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Interest of the Obstetrical Index Shock in Anesthesia-Resuscitation of Third Trimester Hemorrhage

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Abstract

Aim: To determine the contribution of shock-index in anesthesia-resuscitation of third-trimester hemorrhage.

Material and method: A prospective study was conducted in the operating room of the maternity unit of Saint Louis Regional Hospital. All patients received for third-trimester haemorrhage were included. The Shock index (SI) is defined as the ratio of heart rate to systolic blood pressure. A threshold value of SI ≥ 0.9 was set to differentiate two groups: Shock index group SI < 0.9 and index shock group SI ≥ 0.9. We studied vital parameters on admission, intraoperatively, transfusion requirements, and place of postoperative management.

Results: We collected a total of 64 patients. The average age was 29.7 years. The indications for caesarean section were mainly retro-placental hematoma (60.9%), placental insertion anomalies (34.3%) and third trimester metrorrhagia (3.1%). The pre-operative shock index was ≥ 0.9 in 15.6% of cases. Biological abnormalities included anemia (18.7%) and coagulopathy (14%). Intraoperative hemodynamics were unstable in 8 patients (12.5%). The surgical procedures were a transverse low Caesarean section (95.3%) and a hysterectomy (4.6%). Blood transfusion was performed in 21.8% of cases. In correlational analysis, a shock index ≥ 0.9 was associated with blood transfusion ($p < 0.0001$) and postoperative intensive care admission ($p < 0.005$).

Conclusion: The obstetrical shock index is an excellent score for the early initiation of resuscitation measures in the management of third-trimester haemorrhage.

Keywords: Shock Index; Obstetrical Haemorrhage; Anesthesia Resuscitation

Introduction

The Shock Index (SI) is defined as the ratio of heart rate (HR) to systolic blood pressure (SBP) (SI = HR/SBP). It has been studied in traumatology for some fifteen years, and normal values range from 0.5 to 0.7. An SI ≥ 0.9 is accepted as the most relevant value for diagnosing hemorrhagic shock. Its value in the anaesthesia-resuscitation of obstetric haemorrhage has been little studied. Our study aims to determine the contribution of the shock index in anaesthesia resuscitation of third-trimester haemorrhage.

Material and Methods

This was a prospective, observational, and descriptive study carried out in the anesthesia-intensive care department of the regional hospital of Saint Louis, Senegal. We included all patients admitted to our center for the management of third-trimester haemorrhage. Shock index (SI) is defined as the ratio of heart rate (HR) to systolic blood pressure (SBP). A threshold value of SI ≥ 0.9 was set to differentiate two groups:

- Shock index group SI < 0.9 (group I)
- Shock index group SI ≥ 0.9 (group II)

We measured SI and vital parameters on admission, at 15 min and before discharge from the operating room (possibly before extubating). Therapeutically, all patients received anaesthetic management by scientific recommendations (Formalized Expert Recommendations of the French Society of Anesthesia and Intensive Care). For each patient, we recorded clinical, anaesthetic, therapeutic (amount of blood transfused, use of vasoactive drugs, duration of ventilation), evolutionary and prognostic data. evolution and prognosis. The main research question was to determine the value of the shock index in predicting hemorrhagic

shock and transfusion strategy. Blood transfusion was the primary endpoint. Secondary endpoints were hemodynamic instability, use of vasoactive drugs and prolongation of mechanical ventilation in the Intensive Care Unit.

Data acquisition and statistical analysis were carried out using IBM SPSS Statistics 20 software. We carried out a descriptive study: with the calculation of simple frequencies and relative frequencies for qualitative variables. Calculation of means, medians, standard deviations, and range for quantitative variables. An analytical study with comparison of quantitative variables (Student's t-test); comparison of qualitative variables by Pearson's chi-square test, in the event of non-validity of this test by Fisher's two-tailed exact test. We carried out a univariate study with a search for risk factors by calculating the Odds Ratio (OR), and a multivariate study to identify independent risk factors linked to blood transfusion and morbidity. The "p" significance level was set at 0.05.

Results

A total of 64 patients were enrolled. The mean age was 29.7 years, with a standard deviation of 6.08 and extremes of 40 and 18 years. Figure 1 shows the age distribution. 2 patients (3.1%) had gravidic hypertension, 6 patients (9.3%) had a history of uterine scarring, and 1 patient (1.5%) had diabetes. Indications for caesarean section included retro-placental haematoma in 39 patients (60.9%), placental insertion anomalies in 22 patients (34.3%), and third trimester metrorrhagia in 2 patients (3.1%). Figure 2 shows the distribution of our population according to indications. The mean preoperative shock index was 0.75, with a standard deviation of 0.2 and extremes of 1.9 and 0.3.

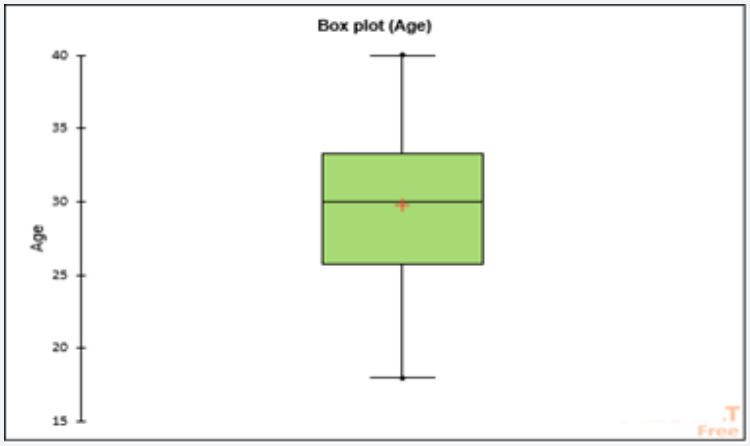

Figure 1: Age Class Distribution.

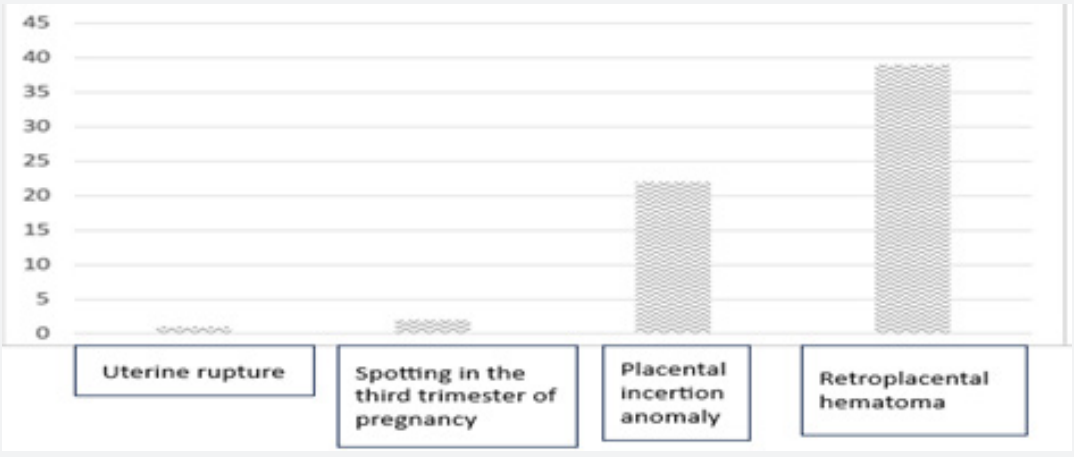

Figure 2: Distribution of Our Population According to Indications.

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Figure 3 highlights the distribution of preoperative shock indexes in our population. The preoperative shock index was ≥ 0.9 in 10 patients (15.6%) and 54 patients (84.4%) had a preoperative shock index of < 0.9. Preoperative hemodynamic instability was observed in 2 patients (3.1%). Intraoperative biological abnormalities were noted in 21 patients (32.8%). They included anemia in 12 patients (18.7%) and coagulopathy in 9 patients (14%). Spinal anaesthesia was used in 41 patients (64%) and general anaesthesia in 23 (36%). The hyperbaric bupivacaine (7.5mg)-Morphine (100µg)-Fentanyl (25 µg) protocol was used in all patients who underwent spinal anaesthesia. The Propofol-celocurin-fentanyl protocol was used in 7 patients (30.4%) and the ketamine-celocurin-fentanyl protocol in 16 patients (69.5%). Intraoperative hemodynamics were unstable in 8 patients (12.5%).

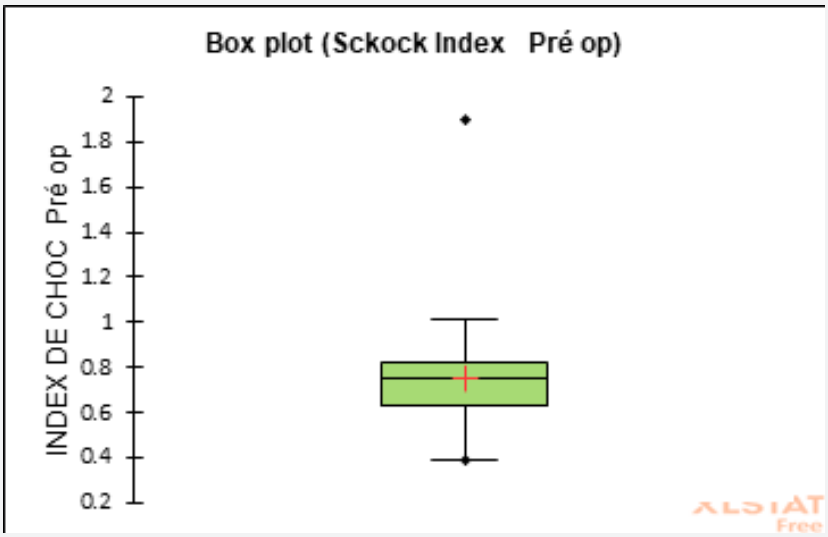

Figure 3: Distribution of Pre-Operative Shock Indexes in our population.

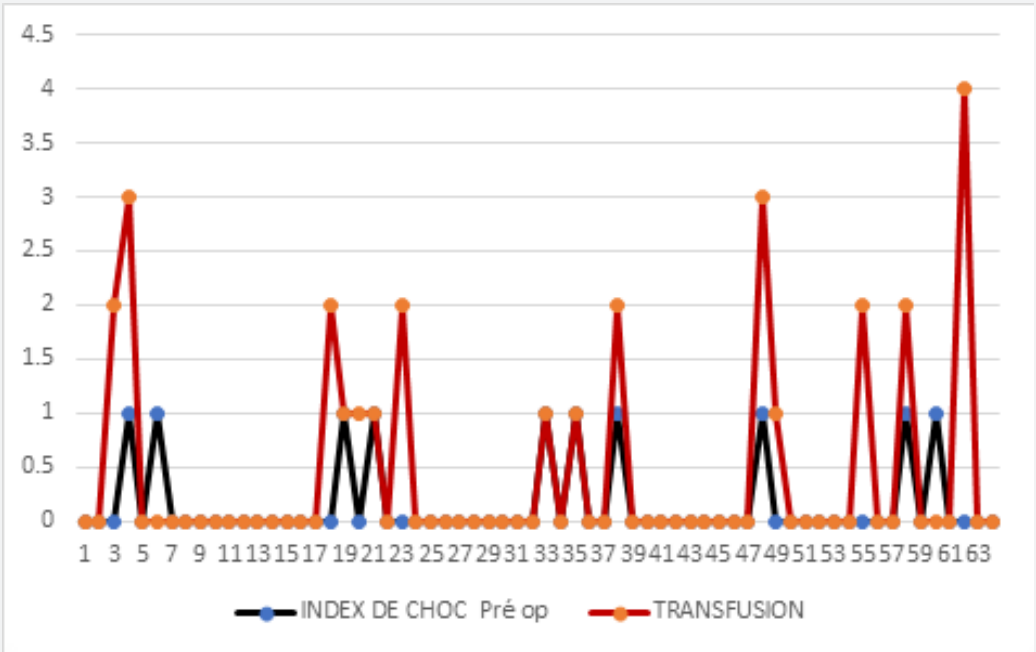

Figure 4: Relationship Between Preoperative Shock Index and Transfusion.

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Surgical procedures included a low transverse caesarean section in 61 patients (95.3%), hysterectomy in 3 patients (4.6%), carbetocin as uterotonic in 29 patients (45.3%), oxytocin in 35 patients (54.6%) and tranexamic acid 1g IVL in all patients. The mean shock index at 15 min from induction was 0.8, with extremes of 1.5 and 0.38 and a standard deviation of 0.2. At 15 min from induction, the shock index at 15 min was ≥ 0.9 in 16 patients (25%). Blood transfusion was performed in 14 patients (21.8%). The average shock index before discharge was 0.65, and 6 patients (9.3%) had a shock index at discharge ≥ 0.9. The intensive care unit was the place of post-operative management for 7 patients (10.9%), the remainder (57 patients) were managed post-operatively in the gyneco-obstetrics department. Only one patient died, representing a mortality rate of 1.5%. In correlational analysis, the increase in preoperative shock index was associated with transfusion with a statistically significant relationship ($p < 0.0001$). Figure 4 illustrates the relationship between preoperative shock index and transfusion. A high preoperative shock index value ≥ 0.9 correlated significantly with postoperative resuscitation management ($p < 0.005$) (Figure 1,2,3,4).

Discussion

In this prospective descriptive study, including parturient admitted for management of third-trimester haemorrhage, a shock index value greater than or equal to 0.9 calculated on admission appeared to be an independent factor for transfusion (OR=2.03; IC95%: [1.3- 3.3]; p=0.001) in these patients. The limitations of our study were: the sample size (64 patients) and the monocentric nature of the study. Our study did not aim to identify a shock index cut-off, but the prospective nature of our study remains a strong point. Triage and classification scores have been developed in emergency medicine, especially for severe trauma patients, to improve the prognosis of these patients by reducing the time required for treatment. Obstetric haemorrhage is often acute, dramatic and under-appreciated [1], and is the third most common cause of haemorrhagic shock, after traumatic causes and digestive haemorrhage [2,3]. While the management of postpartum haemorrhage is well codified and has been the subject of several studies [3], third-trimester haemorrhage deserves particular attention, as it can be life-threatening.

When blood loss occurs, the resulting hypovolemia triggers compensation mechanisms. This explains why hemorrhagic shock is difficult to detect, particularly in obstetrics, where accurate monitoring of blood loss may be lacking in the sub-Saharan context. Faced with an acute drop in blood volume linked to blood loss, the body activates adaptation mechanisms, mainly through activation of the sympathetic system, the intensitý of which depends on the extent of blood loss [2]. A distinction is then made between the compensated shock phase, during which hemodynamics are maintained thanks to compensatory mechanisms (sympathetic, the renin-angiotensin-aldosterone system) and the decompensated shock phase, during which tissue hypoperfusion occurs, leading to anaerobic metabolism and acidosis. The patient is present with marked tachycardia and tachypnea, accompanied by respiratory failure. She becomes oliguric, then anuric. Loss of sensitivity and consciousness may then occur [1, 4].

Cell dysfunction, followed by cell death, leads to multi-organ failure and irreversible shock [1,5]. The mortality rate at this stage exceeds 30% [1]. It is therefore important to identify these different phases rapidly. It is in this sense that the shock index would be of great use. According to the report used to calculate it, the shock index increases as soon as there is an increase in heart rate and/or a decrease in blood pressure. In the first situation (increase in heart rate), index shock (IS) enables early detection of major bleeding and initiation of resuscitation measures (filling, transfusion or catecholamines), thus avoiding cell failure. The increase in index shock in the event of a drop in blood pressure is a situation we see in decompensated shock. Anne Charlotte et al confirmed the value of the shock index, which enables early detection of haemorrhage. According to these authors, SI appeared to be a more interesting hemodynamic parameter than the study of heart rate and blood pressure taken in isolation [6].

The shock index could represent a simple, relevant triage tool, enabling the detection of incipient haemorrhage requiring early evacuation to an operational medical unit́ [6]. SI has been studied for some fifteen years in traumatology, and normal values are between 0.5 and 0.7 [7]. An SI ≥ 0.9 is accepted as the most relevant value for diagnosing hemorrhagic shock [7]. Given the hemodynamic changes associated with pregnancy (↑ FC and ↓ PA), several studies have sought to determine SI threshold values in obstetrics [7]. In 2013, a case-control study of 50 patients with massive postpartum haemorrhage (PPH) (>30% of blood volume) defined a normal "Obstetrical Shock Index OSI" between 0.7 and 0.9 [7]. In the HPP group, the median OSI was 0.91. An OSI > 1 would be predictive of transfusion, and 89% of patients were transfused for an OSI > 1.1 [8]. These normal values of SI between 0.7 and 0.9 were confirmed in another study, with potential variation according to term and Body Mass Index (BMI) [9].

A study of 233 patients with PPH > 1500 ml found a better predictive value of SI for ICU admissions and transfusion ≥ 4 RGCs compared with conventional hemodynamic parameters: systolic, diastolic, and mean arterial pressure, pulse pressure and heart rate [10]. In our study, the increase in preoperative shock index was associated with transfusion and ICU admission, with a statistically significant relationship. Drew T et al concluded that an SI < 0.9 was reassuring, whereas an SI > 1.7 required urgent action. Finally, a recent study found a statistical link between SI values and the amount of bleeding within 30 min of delivery, but not beyond [11]. The importance of shock index in the detection of postpartum haemorrhage was not evaluated in our study. In summary, normal SI values are no different from those established outside pregnancy, between 0.7 and 0.9. An SI >0.9 is predictive of severe PPH [7]. To simplify, the following message could be

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disseminated to all birth room caregivers regardless of profession and experience: "When the HR is greater than the SAP, you must call for help because this is Severe Hemorrhage".

Conclusion

The obstetrical shock index is an excellent score for the early initiation of resuscitative measures in the management of third-trimester haemorrhage. In the practice of obstetric anaesthesia in sub-Saharan Africa, where monitoring blood loss and intraoperative hemoglobin can be difficult, its use should be encouraged.

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