ranged from 3 hours to 24 days. The evolution is encumbered by a mortality of 48.5%. ***Conclusion:*** The post-operative complications are frequent in intensive care unit. They are infectious, cardiovascular and renal in the majority of cases. Mortality remains very high. The management must be multidisciplinary.

Keywords: Post-operative complications – Resuscitation - Peace Hospital – Ziguinchor.

INTRODUCTION

Post-operative complications (POC) refer to all incidents or accidents that may occur during or after any surgical procedure. They lead to the worsening of the previous situation through their morbidity and even their mortality. They are said to be early when they occur within thirty (30) days following the intervention [1; 2]. They remain important indicators of the quality of intervention and post-operative care [2]. Despite the progress made with the use of techniques that are less and less invasive and more and more efficient as well as early rehabilitation after surgery, POC remain frequent situations of admission to ICU [2, 3]. In Africa, the frequency of POC is between 14.3 and 23.3% with a mortality of 2.1% [2]. In sub-Saharan Africa, POC was dominated by post-operative infections [4]. In Senegal, the study conducted in ICU in Dakar found POC frequency of 36.4% [5]. In Mali, in ICU, the POC ranged from 28% to 41.4% [6; 7]. The literature on POC in ICU is poor. The POC have not yet been evaluated in peripheral resuscitation department in Senegal. The main objective of our study was to evaluate the management of POC and the specific objectives were to give the frequency and describe the epidemiological, surgical, anesthetic aspects, therapeutic and evolutionary of the POC in ICU at the Ziguinchor Peace Hospital Center in southern Senegal.

PATIENTS AND METHODOLOGY

It was a retrospective, descriptive and analytical study on POC in ICU. The study was conducted over a period of 24 months from January 1st, 2022, to December

31th, 2023, at the ICU of the regional hospital center for peace in Ziguinchor. Our study population consisted of all patients admitted to ICU for post-operative conditions, regardless of the type of surgery performed, during the study period. We included the written medical records of all patients aged 15 years and older, regardless of gender, who presented at least one intra-operative or POC requiring admission to ICU and/or during their post-operative stay in ICU. We did not include patients whose surgery was performed in other hospitals and those who died upon admission to ICU (less than 3 hours). The data were collected from the registers of admission to resuscitation and the operating room, the medical records of resuscitation and anesthesia of the patients as well as the post-operative prescription and monitoring sheets. To this end, an investigation form has been pre-established. The following variables were studied: epidemiological (frequency, age, sex, medical history, reason for admission to ICU), surgical (emergency or elective, diagnosis and indication of surgery, exploration during operation and surgical procedure, duration of surgery), anesthetic (preoperative preparation, type of surgery according to the Altemeier classification, ASA classification, anesthetic technique, adverse events during interventions and their management), therapeutic (resuscitation measures namely vascular filling, vasoactive drugs, mechanical ventilation, oxygen therapy, blood transfusion, antibiotic prophylaxis and antibiotherapy, heparin therapy, prevention of stress ulcer) and evolutive (transfer, time of occurrence and type of complications observed, death, causes, mortality index reduced by the efficient management of complications or IMAGE and duration of ICU).

We used the Microsoft Excel 2016 software for the creation of the database. The quantitative variables were expressed as mean standard deviation and the qualitative variables were expressed in terms of number and percentage (%). The statistical analysis was carried out using the Pearson Chi2 test or the exact Fisher test from the Jamovi software version 2.6.19. The p value allowing to affirm the existence of a statistically significant difference between two percentages of two variables was set at 0.05.

RESULTS

During our study period, 3167 surgical procedures were performed in the operating room of the Ziguinchor Peace Hospital Center as part of the emergencies and the elective interventions. In ICU, 649 admissions were made including 115 patients for post-operative suites. Among these, 101 presented at least one POC. The frequency was 3.1% for all surgical procedures and 15.5% for ICU admissions. The average age was 46.7 years and the median was 41 with extremes of 16 and 103 years. The age group from 30 to 49 years was predominant in 34.7%. The sex ratio was 0.38. A pathological medical history was found in 28.7%. In 24.7%, a surgical history was found. Among these factors, hypertension in 7.9%, diabetes mellitus in 6.9% and chronic kidney disease 3.9% were predominant. The reasons for admission to ICU were dominated by states of shock in 51.5% followed by postoperative care for major and/or long-term surgery in 10.9%, then delay in waking up in 10.9%, then vascular-renal complications of pregnancy in 13,8% and finally respiratory distress in 3.9%. Patients were operated on urgently in 64.4%. The surgeries were digestive in 50.5%, obstetric in 35.6%, urological in 5.9%, ENT in 2.9% and orthopedic in 1.9%. Pre-operative diagnostics were dominated by obstetric emergencies in 34.6% followed by abdominal emergencies in 30.7% and digestive tumors in 13.8%. Obstetric emergencies were represented by severe pre-eclampsia and its complications in respectively 16.8% followed by postpartum hemorrhages in 14.8%. Peritonitis accounted for 15.8% of abdominal emergencies. Caesarean sections and exploratory laparotomies were performed in 34.6% and 30.7% respectively. Table I describes the distribution of patients according to operative indications.

Table I: Distribution of patients according to operative indications

Operative indications	Percentage (%)
Caesarean	34,6
Exploratory laparotomy	30,7
Hemicolectomy	3,9
Cephalic duodenopancreatectomy	2,9
Hysterectomy	2,9
Fundoplication	1,9
Gastrectomy	1,9
Thyroidectomy	1,9
Other	11,8

Contaminated (III) and dirty (IV) surgeries according to the Altemeier class respectively accounted for 40.5% and 41.5% of cases. Clean (I) and clean contaminated (II) surgeries were found in 6.9% and 8.9% respectively. According to the ASA classification, class 2 was predominant in 54.4% followed by class 1 in 17.8%. Classes 3 and 4 represented 12.8% and 14.8% respectively. A preoperative preparation was carried out in 16.8%. General anesthesia was the dominant anesthetic technique in 83.2% versus 16.8% spinal

anesthesia. An adverse event was found in 27.7%. It was a hemorrhagic shock in 20.8% followed by pulmonary inhalation in 4.9% and cardio-respiratory arrest in 1.9%. The intraoperative management consisted of vascular filling in 26.7% associated with vasopressive amines in 22.7% and blood transfusion in 32.6%. POC occurred during the first 48 hours of hospitalization in intensive care in 92.1%. Post-operative complications were medical in 91.7% and surgical in 8.2%. Post-operative complications were infectious in 21.4%, followed by cardiovascular in 19.3% and renal in 17.2% as shown in table II.

Table II: Distribution of the different post-operative complications

Post-operative complications		Percentage %
Infectious (Septic shock)		21,4
Cardiovascular		19,3
Renal		17,2
Respiratory		15,6
Digestive		8,1
Neurological		6,8
Thromboembolic		4,1
Metabolic		4,1
Haematological		2,7

Therapeutic management in ICU consisted of systematic gastric protection with proton pump inhibitors associated with echoguided vascular filling, oxygen therapy, catecholamine use, transfusion, mechanical ventilation, to heparin therapy and antibiotic therapy. Table III shows the distribution of patients according to therapeutic modalities.

Table III: Distribution of patients according to therapeutic modalities

Therapeutic modalities	Percentage (%)
Prevention of stress ulcer/ PPI	100
Heparinotherapy	84,1
Antibiotic therapy	55,4
Vascular filling	26,7
Blood transfusion	31,6
Vasopressor amines	28,7
Mechanical ventilation	16,8
Oxygen therapy	76

PPI : proton pump inhibitor

The evolution was favorable in 51.5%. We deplored 48.5% of deaths. More than a third of deaths, 32.6%, occurred within the first 24 hours. The causes of death were septic shock with multiple organ dysfunction in 71.4% followed by refractory hemorrhagic shock in 24.5% and multiple organ dysfunction after cardiac arrest in 4.1%. The IMAGE index (101-48/101) was 51.5. The duration of hospitalizations ranged from 3 hours to 24 days. The factors of poor prognosis found in the analytical study were post-operative infectious, renal, neurological, respiratory complications and lack of pre-operative preparation. The urgency of surgery was associated with the occurrence of cardiovascular POC. Intraoperative adverse events were associated with the occurrence of respiratory POC.

DISCUSSION

This work carried out in ICU in a country with limited resources had some limitations. The retrospective nature associated with the absence of computerized archiving makes several results unavailable. The low socioeconomic level of patients in regions prevented the completion of certain additional examinations necessary for therapeutic adaptation. The technical platform is poorly adapted with the absence of a dialysis machine, blood gas analyzer, and X-ray in the resuscitation unit. The literature on POC in ICU in Senegal is poor. A study on the subject was carried out in Dakar and the rest of the studies concerned POC of specific surgical populations. This cross-sectional study allows to evaluate the frequency and to describe the POC in ICU in a peripheral structure of Senegal. In our series, the frequency of POC in ICU was 15.5%. Our result was lower than that of Mpoy Emy [5] in Dakar who had found 36.4%. This difference could be explained by the fact that this last study was carried out in a national reference hospital center taking care of more complex pathologies. Similarly in Bamako, Niang and Bagayoko had found POC frequencies of 41.4% and 28% respectively [6; 7]. Atangana had found a similar result to ours but it was a study on POC after elective surgery [8].

In our study, the average age was 46.7 years. This result was similar to the one found in Dakar which

was 47.1 years and in Mali 43.9 years [5; 9]. A lower average age has been found by other African authors [6; 8 ; 10]. In Europe, Proske had found an average age of 66 [11]. This relatively young age in our context could be explained by the predominance in sub-Saharan Africa and particularly in Senegal of the youth of the population.

A female predominance (72.3%) was found in our study with a sex ratio of 0.38. Our study population concerned any type of surgery with a significant share of gynecologic and obstetric pathologies that could explain the average young age of our series. This result is corroborated by other studies [5; 7 ; 12]. However, Niang and Atanga in Mali had regained a male predominance [6; 8]. This difference is explained by a selection bias and a heterogeneity of the populations studied.

The reasons for hospitalization were dominated by shocks in 51.5% followed by major surgery and delayed awakening in 10.9% each. Hemodynamic instability is a common reason for hospitalization in ICU. Surgery remains a risk factor for hemodynamic instability, especially in the context of emergency. This predominance of shock as a reason for admission has been found by other authors [5; 6 ; 7]. These shocks were related on one hand to postpartum hemorrhages in the context of obstetric emergencies and on the other hand to septic shock in the context of digestive emergencies. However, Kumar noted mechanical ventilation associated with the existence of comorbidity as the most frequent reason followed by prolonged surgery. Hemodynamic instability (21.2%) was ranked third [13]. In our study, emergencies represented 64.4% of surgeries. This result was corroborated by other studies [5; 7 ; 12]. Emergency was associated with the occurrence of cardiovascular complications in our study. The surgeries were digestive in 50.5% and obstetric in 35.6%. The surgical indications in our study were dominated by digestive and obstetric emergencies in 34.6% and 30.7%, respectively. This result was found by Mpoy Emy in Dakar with generalized acute peritonitis (26.6%) and obstetric emergencies (21.9%), particularly eclampsia and postpartum hemorrhage [5].

In Mali, Niang had found general surgery as indications in 44.7% and obstetrics and gynecology in 26.8% [6]. These results confirm the impact of digestive and obstetric pathologies in the occurrence of POC. In our series, 16.8% of patients had pre-operative preparation. Emergency surgery has been recognized as a risk factor for POC [14; 15]. On the one hand, these are unstable patients and sometimes have not benefited from pre-operative preparation and on the other hand, the anesthetic and surgical teams with little preparation time and a limited technical platform. The patients were mostly classified as ASA 2 in 54.4% and Altemeier 4 (dirty surgery) in 41.5% and Altemeier 3 (contaminated surgery) in 40.5%. These were patients with few comorbidities but needing to undergo contaminated and dirty surgery in an emergency unit. In Dakar, Mpoy Emy had found that Altemeier's classes II (50%) and ASA 3 (45.3%) were the majority [5]. In Mali, Mwembe had regained the ASA 1 class in 54.9% and Altemeier 2 in 39% [12]. This difference is explained by a selection bias and a predominance of gynaecological-obstetric pathologies in these studies.

During the operations, adverse events were dominated by shock in 20% and pulmonary inhalation in 4.9%. The shock was found in a similar proportion in the study conducted in Dakar with 18.8% [5]. Niang in Mali had found the Mendelson Syndrome in 3.4% [6]. Other authors had noted a predominance of low blood pressure as an intraoperative adverse event [6; 7; 12]. Low blood pressure is common in emergency surgery in unprepared patients with high hemodynamic risk and is aggravated by anesthesia-induced sympathetic block. Emergency surgery constitutes a major risk of pulmonary inhalation, particularly in digestive and obstetric emergencies. This inhalation would be the cause of respiratory and infectious POC.

In our study, POC were early in 92.1%. They were medical in 91.7%. These results confirmed the trend found in Dakar where POC were early in 82% of cases and medical in 92.2%. Our series found a predominance of infectious POC in 21.4%, cardiovascular in 19.3%, renal in 17.2% and respiratory in 15.8%. In the study conducted in Dakar, the POC observed were cardio-circulatory in 39.1%, infectious in 32.8%, renal in 26.6% and respiratory in 23.4% [5]. This small difference could be explained by the fact that in our study, surgeries classified as Altemeier 4 predominated. Mwembe and Bagayoko in Mali had found the same order of predominance of cardio-vascular, infectious, renal, and respiratory POC [7; 12]. In the studies of these latter authors, surgeries were classified as Altemeier 2 and ASA 2 with a predominance of obstetric pathologies and own surgery. However, Niang had found a predominance of renal POC in 43.9%, respiratory in 37.4%, infectious in 30.8% and cardiovascular in 13%. This last study included a pediatric population, more neurosurgical pathologies and a higher rate of laparotomy 56.9% [6]. These studies confirm the predominance of cardiovascular, infectious, renal and respiratory POC despite variability in frequency order depending on the type of population and surgery. The mortality in our study was 48.5% for multiple organ dysfunction with an IMAGE index low at 51.4. The same causes of death were found in the Dakar study with a lower prevalence in 25% and a higher IMAGE index at 75% [5]. This difference in mortality reflects the imbalance and disparity in healthcare provision between the capital city and the rest of the country. The reduction of morbidity and mortality related to POC requires the improvement of material and human resources but also collaboration and multidisciplinary care.

CONCLUSION

The post-operative complications are frequent in intensive care unit. They can affect the functional and vital prognosis of patients. They generate additional costs for patients and their families. The identification of risk factors and knowledge of the different types of post-operative complications is essential to reduce morbidity and mortality related to post-operative complications. This management requires a technical platform, multidisciplinary collaboration and quality human resources. Patients are most often admitted for shock after digestive or obstetric surgery under general anesthesia. The post-operative complications observed were infectious, cardiovascular, renal and respiratory. Their reduction requires the implementation of protocols to avoid reducing the factors of poor prognosis.

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