

Inventory of the Practice of Sedation Procedural Analgesia in Digestive Endoscopy: Case of Hospitals in the City of Kinshasa

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Abstract: *Objective:* This study was conducted to take stock of the practice of procedural analgesia sedation in digestive endoscopy in Kinshasa hospitals. *Methods:* This is a cross-sectional study from 06/01/2021 to 06/30/2022 in three Kinshasa hospitals in patients who received sedation analgesia for digestive endoscopy. Socio demographic, preoperative, postoperative variables and complications were sought, analyzed with SPSS 23.0 for <0.05. *Results:* Four hundred and seven patients were selected; the mean age was 48.069 years (range 2 to 90). The M/F sex ratio was 1.04. The pre-anaesthetic consultation was done the same day in 41.5%, the comorbidities were: arterial hypertension (27%), obesity (4.9%), diabetes (4.2%) and heart disease (3.2%). Pre-anesthetic examinations were prescribed in 70.3%, pre-anesthetic fasting was respected in 95.8%. Mallampati's grade was I (69.8%), II (23.1%) and III (7.1%). ASA classes I and II accounted for 89.7%. Pre oxygenation was done in 96.6% of patients. The products used were: propofol (98.8% for an average dose of 228.11 mg), midazolam (5.4% average dose of 1.53mg), ketamine (4.2% the average dose of 9.6mg), fentanyl (32.7% mean dose of 38.66µg), sufentanil (9.2% mean dose of 3.86µg) and haloperidol (7.6%). The endoscopy performed was high (56.8%), low (25.3%) and combined (16.5%). The procedure performed was: exploration/biopsy (53.8%), exploration (23.3%), removal of the foreign body (3.4%) and haemostasis (3.2%). Complications were present in 47.7% (desaturation, cough, arterial hypotension, bradycardia, tachycardia, arterial hypertension, spasm and apnea). The high total doses of the products (fentanyl, midazolam and ketamine) were associated with complications but in multivariate analysis, persisted: the grade of Mallampati III, the ASA class IV, the duration of the procedures greater than or equal to ten minutes, endoscopy combined and the junior anesthesiologist. *Conclusion:* Procedural analgesia sedation in Kinshasa is increasingly practiced in gastrointestinal endoscopies. It is provided by anesthesiologists who use the same products cited in the literature but with a relatively high rate of complications.

Keywords: Sedation, Analgesia, Digestive and Endoscopy

1. Introduction

Gastrointestinal endoscopies are the gold standard for the early detection of digestive pathologies including gastric and colorectal cancer [1]. It is the method of choice for diagnosis and treatment of diseases of the esophagus, stomach and colon [2]. Globally Overall, the number of procedures that are performed each year worldwide exceeds the threshold of millions [2]. These are most often outpatient procedures with low morbidity, but sometimes involving hospitalized patients who are very old and/or of a high class of the American Society of Anesthesiologists physical status (ASA-PS) [3, 4].

In France, for example, approximately more than one million esophagogastroduodenoscopies are performed each year [5] and approximately 1,400 million colonoscopies [6].

In the USA, according to 2015 data, approximately 20 million gastrointestinal endoscopies are performed on an annual basis [6, 7]. Statistical analysis of data for China in 2016 revealed that 26 million gastrointestinal endoscopies were performed in the country [7, 8]. Although endoscopic analgesia sedation is widely used throughout the world to relieve patient anxiety and discomfort, provide higher quality examination, to improve examination result, reduce patient's memory ability of experience of the procedure [8, 9] as well as the acceptability of the examination [9, 10]; the sedation analgesia procedure varies from one country to another [8, 11]. However, sedation and analgesia requirements for upper and lower endoscopy also vary considerably between different geographic regions and even in the same country [12].

Almost all gastroscopies in the United- States and Australia are performed with sedation. And more than 98% of colonoscopies performed in the United States, Australia and Canada involve the use of sedation [11]. The need for the presence of an anesthetist to perform such sedation is widely appreciated around the world [10-15].

Advanced endoscopic procedures such as endoscopic retrograde cholangiopancreatography and endoscopic ultrasound or endoscopic ultrasound, particularly when a biopsy is required using a fine puncture needle, are uncomfortable procedures that require adequate deep sedation to ensure patient immobility or either general anesthesia for successful completion [7, 8]. In this case, the need for oro-tracheal intubation is controversial in the literature, but the measurement of exhaled CO₂, which also allows the monitoring of respiratory rate, is strongly recommended [12, 15, 16]. Colonoscopy or lower digestive endoscopy gives the anesthetist free access to the head and the airways. Several anesthetic protocols are possible for performing endoscopic procedures.

The anesthesiologist must know how to adapt his technique to the patient and the local conditions [17, 18]. In current clinical practice, midazolam or propofol are the primary anesthetic sedatives commonly used during outpatient procedures, such as diagnostic and/or therapeutic

gastrointestinal endoscopies. Propofol is more preferred than others because of its pharmacodynamic properties [19, 20]. It can be administered alone or in combination with another anesthetic agent with or without an opioid [21-24]. The anesthetic agent currently most used is propofol, best administered by intravenous sedation with a target concentration, but studies also evaluate the interest of remifentanyl in this indication [17-24]. Complications in digestive endoscopy are rare events [25]. By relieving anxiety, reducing pain and providing amnesia, sedation techniques have the potential to make diagnostic and therapeutic procedures more uncomfortable and acceptable for patients. However, it must also be recognized that these techniques also have the potential to create life-threatening complications [8, 9, 26]. They are often related either to sedation analgesia or to the endoscopic procedure. Procedural analgesia sedation, apart from the cost of the intervention which it increases [25, 27] it also increases the rate of complications [28]. These complications are often respiratory and/or cardiovascular represented by subsequent desaturations: either by the depth of the sedation, or by an obstruction of the airways by the caliber of the endoscope (especially the endoscope of echoendoscopy) [28, 29]. Hence the interest, to prevent them from administering oxygen before and during the procedure and monitoring vital parameters. Standard monitoring of patients during procedural analgesia sedation includes: measurement of blood pressure, heart rate, respiratory rate and oxygen saturation. The capnograph is an additional monitoring tool, which by quantifying the level of carbon dioxide (CO₂) released at the end of expiration can provide an indication of metabolic, circulatory and respiratory activities. Capnography could help to identify critical incidents early and to react quickly in order to avoid further deterioration of the patient's condition [25, 27].

In Kinshasa, in the Democratic Republic of Congo (DRC), the advent of digestive endoscopy has improved the management of digestive and even surgical pathologies. Several health facilities regularly perform digestive endoscopies. But the drugs, the techniques of sedation analgesia used as well as the possible complications related to these procedures have not been the subject of any study. This is why we deemed it useful to conduct this study to take stock of the practice of sedation and analgesia for digestive endoscopies in the city of Kinshasa. This in order to contribute to the improvement of the management of patients benefiting from sedation analgesia during digestive endoscopy in our environment.

2. Methods

This study is a cross-sectional and multicenter study. It covered the period from June 1, 2020 to June 30, 2022, either a duration of 2 years and took place in three medical training courses in the city province of Kinshasa, namely: HJ Hospital Limete site, Kinshasa Medical Center site de la Gombe and

Monkole Mother and Child Hospital.

These three structures were chosen because of logistics, the existence of a regular digestive endoscopy activity during the study period and the presence of anesthetist-resuscitators on site or under supervision for the performance of the procedure.

The present study used an exhaustive sampling with consecutive recruitment of all the patients having benefited from an analgesic sedation for a digestive endoscopy in the medical formations retained and during the period of the study.

2.1. Data Collection Technique

We used the documentary technique. Thus, the data was taken from the patients' medical files, whether electronic or hard-copy, as well as the registers of the endoscopy rooms. The collection was carried out by the principal investigator with the help of personnel working in the digestive endoscopy departments of the medical training courses concerned. A sheet containing all the variables of interest was drawn up and filled in from patient files. An Excel file has been created for this purpose. Data was edited, coded and transferred to SPSS for analysis. In the post-anaesthesia period, the data only concerned the monitoring period in the post-interventional care room.

The following variables were retained: socio-demographic data (age and gender); clinical data (comorbidities, ASA class, Mallampati grade), whether or not biological examinations have been carried out; endoscopic procedures and qualification of the endoscopist; the time of the realization of the pre-anaesthetic consultation, the duration of the pre-anaesthetic fast, the difficulty of venous access, the technique and the anesthetic products, the use of pre-oxygenation, the duration of the acts and the qualification of the anesthesiologist. Per-anaesthetic complications, post-anaesthetic complications and patient outcome.

2.2. Data Processing and Analysis

Data were entered using Microsoft Excel 2013 software and analyzes were performed using SPSS 23.0 software. A simple descriptive analysis was performed on the entire study population. The results are expressed as the mean \pm standard deviation for the quantitative variables or as a percentage with the 95% confidence interval for the qualitative variables. Pearson's chi-square test or Fisher's exact test was performed to compare the percentages. Student's *t* test compared the means.

Factors associated with adverse events were sought by logistic regression. The strength of association between a factor and an adverse event was measured by calculating the odds ratio (OR) with their 95% confidence intervals. For all these tests, the statistical significance threshold was set at $p < 0.05$.

2.3. Ethical Considerations

The principle of confidentiality was respected by anonymity during all stages of data collection and analysis. The protocol of this study received the approval of the ethics committee of the School of Kinshasa Public Health under number 97/B. However, having worked on the records, informed consent was not required.

We have no conflict of interest for this study.

3. Results

During this period, 430 endoscopic procedures performed, 6 under local anesthesia without the presence of an anesthesiologist, 17 patients had files that lacked certain important study variables. Only the records of 407 patients were analyzed in this study.

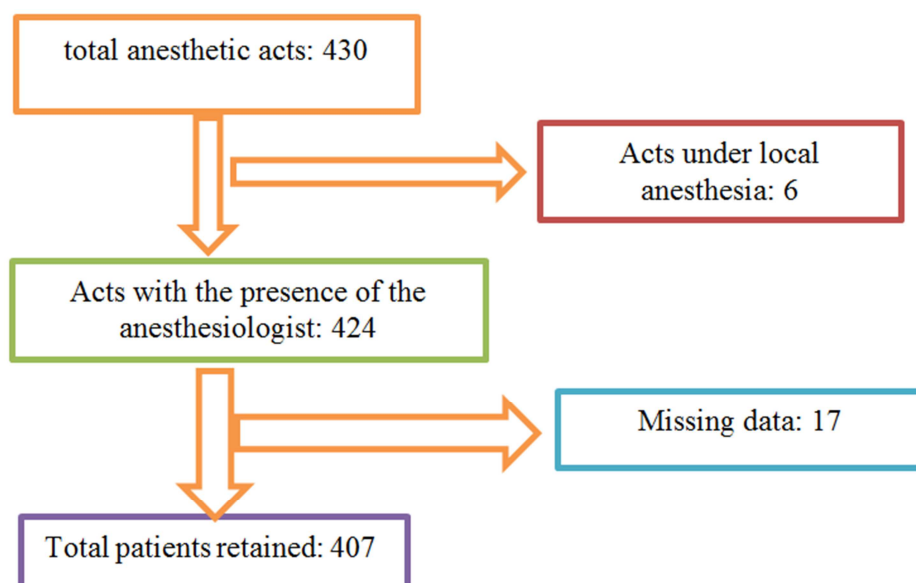


Figure 1. Patient flow chart.

3.1. Sociodemographic Characteristics of Patients

The mean age was 48 ± 16 (2-90 years). The majority of patients (85.7%) were under 65 years old and 14.3% were over 64 years old. Men represented 51.15% against 48.85% of women, i.e. a sex ratio M/F of 1.04. The patients having made the pre anesthetic consultation the same day represented 41.5% against 58.5% having made it 48 hours before. The most frequent co morbidities were: arterial hypertension (27%), obesity (4.9%), diabetes (4.2%) and heart disease (3.2%). Pre anesthetic biological examinations were prescribed in 70.3% and not prescribed in 29.7%. The pre anesthetic fast was respected in 95.8% and not respected in 4.2%. Mallampati's grade was I (69.8%), II (23.1%) and III (7.1%). ASA class was I in 50.1%, II in 39.6%, III in 8.8% and IV in 1.5%. Venous access was easy in 96.8%.

Table 1. Socio-demographic characteristics.

Variables	(n=407)	%
Age		
<65 years old	349	85.7
≥65 years old	58	14.3
Sex	208	51.1
Male	199	49.8
Feminine		
CPA timing		
The same day	169	41.5
More than 48 hours before	238	58.5
Comorbidities		
hypertension	110	27
Obesity	20	4.9
Diabetic sugar	17	4.2
heart disease	13	3.2
Allergy	13	3.2
Viral hepatitis	9	2.2
TBC	8	2
Anemia	6	1.5
Request for pre-anaesthetic examinations		
No	286	70.3
Yes	121	29.7
Respect for the young pre-anaesthetic		
Yes	390	95.8
No	17	4.2
Mallampati Rank		
I	284	69.8
II	94	23.1
III	29	7.1
ASA class		
I	204	50.1
II	161	39.6
III	36	8.8
IV	6	1.5
Venous access		
Easy	394	96.8
Difficult	13	3.2

3.2. Intraoperative Patient Characteristics

Preoxygenation was done in 96.6% of patients and not done in 3.4% of patients. Propofol was used in 98.8% of patients and the mean dose was 228.11 mg (± 106.717). Midazolam was used in 5.4% of patients and the mean dose was 1.53mg (± 8.75). Ketamine was used in 4.2% of patients

with the average dose of 9.6mg (± 26.986). The analgesics used were fentanyl in 32.7% with the average dose of 38.66 μ g (± 42.926) and sufentanil in 9.2% with the average dose of 3.86 μ g (± 4.292). Haloperidol was used in 7.6% of patients. Patients awakened on the operating table represented 98.5% against 1.5% awakened in the post-interventional care room. The endoscopy performed was high in 56.8% of patients, it was low in 25.3%, it was combined in 16.5% and not specified in 1.5%. The act performed was exploration/biopsy in 53.8% of patients, simple exploration in 23.3%, removal of the foreign body in 3.4% of patients, hemostasis in 3.2% and it was not specified in 16.2%.

Table 2. Intraoperative characteristics.

Variables	(n=407)	%	Mean and SD
Pre oxygenation			
Yes	393	96.6	
No	14	3.4	
Drugs used			
Propofol (mg)	402	98.8	228.11 (± 106.717)
Haloperidol (mg)	31	7.6	
Midazolam (mg)	22	5.4	1.53 (± 8.75)
Ketamine (mg)	17	4.2	9.6 (± 26.986)
Fentanyl (μ g)	133	32.7	38.66 (± 42.926)
Sufentanil (μ g)	9	9.2	3.86 (± 4.292)
Awakening			
On table	401	98.5	
In SSPI	6	1.5	
Type of endoscopy			
High	231	56.8	
Low	103	25.3	
Combined (high and low)	67	16.5	
Unspecified	6	1.5	
Endoscopic gesture			
Biopsy	219	53.8	
Exploration	95	23.3	
Foreign body removal	14	3.4	
Hemostasis	13	3.2	
Unspecified	66	16.2	
Qualification of the speakers			
MAR	300	73.7	
Junior	107	26.3	
Specialist endoscopist	263	64.6	
Junior endoscopist	144	35.4	
Duration of anesthesia			
< 10 minutes	149	36.6	
≥ 10 mins	224	55	
Complications			
Absent	213	52.3	
Present	194	47.7	
Type of complications			
Desaturation	77	18.9	
Cough	69	17	
HypoTA	62	15.2	
Bradycardia	35	8.8	
Bradypnea	28	6.9	
Tachypnea	9	2.2	
Hypertension	7	1.7	
Spasm	6	1.5	
Apnea	5	1.2	
Others	12	2.9	

The average duration of procedures was 14.24 minutes SD ± 13.002 (range 8 to 66). The acts had lasted less than ten

minutes in 36.6%. The anesthesiologist was senior in 73.7% and junior in 26.3%. The endoscopist was senior in 64.6% and junior in 35.4% (table 2).

Complications were present in 47.7% of patients and

represented mainly by: desaturation (18.9%), cough (17%), arterial hypotension (15.2%), bradycardia (8.8%), tachycardia (9 %), hypertension (1.7%), spasm (1.5%) and apnea (1.2%).

3.3. Factors Associated with Complications

Table 3. Factors associated with complications in multivariate analysis.

Variables	Univariate analysis		Multivariate analysis	
	p	OR (95% CI)	p	ORa (95% CI)
Hypertension				
No		1		1
Yes	0.010	1.79 (1.15-2.78)	0.911	1.03 (0.57-1.87)
Mallampati				
I		1		1
II	0.406	1.23 (0.76-1.95)	0.746	0.91 (0.51-1.63)
III	0.001	4.88 (1.92-12.34)	0.035	3.19 (1.09-9.36)
ASA				
I		1		1
II	0.182	1.23 (0.58-8.06)	0.789	1.35 (0.15-3.86)
III	0.003	1.90 (1.25-2.89)	0.131	1.54 (0.88-2.71)
IV	0.001	3.67 (1.71-7.88)	0.012	3.29 (1.30-8.34)
Gesture duration				
<10 mins		1		1
≥10 mins	<0.001	2.77 (1.80-4.27)	0.019	1.97 (1.12-3.47)
Type of endoscopy				
High		1		1
Low	0.080	1.52 (0.95-2.42)	0.355	0.75 (0.41-1.38)
Combined	<0.001	3.14 (1.76-5.60)	0.007	2.96 (1.93-4.12)
Anesthetist				
Specialist		1		1
Junior	<0.001	2.84 (1.79-4.51)	0.031	2.66 (1.10-6.45)
endoscopist				
Specialist		1		1
Junior	<0.001	3.06 (2.01-4.68)	0.167	1.74 (0.79-3.80)

In univariate analysis, the factors associated with complications were: the presence of arterial hypertension, the grade of Mallampati III, the ASA class greater than II, the duration of procedures greater than or equal to ten minutes, combined endoscopy, junior anesthesiologist and the junior endoscopist. In multivariate analysis, factors associated with complications persisted: Mallampati III grade, ASA IV class, procedure duration greater than or equal to ten minutes, combined endoscopy and junior anesthesiologist.

4. Discussion

This work was carried out with the aim of making an inventory of the practice of sedation/analgesia for digestive endoscopy in the city of Kinshasa. He showed that digestive endoscopies are done in Kinshasa with the presence of anesthesiologists and the rate of complications is quite high. These results are close to those of French studies, in fact, the majority of digestive endoscopies performed in France are performed with the assistance of an anesthetist in 74% or a nurse anesthetist in 8%. There are approximately 2.8% of anesthetic acts performed by gastroenterologists and 24.4% of acts performed without sedation [29, 30]. The presence of anesthetic doctors (seniors) or rarely juniors in our series is explained by the characteristics of the centers where the study took place. Indeed, the three structures in which the

study was conducted have permanent anesthesiologists and juniors in training for two of them. This is not the case for the rest of the health structures in the city of Kinshasa, apart from university clinics and general reference hospitals. Only six patients performed their examination under local anesthesia, practitioners and patients in our series seem to prefer an examination under good sedation contrary to the observations of Cann [7, 28] who found that 64% of patients accepted upper endoscopy without sedation, an observation confirmed by the study by Seip [8, 31] which found that the need for sedation for upper digestive endoscopy was around 32%.

4.1. Preoperative Characteristics of Patients

The average age was 48,069 years. The majority of patients (85.7%) were under 65 years old and 14.3% were over 64 years old. Men represented 51.15% against 48.85% of women with a sex ratio M/F of 1.04. Servin [32] in France had reported an average age of 57.7 years with a female predominance in 54% of cases and patients over 50 years old represented 69%. These data are different from ours because the Congolese population is younger than the French population. However, we cannot find an explanation for the fact that there are more women in his series compared to ours.

On the other hand, our results are similar to those of Dia [33] in Senegal who found a male predominance and an average age of 41 years, even if the study was particularly interested in lower endoscopies. There seems to be a similarity between the African series but a difference with the European series having older populations. The most frequent comorbidities were: high blood pressure, obesity, diabetes and heart disease. Servin [32, 33] in France had also noted that many patients who had to benefit from digestive endoscopy procedures were carriers of comorbidities. It seems then that the cardiovascular diseases that we thought were rare in Africa have become quite frequent in our circles, in particular arterial hypertension and diabetes mellitus which are at the forefront of comorbidity in our series. Pre-anaesthetic biological examinations were prescribed in 70.3% and not prescribed in 29.7%. These examinations have no impact on morbidity and mortality in this context of short procedures.

ASA I was in 50.1%, II in 39.6%, III in 8.8% and IV in 1.5%. These results are close to those reported by Servin [32] in France who noted that hospitalized patients were often ASA class III and IV. As most of our patients were taken on an outpatient basis, it seems logical that ASA classes I and II are in the majority. The pre-anaesthetic consultation was done for all the patients but only 58% before 48 hours contrary to the recommendations of the experts of the SFAR who proposes it almost a month before [34]. Note, however, that the context of our environment does not allow pre-anaesthetic consultations at times further away from the performance of the act. Many procedures were performed on an outpatient basis, except for patients already hospitalized. This practice complies with the recommendations of the SFAR experts [34]. Dia [33] in Senegal also found that 95% of patients were managed on an outpatient basis.

The pre-anaesthetic fasting was respected in almost all the patients, either 95.8%, in accordance with the recommendations in the field [34]. Preoperative fasting must be observed to reduce the risk of inhalation, thus we had 0.7% cases of inhalation and non-observance of fasting may have contributed to the occurrence of this complication. The search for Mallampati grade, ASA class was done in all patients. Mallampati's grade was I (69.8%), II (23.1%) and III (7.1%). The Korean Society of Digestive Endoscopy recommends this research to decrease complications during sedation in digestive endoscopy [35].

Indeed, the ASA class is well correlated with mortality and the Mallampati score makes it possible to predict patients at risk of difficult intubation and even desaturation, frequent complications in digestive endoscopy [36, 37]. Moreover, the high Mallampati grade appeared as a factor associated with complications in our series. Peripheral venous access was easy in 96.8%. However, venous access difficulties would have no effect on morbidity or mortality in this situation, but venous access remains essential to start the procedure, especially since inhalation induction is not possible. a good choice. Thus, trying to take a central venous approach would lead to the complications of central catheter placement, fortunately, this was not the case in our series.

4.2. Intraoperative Characteristics of Patients

Preoxygenation was done in 96.6% of patients. Propofol was used in 98.8% of patients and the mean dose was 228.11 mg (± 106.717). Midazolam was used in 5.4% of patients and the mean dose was 1.53mg (± 8.75). Ketamine was used in 4.2% of patients with the average dose of 9.6mg (± 26.986). The analgesics used were fentanyl in 32.7% with an average dose of 38.66 μ g (± 42.926) and sufentanil in 9.2% and not specified in 8.4%. Haloperidol was used in 7.6% of patients. However, the high total doses of the products that seemed to be associated with complications did not emerge in multivariate analysis.

In a review of the literature published in 2015, Ferreira [36] noted that propofol and midazolam were the most used hypnotics, but also meperidine, pethidine and fentanyl as analgesics. In our series, meperidine and pethidine were not used either by their rarity on the market or by the habits of practitioners. However, ketamine has been used in all patients with a precarious hemodynamic state because of these field advantages. The act performed was exploration/biopsy in 53.8% of patients, simple exploration in 23.3%, removal of the foreign body in 3.4% of patients, hemostasis in 3.2%. Exploration in particular colorectal by endoscopy is strongly recommended for the detection of colorectal cancers [34, 35]. Similarly, upper digestive endoscopy is systematic in all cases of digestive haemorrhage.

In our series, all anesthetic acts were performed by the senior or junior with the ability to manage the airways and perform cardiopulmonary resuscitation. The Korean Society of Gastrointestinal Endoscopy had made a recommendation that the person performing sedation for gastrointestinal endoscopy should be able to perform cardiopulmonary resuscitation [35]. The practice in our series is close to this recommendation. The anesthetic act in our series was therefore only performed by an anesthesiologist, often senior but sometimes junior. The doses of propofol and other drugs also seem low in our series, although this recommendation applies particularly to the elderly according to the Korean anesthesia society [35]. The endoscopy performed was high in 56.8%, low in 25.3% combined in 16.5% and unspecified in 1.5%.

In the French review by Servin [32], upper gastrointestinal endoscopies included diagnostic esogastroduodenoscopies (33%), echo-endoscopies (3%) and endoscopic retrograde cholangiopancreatographies (2%). Lower endoscopies included colonoscopies (46%) and rectosigmoidoscopies (4%). The esogastroduodenoscopy plus colonoscopy association represented approximately 16% of patients. Endoscopic ultrasound punctures, videocapsules and enteroscopies only concerned about 0.1% of patients each. Although we did not find the cases of echoendoscopy and endoscopic retrograde cholangiopancreatography, our rate of upper endoscopy remains high while for lower endoscopy, our rate is lower than that of the French series. This difference can be explained by the fact that there is a colon cancer screening colonoscopy in France, whereas in our

country, all examinations are done only when there is a warning sign. There are still no materials for videocapsule and enteroscopy in our environment [34].

A prospective randomized study compared fentanyl and remifentanyl in combination with propofol for esogastroduodenoscopies in 199 patients [15, 16]. Patients received 1mg/kg of propofol and 0.5 µg/kg of fentanyl or remifentanyl. If necessary, they received additional boli of 0.5 mg/kg of propofol. The study showed a greater efficacy of remifentanyl in this context, with doses of propofol which however exceeded 2.5 mg/kg in the two groups. It might seem more logical to rely more on remifentanyl to ensure a smooth examination and rapid recovery, bearing in mind the increased risk of ventilatory depression when propofol and remifentanyl are combined [10, 13].

In our series, the morphine used was only fentanyl most often in combination with propofol because remifentanyl is rare on the market in our environment. The choice of propofol associated with fentanyl in our series is also corroborated by the results of a review of the Cochrane library [37] carried out in 2008 which compared the use of propofol for colonoscopy with previous protocols (benzodiazepines, morphine). Propofol allowed faster recovery and therefore faster discharge, and better patient satisfaction, without increasing the risk of adverse effects. All patients received nasal cannula oxygen before and during the procedure. This practice is recommended by many experts since hypoxia is a common complication during digestive endoscopy [29, 31].

In our series, midazolam was the only benzodiazepine used, a recent study had shown that a new benzodiazepine, remimazolam, is on the market and has advantages over midazolam [25, 29]. This product does not yet exist on the Congolese market.

4.3. Complications

Complications were present in 47.7% of patients and represented mainly by: desaturation, cough, arterial hypotension, bradycardia, tachycardia, arterial hypertension, spasm, apnea, vomiting, hemorrhage, inhalation, memorization and allergic reaction which are all complications described in the literature. However, the overall frequency seems too high, as do the frequencies of some of them, such as desaturation.

In a study of 10,662 successive patients who had received a low dose of propofol (mostly between 20 and 40 mg depending on their age) during an esogastroduodenoscopy lasting an average of 5.7 minutes, 28 patients had presented desaturation justifying nasal oxygen supply, and one patient presented with bradycardia [3, 4]. Our desaturation rate is higher than that reported in this series and without us having a plausible explanation. Indeed, preoxygenation was reported in all patients before the induction dose. Would there be flaws in the monitoring or low experience of some practitioners. Because the rate of complications was not the same in the three structures concerned and there were disparities between the centers. Inhalation seems to have a

low frequency of 0.7% in this series, fortunately without serious consequences. It should be noted that inhalation of gastric contents may occur during colonoscopy [38, 39]. This rare occurrence can lead to death. It most often occurs in the context of emergency in weakened patients. Following good practice should further reduce the frequency of this serious complication [39, 40-42].

Some authors had found that co morbidities, upper endoscopy and the use of propofol were factors associated with inhalation [43, 22] It should be noted, however, that the inhalation rate is quite low despite the frequent use of propofol, the presence of comorbidities and the performance of many upper endoscopy procedures. It is also probable that the cough encountered in 17% of cases in our case is the expression of micro-inhalation triggering the cough reflex, especially if the anesthesia is not deep. In addition, this cough may reflect very light sedation and the peaks of arterial hypertension (1.7%) and tachycardia (9%) may have in our series may explain this tachycardia. On the other hand, the bradycardias (8.8%) can probably be linked to propofol, as other authors have observed [3, 4]. Similarly, the high frequency of arterial hypotension (17.8%) may be related to the use of propofol, the hypotensive effect of which is known.

4.4. Factors Associated With Complications

In multivariate analysis, factors associated with complications persisted: Mallampati III grade, ASA IV class, procedure duration greater than or equal to ten minutes, combined endoscopy and junior anesthesiologist. The total doses of the products used, the age and the comorbidity (arterial hypertension) did not emerge. In 2007, in the United States, Sharma *et al.* [43] had carried out a national retrospective analysis of files to try to quantify the cardio-respiratory complications of digestive endoscopies and identify risk factors. The analysis concerned 324,737 examinations carried out between 1997 and 2002 (approximately 141,000 esogastroduodenoscopies, 174,000 colonoscopies, 6,000 ERCPs and 4,000 echo-endoscopies). Cardiorespiratory complications were found in 0.9% of patients, including 28 deaths. The risk factors were advanced age, high ASA class, being hospitalized rather than ambulatory, the presence of students in training and the systematic use of oxygen. At that time, sedation was performed by gastroenterologists without oxygen supply for more than half of procedures.

The high ASA class and the lack of experience are factors that we also found in our series. Indeed, the junior anesthetist in our series, and the student in the American series are characterized by the lack of experience. Arterial hypertension as a comorbidity did not emerge in our series because it was probably absorbed into the ASA class.

The performance of combined upper and lower endoscopies can be put together with the duration of the procedures. Indeed, the completion time is almost doubled and therefore the determining factor would be the duration of the procedures. The role of the duration of procedures in the occurrence of complications is a well-known fact. High

Mallampati grade emerged as a factor associated with complications likely through airway obstruction and hence desaturation.

5. Conclusion

This study allowed us to affirm that digestive endoscopies are carried out in the city of Kinshasa almost with the presence of anesthesiologists. The techniques performed are esogastroduodenal endoscopies and colonoscopies using the products mentioned in the literature but with a higher rate of complications even if there were no deaths.

The high ASA class, the high Mallampati grade and the practitioners' lack of experience appeared to be the factors associated with the occurrence of complications.

Conflicts of Interest

No conflict of interest has been declared by the authors.

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