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Anesthesia practice in collective emergency situations: Example of Togo army peacekeeping hospital

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Abstract

Objective: To report on anesthesia activities at the Togo Armed Forces Hospital deployed to Kidal in northern Mali as part of the Minusma.

Patients and methods: This is a retrospective descriptive study carried out from 1er March 2015 to 29 February 2020.

Results: One hundred and six (106) patients were treated under anaesthesia, i.e. an average of 21.2 per year. The mean age was 28.9 years, with extremes of 4 and 57 years. The patients were predominantly male, with a sex ratio of 25.5. Military personnel accounted for 74% of patients. Traumatic emergencies were the most frequent (56.4%), including 42.3% war injuries. Trauma and visceral surgeries were the most common at 48.1% and 47.2%. 66.1% of patients were classified as ASA1u. General anesthesia with orotracheal intubation (GA + OTI) was used in 56.6%. Ketamine (68.4%) and Propofol (31.6%) were most commonly used. Rocuronium was used in 88.3% of cases, and Fentanyl was the only morphine used. All patients received minimal monitoring of blood pressure, pulse, electrocardiogram, oxygen saturation and capnogram. Twenty (20) % of patients received a transfusion of packed red blood cells; only one patient received a transfusion of lyophilized plasma. Tranexamic acid was used in 9.4% of patients. Multimodal analgesia was provided with Paracetamol, Nefopam, Ketoprofen and Morphine. Forty-two patients were evacuated after stabilization, 59.5% to level 3 (Dakar) and 40.5% to level 2+ (Bamako). Intraoperative complications were dominated by arterial hypotension (35.2%) and shivering (19.6%). We recorded 0.6% intraoperative deaths.

Conclusion: The organization of anesthesia care remains a major challenge in areas with limited medical resources and in conflict zones. It is possible thanks to improved medical equipment and ongoing simulation of medical and paramedical staff in emergency and disaster medicine.

Keywords: Anesthesia; Resuscitation; Emergency; Armed conflict; Togo armed hospital

1. Introduction

Terrorist groups regularly attack both military personnel and civilians in northern Mali. These attacks, which are becoming increasingly frequent in neighboring countries (Burkina Faso, Niger, etc.), are likely to spread to countries on the Gulf of Guinea. These situations, which lead to a massive influx of wounded, generate traumatological surgical

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emergencies requiring treatment under anesthesia, backed up by perioperative resuscitation [1]. This is a public health concern that has led to the displacement of several million people in the Sahel-Saharan sub-region, with socio-economic consequences. The Togolese army hospital (HN2) deployed in Kidal as part of the United Nations (UN) mission is the only real health facility in this landlocked region, more than 750 km from the first paved road. It is a field hospital, with the practice of "war surgery". The practice of such emergency anesthesia is risky, and relies on damage control techniques [2,3]. The problems posed by emergency anesthesia take into account the patient's condition, severity and impact on vital functions [4]. Management in situations of hemodynamic and respiratory instability represents a real challenge in our context. We thought it would be interesting to carry out this study, the main aim of which is to make a quantitative and qualitative assessment of anesthesia activities at HN2 Togo. More specifically, the aim was to list the socio-demographic data of patients who received care under anaesthesia, to list the types and indications of surgery, and to describe the perioperative stages as well as complications and their management.

2. Patients and methods

HN2 Togo is located in the middle of the combat zone in the camp of the United Nations Multidimensional Integrated Stabilization Mission in Mali (Minusma) in Kidal. It is the level 2 hospital furthest from Bamako, according to the Minusma health support organization plan. In addition to more than 4,500 UN personnel, the hospital's area of responsibility includes allied national and international armed forces, as well as the local civilian population. The hospital has 13 doctors, a dental surgeon, a pharmacist and 25 paramedics. The total number of staff is 70, distributed as follows: the hospital director, 01 chief physician, 02 surgeons: 01 trauma-orthopaedic surgeon and 01 general surgeon, 01 intensive care anaesthetist, 01 internist, 01 public health physician, 01 general practitioner, 05 doctors from the aeromedical evacuation team (AMET), 01 dental surgeon, 01 pharmacist, 01 logistician, 25 paramedical staff and 29 staff providing logistical support and maintenance of major equipment to ensure the hospital's autonomy. It has a reception and sorting room, two consulting rooms, a 4-bed intensive care unit, a 4-bed intensive care unit, an operating theatre, a dental surgery, a laboratory, a medical imaging unit, a pharmacy, a morgue and an air medical evacuation unit. There are two helicopters, one in Kidal and the other in the town of Tessalit for aeromedical evacuations. According to UN standards, all patients likely to be hospitalized for more than 7 days must be systematically evacuated after stabilization from HN2 Togo to a higher level.

This is a retrospective, descriptive study. Data collection took place over five years, from March 1, 2015 to February 29, 2020. All patients who received anesthesia management in the operating room were included in the study. Data collection was based on registers of consultations, emergency admissions, hospitalizations, anesthesias, operative reports and preanesthetic evaluation/consultation sheets. For each patient, the following parameters were recorded: socio-demographic data; problems posed by the field, surgery, anesthesia protocol; pre-, intra- and postoperative resuscitation, complications and management, as well as poststabilization medical evacuation modalities. All data were initially collected on a standardized, anonymized form and subsequently entered into an Excel spreadsheet (Microsoft® Redmond, USA) after approval by the HN2-Togo ethics and data protection committee.

3. Results

From March 1, 2015 to February 29, 2020, 106 patients received anesthesia and resuscitation care in the operating room at HN2 Togo, an average of 21.2 patients per year. The average age of patients was 28.9 years, with extremes of 4 and 57 years. The most common age group was 20-29 (51.9%). There was a clear male predominance, with a sex ratio of 25.5 (102 men to 4 women). Three quarters of patients were UN military personnel. Traumatic emergencies were the main indications, with 60 cases (56.4%), including 45 cases (42.3%) of war trauma and 15 cases (14.1%) of road and industrial accidents. Non-traumatic emergencies accounted for 43.4% (46). There were 51 cases (48.1%) of trauma surgery and 50 cases (47.2%) of visceral surgery. Trauma indications were dominated by soft-tissue trimming 25 (23.6%). Patients classified as Mallampati 1 accounted for 49% (46 cases). Two-thirds of patients were classified ASA1u (66.1%). More than three out of four patients received general anesthesia with rapid sequence induction 81 (76.3%), and spinal anesthesia was used in 23 patients (21.9%) (Figure 1).

All patients benefited from continuous multiparametric monitoring of oxygen saturation, pulse, blood pressure, electrocardiogram, temperature, bleeding and diuresis. Two well-calibrated peripheral venous lines were taken in the majority of cases. Only one central venous line, under the collarbone and internal jugular vein, was used. The Fentanyl + Propofol + Rocuronium protocol was used in 68.3% of cases (Table 1).

General anaesthesia was maintained with a combination of Isoflurane + Fentanyl in 75% (45) and/or intravenous titration with reinjections of Ketamine/Propofol 25% (15) depending on haemodynamics and respiratory status.

Patients who underwent general anesthesia with tracheal intubation were all systematically placed on mechanical ventilation with pure oxygen. Among the 44.4% (45) of patients who received vasopressors, Ephedrine was most commonly used in (27.4%) of cases, followed by Noradrenaline (8.5%) and Adrenaline (8.5%). Whenever hemodynamic status permitted and the surgical site was suitable, spinal anesthesia was performed with Bupivacaine 12.5 mg in 23 cases. Adjuvants were Fentanyl 25µg (10 patients), Clonidine 75 µg (9 patients) and Morphine 4 patients. Tranexamic acid was used in 9.4% (10) of patients. Transfusion of red blood cell concentrate (RBC) was performed in 19.8% (21) of cases. The mean quantity of RGC transfused was 1038.2±428 ml. Only one patient received 500 ml lyophilized plasma. Gelofusine was the most commonly used macromolecule in 22.6% of patients (24). Surgeries lasting 02 to 03 hours accounted for 32% (34) and those lasting 04 hours or more for 6.5% (7). Intraoperative complications were dominated by arterial hypotension (35.2%) and shivering (19.6%), as shown in Table 2. We recorded 02 deaths. All patients received multimodal analgesia with Paracetamol and Nefopam in all cases, combined with Ketoprofen in 54.7%, Tramadol in 23.6% and morphine titration in 28.3%.

Of the 42 patients evacuated after stabilization at HN2 Togo, 25 (59.5%) were transferred to level 3 (Dakar) and 17 (40%) to level 2 + (Bamako), in accordance with the standards set out in the Minusma's health organization chart.

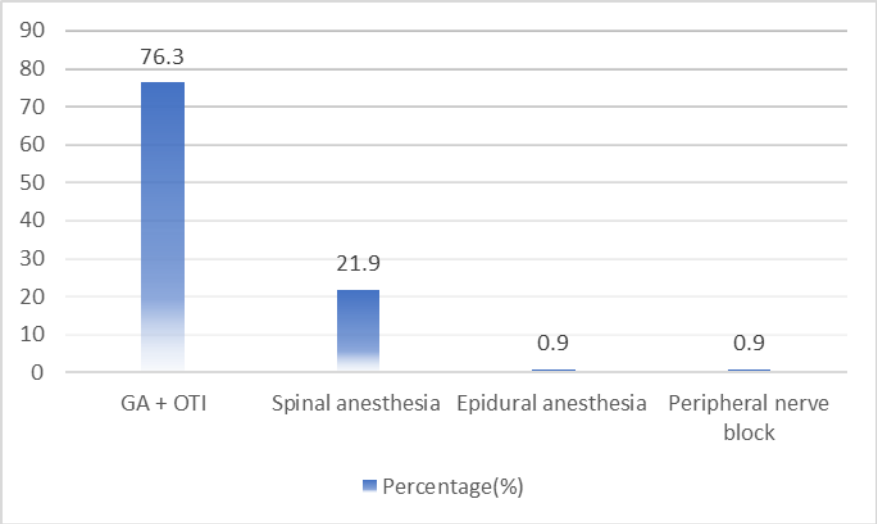

Figure 1 Distribution of patients according to anesthesia technique

Table 1 Distribution of patients according to the general anesthesia with rapid sequence induction protocol

Anesthesia drugs	Number(n)	Percentage (%)
Propofol + Rocuronium + Fentanyl	41	61.6
Ketamine + Rocuronium + Fentanyl	16	26.7
Propofol + Suxamethonium + Fentanyl	1	1.7
Propofol + Vecuronium + Fentanyl	1	1.7
Propofol + Suxamethonium + Vecuronium + Fentanyl	2	3.3
Ketamine + Suxamethonium + Fentanyl	3	5
Total	60	100

Table 2 Distribution of patients according to intraoperative complications

Complications	Number(n)	Percentage (%)
Low blood pressure	18	35.2
Bradycardia	4	7.8
ACR	4	7.8
Chills	10	19.6
Hemorrhagic shock	9	17.4
Vomiting	4	7.8
Death	2	4.4
Total	51	100

ACR: cardiorespiratory arrest

4. Discussion

The frequency of mass casualty situations [1,5] and the severity of traumatic injuries requiring surgical damage control under anesthesia [2,3] led us to take stock of anesthesia practice at HN2 Togo, more than 8 years after its deployment in Mali. One hundred and six (106) cases of anesthesia and resuscitation were performed over a period of 5 years (60 months), i.e. an average of 21.2 patients per year. This activity is typical of a level 2 hospital deployed in modern asymmetric conflicts between terrorist groups and conventional forces. In our series, 74.5% of patients were military personnel. Barbier et al had also found in their study 60% military patients [6]. Coulibaly et al in Côte d'Ivoire observed a predominance of civilians (68.6%) [7]. In Côte d'Ivoire, the military conflict took place in the country's largest cities, unlike Kidal, located in a landlocked desert region with a high incidence of IED-related trauma. We found an average age of 28.9 years, with a male predominance of 98%. This mean age is close to that of Barbier et al [6] who found an average age of 29, with a male predominance of 86%. The exposed population is essentially made up of young men. War trauma accounted for 42.5%, slightly less than Konan et al's figure of 58% [8]. Our results differ from those of Esbrard et al [25] in Afghanistan, who found 7.7% war trauma patients. Other traumatic emergencies included road traffic accidents and industrial accidents. We performed 48.1% traumatology surgery and 47.2% visceral surgery. Barbier et al [6] found 53% trauma surgery and 39% visceral surgery. The majority of traumas involved the limbs. Individual and collective protective measures essentially cover the body, leaving the limbs vulnerable. In our series, 66.1% of patients were classified as ASA1u, and 16% as ASA2u. Konan et al [8] found 31% of patients classified ASA1u and 53% ASA2u. The predominance of ASA1u and ASA2u patients can be explained by the medical visits and counter-visits carried out before troops are deployed to theaters of operation; this makes it possible to eliminate patients with unbalanced chronic pathologies at risk of acute decompensation in the field. We found 11.3% ASA4u patients. These were victims of severe trauma with severe hemodynamic, respiratory, neurological and metabolic repercussions.

General anesthesia with rapid sequence induction was predominant (76.9%). This predominance of GA was found by Konan et al (91,9%). In fact, general anesthesia is better adapted and offers greater stability in emergency situations with hemorrhagic shock. In contrast, Diaw et al [9]in their review of anesthesia activities in the HN2 of the Senegalese contingent in Guinea Bissau, practiced more spinal anesthesia (58%). The mission in Guinea-Bissau was a peacekeeping mission, with relatively stable patients who did not always suffer serious impairment of vital functions. In Mali, the offensive aspect of the counter-terrorism mission exposed professionals to more serious injuries, against which loco-regional anaesthesia techniques could be used. In all cases, our anaesthetic practice complied with recommendations [10-12] in extreme front-line situations and in precarious environments. GA with rapid-sequence induction using Sellick's maneuver was performed using Propofol (68.3%), Ketamine (31.7%), Rocuronium (88.3%) and fentanyl as the only morphine used. These are the main indicated drugs available at HN2 Togo. Monitoring BIS, respiratory gases and curarization would have enabled us to better monitor and improve patient safety. Sometimes our medical-surgical team received severe trauma patients in a context of massive influx, with complications such as hemorrhagic shock requiring vascular filling and rapid use of vasopressor amines (44.5%). Fast-echography enabled non-invasive monitoring of hemodynamics and cardiac kinetics. Tranexamic acid was used in 9.4% of cases. Its administration prior to incision significantly reduces total blood loss [13]. In our series, 19.8% of patients were transfused. Benois et al [14] used polytransfusion in 14.2%. Although our transfusion rate appears to be higher, it should be noted that difficulties in supplying labile blood products prevented us from responding to all transfusion indications. In acute post-traumatic coagulopathy, freeze-dried plasma offers the advantage of easy transport and use, and is a genuine alternative to fresh

frozen plasma. The use of lyophilized plasma has recently become widespread in hospital practice [15]. Cardiovascular complications were marked by the hemodynamic instability associated with hemorrhagic shock in war trauma patients. Multimodal analgesia combined Paracetamol, Ketoprofen, Nefopam, Tramadol and Morphine in titration. Morphine was used for very severe pain with a visual analog scale (VAS) > 4 (28.3%). No anesthesia-related deaths were observed. The two perioperative deaths were polytrauma patients evacuated late in shock with multivisceral failure. While many shortcomings exist in pre- and in-hospital emergency medicine in sub-Saharan Africa, medical transport has evolved considerably in recent decades [16,17]. Medical evacuation by air [18] is now an imperative and would improve the prognosis of severe trauma patients in African environments.

5. Conclusion

Emergency resuscitation anesthesia in severe trauma patients with hemodynamic instability remains a major challenge in regions of armed conflict with limited medical resources. The majority of patients were United Nations military personnel with trauma emergencies. Trauma surgery and visceral surgery were the most common procedures performed on these patients, most often in emergency and disaster situations. General anesthesia with rapid sequence induction was the most common type of anesthesia used. Propofol, ketamine, rocuronium and fentanyl were the main anesthetic drugs available and used. The review of anesthesia activities at the Togo Armed Forces Hospital shows that, despite health isolation and precariousness, effective, high-quality care is possible; it relies on the training and ongoing simulation of medical and paramedical staff in emergency and disaster medicine, the improvement and regular maintenance of medical equipment, the availability of emergency and resuscitation drugs and consumables, and the ongoing implementation and updating of emergency care protocols adapted to the specific constraints of the Sahelo-Saharan region.

Compliance with ethical standards

Disclosure of Conflict of interest

The authors have declared no conflicts of interest.

Statement of ethical approval

The present research work does not contain any studies performed on animals/humans subjects by any of the authors.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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