

Use of Ketamine in Rural Area at the East of the Democratic Republic of the Congo (DRC)

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Abstract

Introduction: Ketamine is the most commonly used agent for general anesthesia in rural hospitals in the DRC, for victims of armed conflict, in locations with few resources, equipment, medicines, and in opportunities to transfer patients who are very ill. The object of this study was to evaluate the use of general anesthesia with ketamine in the working conditions of the East of the Democratic Republic of the Congo.

Methodology: This was a retrospective and descriptive study conducted at the Referral Health Center Erineti, in the east of the DRC from 1st January to 31st December 2017.

Results: 771 patients underwent general anesthesia with ketamine. Females were more represented (85.86%). The average age of the operated was 30 ± 5 years. 97.4% of the operated patients were classified as ASA II and the intermediate surgical risk was more represented in 82.9%. Caesareans section represented 80.5% of cases. The operating room staff had no doctor or nurse anesthetist. The adverse effects of ketamine recorded were arterial hypertension, salivary hyper secretion and respiratory distress respectively in 10.2%, 5.5% and 4.8% of cases. 30.8% of the patients were agitated on awakening and 22.6% had hallucinations. No deaths were recorded.

Conclusion: Ketamine remains the most used anesthetic in rural areas with a shortage of qualified personnel and insufficient equipment.

Keywords: Ketamine; Rural areas; Eastern; DRC

Introduction

Ketamine is a dissociative anesthetic antagonist of N-methyl-D-Aspartate receptors (NMDA). It interrupts the flow of information between the conscious and unconscious part of the brain without inducing general depression: some regions are activated as the limbic system or the reticular and others are inhibited as in the thalamus where NMDA receptors are present [1,2]. Ketamine is the only anesthetic available in most rural areas of developing countries, where more than 2 billion people live [3]. For a long time, it was considered as the ideal anesthetic, capable of ensuring narcosis, amnesia and the immobility of the patient [1]. Currently, ketamine is used in many countries including the Scandinavian, the UK, Italy, Belgium, Japan and Australia. In France, ketamine has been approved for marketing as a single anesthetic agent, as an induction agent and as a potentiator of low-potency anesthetic agents [4].

In rural areas and particularly in developing countries, the day-to-day reality in the operating room coupled with a lack of resources, persuades anesthesia providers to use simple and effective techniques that are not too expensive and readily available. The properties of ketamine make it the product of choice, alongside local and spinal anesthesia [5]. On the other hand, general anesthesia techniques vary depending on the level of the hospital. In well-equipped centers, inhalation anesthesia is normally the first choice [5]. Ketamine is also useful in settings without recovery facilities and those where patients need to wake up in their own beds and especially in low-income and middle-income countries, and in emergency situations [6]. According to Guegen, general anesthesia by intravenous ketamine is more suitable for conditions in Africa [6]. Ketamine is used in humanitarian medicine, military, mountain, and more broadly in any non-hospital context. [7]. People living in rural areas of poor countries with few resources would no longer have access to essential surgery if ketamine became unavailable [3]. Very few studies have examined the efficacy of this anesthetic despite its frequent use in hospital settings in Africa.

This study aimed to evaluate the use of ketamine in surgical management and to determine the outcome of surgery in poor rural areas in a health facility in eastern of the DRC.

Methods

Our study took place in the operating room of the Eringeti Reference Health Center [Centre de santé de Référence (CSR) d'Eringeti] located in the village of Eringeti. The latter is located in the east of the Democratic Republic of the Congo, in the province of North Kivu, in Beni territory. It is a village which is 60 km north-east of the Beni city, in the health zone of Oicha, on the border with the province of Ituri. This CSR consists of a single operating theatre, with two operating beds, two operating lights, an unused oxygen concentrator, two aspirators, (one electric and the other mechanical), a monitor showing the blood pressure and heart rate and a pulse oximeter. The CSR has a single 6-bed recovery room with no other equipment. The same room is used as an intensive care unit. The only anesthetic drugs available in the center are ketamine and lidocaine. The study was retrospective and descriptive covering the period from January to 31st December 2017. The population of this study consisted of 862 patients who underwent anesthesia during the study period. All patients who

had received general anesthesia with ketamine were included. A total of 771 patients met the criteria and formed the sample. Information about each patient was collected from registers and records of accounts rendered anesthetic through a data collection sheet. The following variables were searched for each patient: age, sex, ASA classification, surgical risk, and type of procedure, adverse events related to anesthesia and outcome in the postoperative period. The data capture and analysis was done using the Epi Info 7 software. The standards of ethics were respected in carrying out this work. Confidentiality was guaranteed for all patients. Ethical clearance was obtained from the local ethics review committee of the Faculty of Medicine at the Université Catholique du Graben, Butembo, DRC, CENK No 012, the Oicha Health Zone District Office and the Eringeti Referral Health Center. No individual consent was required as archived patient records were collected and no patient identification was used.

Results

Demographic variables, anesthetic and surgical risks

The Table 1 below lists the risks of anesthesia and surgery according to demographic variables.

Variables	Number of patients who received General anesthesia based on ketamine=771	Other product used in anesthesia (Lignocaine)=91	Total (862)
Gender			
F	662 (85.9%)	29	691
M	109 (14.1%)	62	171
Age range in years			
0-15	101 (13%)	20	121
16-30	336 (43.6%)	17	353
31-45	165 (21.4%)	24	189
46-60	110 (14.2%)	20	130
61 and over	60 (7.8%)	9	69
ASA classification			
ASA I	19 (2.5%)	91	110
ASA II	751 (97.4%)	-	751
ASA III	1 (0.1%)	-	1
Surgical risk			
Minor	118 (15.3%)	91	209
Intermediate	639 (82.9%)	-	652
Major	14 (1.8)	-	1

Table 1: Distribution of Anaesthetic and Surgical Risks according to Demographic Variables.

The Table 2 below divides the patients according to the type of intervention.

Types of interventions	Number of patients who were put under General anesthesia based on ketamine=771	Other product used in anesthesia (Lignocaine)=91	Total (862)
Gynaecological and Obstetric	643 (83.4%)	-	643
Caesarean sections	621 (80.5%)	-	-
Ovarian cystectomy	10	-	-
Myomectomy	5	-	-
Hysterectomy	4	-	-
Ectopic pregnancy	3	-	-
Gastro Intestinal	104 (13.5%)	-	104
Appendectomy	31	-	-
Hernia repair	26	-	-
Hydrocelectomy	18	-	-
Peritonitis	17	-	-
Bowel obstruction	11	-	-
Splenectomy	1	-	-
Other types of surgery	23 (2.98%)	40	63
Lipectomy	5	-	-
Urology	4	-	-
Circumcision	-	30	-
Incision and drainage abscess	13	10	-
Goiter	1	-	-
Traumatological	1 (0.12%)	51	52
Suturing of traumatic wounds	1	51	-

Table 2: Patient Distribution by Anesthetics and Types of Interventions.

The number, qualification and experience of anesthesia providers

There are no anesthesia providers at the Eringeti Reference Health Center [Centre de santé de Référence (CSR) d'Eringeti]. Anesthesia is giving by non-anesthetist nurses under supervision of general practitioners.

Adverse effects related to ketamine

No patient died during the study. The mortality rate for our cohort was zero. The Table 3 below shows the incidents and anesthetic accidents.

Variables	Number=771	%
Adverse effects related to ketamine		
No	613	79.5
Hypertension	79	10.2
Salivary hyper secretion	42	5.5
Respiratory distress	37	4.8
Time of awakening		

In the hour following the intervention	653	84.7
After an hour	118	15.3
State of the patient upon waking		
Stable	359	46.6
Agitated	238	30.8
Hallucination	174	22.6
Outcome of the operated		
Favourable	771	100

Table 3: Distribution of patients according to incidents and anesthetic accidents.

Discussion

Ketamine was used for anesthesia in 771 cases out of 862 operations (89.4%). Our results corroborate those found by Ketha and his colleagues, in a study on anesthetic practice in a poor area in the east of the DRC, specifically at the General Referral Hospital of Beni, where 78.7% of cases received ketamine anesthesia [8]. Ketamine is the ideal anesthetic agent for hospital settings in developing countries, with insufficient trained personnel and equipment in anesthesia [3]. This is because ketamine is the only product available in our local hospitals because of its lower cost. In addition, ketamine induces a state of dissociative anesthesia; the patient is unconscious, amnesic and deeply analgesic. Airways and breathing are remarkably preserved, regardless of the position of the head [5]. In addition, ketamine does not require special equipment for its administration [1]. It is thus easy to administer even by unqualified personnel.

Regarding the essential surgery, the World Health Organization indicates that ketamine should be accessible in all establishments where sedation is needed to ensure safe and affordable surgical care [3]. Ketamine is easily administered by untrained practitioners compared with anesthetic gases, which require expensive equipment and trained specialists. The administration of ketamine is inexpensive and safe [3]. Females represented 86% of cases. This can be explained by the high number of gynecological and obstetrics interventions in our study. The average age of the patients was 30 ± 5 years, and the age group between 16 and 45 was 65.1%. This is because it includes those in the active period of life, indeed, many of the women who are in their active period of reproduction. The result found in this study does not differ from those found by Kabey and his collaborators in a study conducted on anesthetic practices in Lubumbashi in the DRC where 81.5% of the operated were between the ages of 11 and 50 years and among them, 67.3% of the patients were female [9]. In an Italian study, Peduto and his collaborators had observed 54% of female surgical patients [10] and Sabaté and his collaborators in Spain found that 58% of the operated were female [11].

In this work, the evaluation of the anesthetic risk showed that 97.4% of the patients were in the ASA II class. Intermediate surgical risk was more represented in 82.9% and obstetrics and gynecological interventions were more represented in 83.4% of cases. These results are explained by the fact that caesarean section is the most common operation within the health center. On the other hand, caesarean section cases were graded directly ASA class II in this study. The physiology of every pregnant woman undergoes many changes during

pregnancy [12]. The physiology of the pregnant woman has an impact on the anesthetic and surgical risks [12]. Ketha et al. [8], found in their work that the anesthetic risk assessment that 86.5% of the patients were of the ASA class I and the surgical intermediate risk was shown in 66.3% of cases. These differences may be explained by the fact that the obstetrical cases were directly ASA II and accounted for most of the interventions. On the other hand, high-risk interventions are directly referred to better equipped centers. Gynecological and obstetrics interventions were more represented in 83.4% of cases, followed by visceral interventions. This is explained by the high number of caesarean sections (80.5%) during our study period. In Ivory Coast, in a study by Brouh Y. and al. on anesthetic practice in the Ivory Coast, surgical specialties were dominated by gynecological and obstetrical surgery (40.05%) [13].

There are no anesthesia providers at the Eringeti Reference Health Center. Anesthesia is given by non-anesthetist nurses under supervision of general practitioners. There is a shortage of Anesthetists and Intensive Care consultants in the Eastern part of DR Congo in particular, and throughout the country in general [8]. Considering the study conducted by Ahuka on the distribution of medical specialists in the four major clinical disciplines as well as Anesthesia and Intensive Care in the Democratic Republic of the Congo (DRC) in 2014, out of 339 specialists in the four major clinical disciplines in the DRC, there were only 33 consultant's anesthetists (9.7%). Among these specialists, 49.9% (169/339) work in Kinshasa, the capital of the DRC and 91.7% (311/339) work in provincial capitals including in Kinshasa, that is to say in urban environments [14].

Considering the side effects related to ketamine, it appears from this work that in 79.5%, no side effects were recorded. Nevertheless, arterial hypertension, salivary hyper secretion and respiratory distress were found in 10.2%, 5.5% and 4.8% of cases, respectively. Eighty-four point seven percent of the patients awoke within one hour of the procedure. At their awakening, 359 (46.6%) were stable, 238 (30.8%) were agitated and 174 (22.6%) had hallucinations. No deaths were recorded.

Claire PIGNAL, in her study conducted in Toulouse, found that the rate of adverse effects related to ketamine was high (43.7%) [15]; but it is very variable in the literature, from 21% to 86% depending on the studies. [16,17]. The vast majority of these are disorders of consciousness that do not require the intervention of a doctor. The literature usually contains 5 to 26% incidence of agitation and few disturbances of consciousness. Only one serious adverse effect can be attributed to ketamine, a prolonged apnea (40 seconds) which resolved

spontaneously [18,19]. After administration of ketamine, no marked changes were noted during monitoring of blood pressure parameters at 15 minutes and 30 minutes. A slight decrease in oxygen saturation was noted at 30 minutes, without medical intervention, without consequences on the management and without questioning the safety of the patient [20]. The properties and the many possible routes of administration of ketamine make it a versatile product, and are well adapted to anesthesia in developing countries with a complications rate of less than 0.2% [21,22].

Conclusion

Ketamine remains the anesthetic of choice in our area with its lack of anesthetic equipment and qualified personnel; its lower cost thus increases accessibility and efficiency.

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