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Practice of Pediatric Spinal Anesthesia in a Country with Limited Means: Example of Togo

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Abstract

Introduction: The practice of spinal anesthesia in pediatric surgery is declining, especially in countries with limited means. What about in our context? **Objective**: To evaluate the practice of spinal anesthesia in pediatric surgery in Togo. Framework and method of study: This was a prospective study from November 2017 to May 2018 in pediatric surgery at CHU SO de Lomé, in the operating room and hospital ward of CHU Kara. The surgical, anesthesiological and evolutionary aspects of the patients were analyzed. **Results**: Sixty children were selected for the study who had an indication for sub-umbilical surgery. The male sex was predominant (73.3%). 47 (78.30%) patients were operated on for scheduled surgery. Hernia repair was the most performed surgical intervention (43.30%). The mean duration of the surgery was 78 ± 35.9 minutes. Most of the patients were ASA 1 (98.30%). The local anesthetic used was 0.5% isobaric Bupivacaine. Fentanyl was the predominant adjuvant (55%). The most widely used lumbar puncture needle was 25 Gauge with 75 millimeters in length (63.30%). Diazepam was the most widely used sedative (50%). The predominant spinal anesthesia protocol was spinal anesthesia alone (60%). Only one patient had hypotension (1.70%). **Conclusion**: The fairly satisfactory pediatric spinal anesthesia in Togo remains poorly performed. Its promotion involves the training of anesthesia practitioners and the strengthening of the technical platform.

Keywords

Pediatric Surgery, Spinal Anesthesia, Togo

1. Introduction

Spinal anaesthesia is one of the oldest anaesthetic techniques. Bainbridge described it in a 3-month-old infant with a strangulated hernia [1]. Gradually falling into disuse due to the progress of general anaesthesia (GA), spinal anaesthesia became common practice again in 1984 when it was proposed for hernia repair in the early preterm infant to reduce the risk of postoperative apnea by Abajian [2]. Since then, the efficacy and safety of spinal anaesthesia has been widely established in children of all ages, with or without associated sedation and as an adjunct or alternative to GA [2].

Spinal anaesthesia in children represented 1.3% of all locoregional anaesthesia performed in children, according to a study conducted in France in 2006 [3]. Spinal anaesthesia (RA) in children was therefore not widespread.

Since 2008-2009, paediatric locoregional anaesthesia has gained new impetus in France with the objective of providing intra- and postoperative analgesia by establishing formalised recommendations [4].

Spinal anaesthesia was increasingly performed in children at the Central Hospital of Yaoundé in 2009-2010 [5].

What about in our context of a country with limited means?

The objective was to evaluate the practice of spinal anaesthesia in paediatric surgery in Togo.

2. Methodology

The setting of our study was the pediatric surgery department, the pediatric surgery operating rooms and the post-interventional surveillance room of the Sylvanus Olympio University Hospital (SO) in Lomé, the operating room and the children's hospitalization rooms of the Kara University Hospital in Togo.

Kara University Hospital is a medical and surgical center located 450 km from Lomé in northern Togo. It did not have a paediatric surgery department. This center was used as a setting for the pediatric surgery mission organised by "La Chaîne de l'Espoir" in Lomé.

This was a prospective and descriptive study from November 2017 to May 2018 (7 months).

2.1. Selection Criteria

Patients aged between 3 and 15 years, weighing at least 5 kg, who were to undergo umbilical or subumbilical surgery under spinal anaesthesia in the paediatric surgery department of the CHU SO of Lomé and during the paediatric surgery field mission to the CHU Kara were included in the study. This choice was based on the first practical experience with children; the selection of smaller children was to be the subject of a later study with the fear that, for the first time, the maximum safety for these children could not be achieved.

Any patient whose parent or guardian had not consented to the study or who was less than 3 years old was excluded.

2.2. Performance of Anaesthesia

All the patients operated on in regular surgery were seen in a pre-anaesthetic consultation where the clinical examination, the paraclinical examinations and the practical constraints were analysed. For patients operated on in emergency and during the pediatric surgery mission, no biological Haemostasis examination was carried out. The latter had carried out the grouping and rhesus, the glycaemia, the uraemia and creatininaemia, and the blood count (NFS). At the end of the consultation the patient was classified according to ASA (American Society of Anesthesiologists).

The pre-anaesthetic visit was carried out the day before and pre-operative fasting was prescribed.

The emergency tray contained Adrenalin, Atropine, Ephedrine, Salbutamol spray; difficult intubation equipment and ventilatory support equipment were prepared before induction.

The anaesthetic drugs used and their dosage were: Bupivacaine 0.5% isobaric for patients 5 - 15 kg: 0.08 ml/kg or 0.4 mg/kg; 0.06 ml/kg or 0.3 mg/kg for children over 15 kg, according to the 2010 expert recommendations [4]. Clonidine 0.5 µg/kg; Fentanyl 0.5 µg/kg; Morphine 5 µg/kg; Ketamine 1 mg/kg and Diazepam 0.1 mg/kg IV for sedation; Propofol 3 mg/kg for general anaesthesia with Halothane or Sevoflurane for maintenance of anaesthesia.

The lumbar puncture equipment included the adult Quincke needle 25 Gauge without introducer. Spinal anaesthesia was performed by a physician anaesthetist (MAR), a paramedical anaesthetist. The lumbar puncture was performed in lateral decubitus under GA or sedation or in a sitting position between L3 - L4, L4 - L5 and L5 - S1. It was performed after a peripheral venous line was inserted, often under GA with Halothane or Sevoflurane. The patient was installed in the supine position, with the head elevated after puncture.

Three anaesthesia protocols were used: spinal anaesthesia alone, spinal anaesthesia + sedation and spinal anaesthesia + GA by face mask.

Intraoperative parameters monitored were BP and HR every 3 minutes for the first 15 minutes and then every 5 minutes, respiration, ECG, SpO_2 and consciousness (if patient awake).

The following information was recorded on the anaesthesia cards: patient identity, operative indication, surgical procedure performed, anaesthesia technique, and time of lumbar puncture, incision and end of procedure.

After surgery, postoperative analgesia based on Paracetamol IV 15 mg/kg, Nefopam 0.3 mg/kg IV and Niflumic acid suppository were administered to patients awake on the operating table.

Post-operative care combined multimodal analgesia: Paracetamol + Nefopam + Niflumic acid. Oral rehydration started 2 hours later if GA was associated and as soon as the patient got up from the motor block if spinal anaesthesia was performed alone. Ceftriaxone antibiotic administration was continued.

Intraoperative monitoring was based on vital parameters: BP, HR, respiration, consciousness, temperature, sensibility and motricity of the lower limbs by not-

ing the time of the awakening of the sensitivomotor block.

The parameters studied were: epidemiological (age, sex, number of patients); clinical (weight, HR), paraclinical (CBC, PT, APTT); anaesthesiological (ASA, lumbar spine status, anaesthetic drugs, adjuvants, injection spaces, lumbar puncture needles, puncture level, lumbar puncture position, intraoperative monitoring, anaesthetic personnel); surgical (surgical pathologies to be operated, procedures performed); complications (during intraoperative clinical monitoring, systemic toxicity, mechanical, bleeding, septic complications, injection error); evolution of complications (recovery, worsening state).

The data were processed using IBM SPSS statistic 23. Data were processed using IBM SPSS statistic 23 software. chi2 and Fischer statistical tests were used and a P-value ≤ 0.05 was considered significant.

3. Results

3.1. Epidemiological Aspects

During the study period 117 patients underwent sub-umbilical surgery with 39 under spinal anaesthesia at CHU SO. At the Kara University Hospital, 57 out of 121 were operated on under spinal anaesthesia, with 21 retained for the study. A total of 60 children under spinal anaesthesia were selected for the study.

The average age was 9.4 ± 2.9 years, with extremes of 3 years and 15 years. The most represented age group was 8 to 15 years (75%) followed by 3 to 7 years (25%).

Boys represented 73.3% of the cases.

3.2. Surgical Aspects

Forty-seven patients (78.3%) were operated on as regular surgery and 13 (21.7%) as emergency surgery.

Visceral surgery (42.03%), traumatology (37.68%) and urogenital surgery (20.29%) were the three surgical specialities. A patient could be operated on for several pathologies at the same time.

In visceral surgery, umbilical hernia (55.17%), inguinoscrotal hernia (37.93%) and appendicitis (3.45%) were in the majority.

Urogenital pathologies included: circumcision (7.14%); hypospadias (14.29%); spermatic cord cyst (21.43%); vaginal hydrocele (28.57%) and testicular ectopy (28.57%).

These were mainly urogenital malformations.

Table 1 shows the different traumatological pathologies with a predominance of femur fractures.

3.3. Surgical Interventions Performed.

The average duration of surgery was 78 ± 35.9 minutes, with extremes of 35 and 185 minutes. 7% of the operations lasted 45 minutes; 63% for 45 - 90 minutes; 20% for 90 - 135 minutes; 10% for ≥135 minutes (Table 2).

Table 1. Different lesions traumatologicals lesions had a predominance of fracture of the femur.

	Number	Percentage
Femur fracture	7	26.92
Quadriceps retraction	4	15.38
Knee osteoarthritis	4	15.38
Section of the Achilles tendon	3	11.54
leg fracture	2	7.69
heaving	2	7.69
Knee varum	1	3.85
Infection on osteosynthesis material	1	3.85
BLUNT disease	1	3.85
Ankle trauma	1	3.85
Total	26	100

Table 2. Breakdown of patients according to the surgical procedure performed (according to the 3 specialties).

	Number	Percentage
Hernia repair	26	43.3
Knee arthrotomy	6	10.0
Osteosynthesis by pinning	7	11.7
Quadriceps release	4	6.7
Cure of hydrocele	4	6.7
Orchidopexy	4	6.7
Spermatic cord cystectomy	3	5.0
Debridement-suture	3	5.0
Tendinorrhaphy	3	5.0
Valgus osteotomy	2	3.3
Umbilicalplasty	2	3.3
Urethroplasty according to DUCKETT	2	3.3
Appendectomy	1	1.7
Circumcision	1	1.7
Cast immobilization for fracture	1	1.7

It was marked the predominance of hernial cure.

3.4. Anaesthesiological Aspects

All patients had had a pre-anaesthetic consultation. Thirteen patients (21.7%) had had an emergency consultation.

The mean weight was 27.2 ± 7.9 kg with extremes of 14 and 52 kg. ≤ 20 Kg

accounted for 21.7%; 21 - 35 Kg in 63.3%, 36 - 50 Kg in 13.3%; >50 Kg in 1, 7%.

The preoperative heart rate was: <120 b/min in 31.6%; 120 - 140 in 1.7%; not known in 66.7%.

One (1.7%) patient was asthmatic.

All the patients operated on in the course of the surgery had a normal prothrombin level. The activated partial thromboplastin time (APTT) was: <25 s = 16.7%; 25 - 39 s = 25%; >39 s = 1.7%; not recorded in 56.7% of cases. Platelets had noted: 156,000 - 512,000/mm^3 in 38.3%; >512,000/mm^3 in 5%; uninformed in 56.7%.

Anaesthetic risk included: ASA1 76.6%; ASA2 21.7% and ASA 3 1.7%.

Spinal anaesthesia protocols were: spinal anaesthesia + GA 18.3%; spinal anaesthesia + sedation 21.7% and spinal anaesthesia alone 60%.

Bupivacaine 0.5% isobaric and spinal adjuvants were injected intrathecally.

The different adjuvant protocols used concerned 57 patients: Fentanyl (55%); Fentanyl + Clonidine (15%); Morphine (11.7%); Clonidine (10%); Morphine + Clonidine (8.3%).

The characteristics of the 25 G lumbar puncture needles: 75 mm for 63%; 88 mm for 1.7%, 90 mm for 35%.

Three quarters of the patients had received an infusion of 0.9% isotonic saline just before the spinal puncture. 23.3% had received nothing.

Forty-eight patients (80%) had received lumbar puncture in the sitting position and 20% in the lateral decubitus position.

The median lumbar puncture level was: L4-L5 95%; L5-S1 3.3% and L3-L4 1.7%. The drugs used for sedation were: Diazepam 50%; Ketamine 35 .7% and Fentanyl 14.3%. Those used for GA were: Halothane 82.3%; Sevoflurane 5.9% and Propofol 11.8%.

Intraoperative oxygenation was used in 30% of the patients: face mask 20% and nasal cannula 10%.

The average duration of spinal anaesthesia was 103.6 ± 32.5 minutes with extremes of 60 and 190 minutes. Almost 83.3% of patients who received intrathecal Clonidine had an anaesthetic time of more than 150 minutes (**Table 3**). The use of the adjuvant Clonidine prolonged the duration of anaesthesia.

Table 3. Effect of clonidine on the duration of spinal anesthesia.

Spinal anesthesia with (yes) and without (no) Clonidine: n (%)				
Duration (min)	NO	yes	Total	P-value
≤90	21 (77.8)	6 (22.2)	27 (100	0.0023
]90 - 120]	12 (75)	4 (25)	16 (100)	0.0000
]120 - 150]	8 (72.7)	3 (27.3)	11 (100)	3.7141
>150	1 (16.7)	5 (83.3)	6 (100)	4.5214

Effect of Clonidine on the duration of anesthesia according to P value ($p < 0.5$).

Intraoperative vasoplegic effects were: 1.7% hypotension (with 72/41 mmHg) and dizziness occurred 15 minutes after spinal puncture.

The outcome was favorable in 100% of cases.

4. Discussion

We will focus our discussion on the limits of the work, the epidemiological aspects of the children, the surgical aspects with the duration of the interventions, the anaesthesiological aspects with their evolution, the perioperative complications.

4.1 Limits of the Study

This work was carried out in two different parts of the country, 450 km apart.

In the interior of the country, there was no anaesthetist resuscitator at all. There were only paramedics who were anaesthetists and who practised this technique very little. In Lomé there was a school for paramedics which obliged some paramedical anaesthetists to invest in training. He did not have a diversified lumbar puncture needle. This practice had been carried out in Kara during mobile operations.

4.2. Epidemiological Aspects

Of the 238 cases eligible for spinal anaesthesia, 96 had had spinal anaesthesia (40.34%); only 60 were included in the study. In our context few practitioners master the technique in children. Many practitioners consider this practice, which often combines GA, as a waste of time by applying two techniques at the same time. Some are simply afraid to perform it on the very young. GA was the most commonly practised. Our results were superposable to those of Zoumenou [6] who found GA to be the most practised in French-speaking sub-Saharan Africa in children. Nevertheless, this rate of 40.34% was not negligible and was linked to a willingness on the part of practitioners who were previously reluctant to perform spinal anaesthesia in children. This technique was not sufficiently practised by the MARs, who were very few in number and had to pass it on to the anaesthetic paramedics. In our context, it is necessary to popularise it, to allow its mastery by practitioners and to increase anaesthetic safety in the population of children to be operated on.

The average age was 9.4 ± 2.9 years with extremes of 3 and 15 years. The most represented age group was 8 to 15 years (75%). This result depends on the selection with the fear of practising on the very young. Our results are superposable with those of Afane [5]. Ages under 3 years old required GA. This higher age range was related to the high frequency of hernias in this age range (8 - 15 years).

The male sex predominated (73.3%). This was mainly due to the existence of urogenital malformations and inguinal hernias which were more frequent in boys. These results are close to those found by Afane and Otiobanda [5] [7] who

found a predominance of male sex respectively 60.09% and 66.1%.

Surgical aspects

More than three quarters (78.3%) of the patients were operated on as regular surgery. Afane and Otiobanda [5] [7] found 81.8% and 81.7% respectively in scheduled surgery and the rest in emergency. In our series, the high number of patients in scheduled surgery was related to the 21 patients who were retained in Kara after a 5-day fairground mission.

Our results were almost identical to those of Afane [5] and different from those of Ogondo [8] with trauma surgery predominating (39.7%). Essola [9] noted a predominance of visceral surgery (25.9%). In our series, the high frequency of persistence of the peritoneo-vaginal canal and above all of hernias and children who were too inclined to play, exposed themselves to trauma of the lower limbs. Hernia repair was the most common surgical indication (43.3%). Our results are similar to those of Afane [5] who found a predominance of hernia repair (48.15%). In our context, the high frequency of persistent peritoneo-vaginal canal in children was the cause.

The average duration of the procedures was 78 ± 35.9 minutes with extremes of 35 and 185 minutes. In Afane's series [5] the longest surgery was 130 minutes. A patient could be operated on for several surgical conditions at the same time, which would explain the length of the procedure up to 185 minutes. Clonidine was used in spinal anaesthesia as an adjuvant. Morphine and halogen were administered in case the duration of the surgery was prolonged beyond that of the spinal anaesthesia. In **Table 3** the pvalue was not in favor of an increase in the length of surgery time with the combination of intrathecal Clonidine.

This value was significant for less than 90 min and between 90 - 120 min (only for 10 patients) and for 120 - 150 min then beyond 150 min (not for the 8 children). This would mean that the addition of Clonidine was not a factor that increased the time for the procedure. This is contrary to several authors such as Courrèges and Afane [4] [5] respectively.

Anaesthesiological aspects

The average weight of the patients was 27.2 ± 7.9 kg with extremes of 14 and 52 kg. In our series, the youngest was only 3 years old. There were no infants or newborns as this was the GA for them. Our results were close to those found by Aissaoui [10] during the pediatric surgery field missions with an average weight of 28 kg and extremes of 18 and 47 kg. The weight was a determining factor in determining the amount of Bupivacaine needed to avoid overdose and adverse effects.

All the patients operated on in regular surgery had a normal prothrombin level except for 3 patients who had thrombocytosis. The patients operated on in the emergency department and those in the fairground mission did not have a haemostasis test. This is consistent with the logic that haemostasis is systematic before the operation and not systematic afterwards [11]. Our results are different from those of Afane [5] where all the children had a haemostasis test. Similarly, for children scheduled for surgery and aged 3 years and over, safe haemostasis

was performed.

The ASA I class was the most represented with 98.3%. Only one patient had asthma as an associated pathology. This easily explains why ASA1 was predominant. The very high frequency of ASA 1 patients in our study was related to the fact that 78.3% of the patients were operated on in closed surgery and had received treatment before surgery, reducing the risk. Hammoumi [12] found 87% of patients classified as ASA 1 and 12% as ASA 2.

The technique of spinal anaesthesia had a safety aspect, especially for children. In fairground surgery missions, spinal anaesthesia allowed to multiply the number of patients who had to undergo surgical interventions. Spinal anaesthesia was motivated by the concern to considerably reduce the use of morphinics as in GA, source of delayed awakening and of postoperative respiratory depression more marked in children. Comparing GA and spinal anaesthesia in pediatrics, Jones [13] showed a 47% reduction in postoperative apnea, notably in the absence of any associated administration of sedative agents. It also avoided other complications associated with GA including intubation difficulties in children, neuroendocrine stress and adverse reactions to surgery according to Wolf AR [14]. It guaranteed rapid rehabilitation and was a very interesting medical and economic solution, especially in precarious situations or in countries with limited resources, according to Imbelloni LE and Kokki H. respectively [15] [16].

Most spinal anaesthesia (95%) was performed by paramedical anaesthetists, 35% of which were performed under the supervision of an anaesthetist. Only 5% were performed by a MAR. In this case, it was clear that the paramedical anaesthetist did not want to take any risks for very young children. For Afane [5] only 14% of paediatric spinal anaesthesias were performed by paramedics. In our series the high frequency of paramedics performing spinal anaesthesia was related to the very small number and unavailability of MARs. Due to lack of experience more than 60% of the paramedical anaesthetists did not perform spinal anaesthesia in children.

4.3. Procedure for Spinal Anaesthesia

Spinal anaesthesia combined with GA was performed in 18.3% of patients, with sedation in 21.7% and alone in 60% of cases. The high rate of 60% was related to the fact that 75% were older children between 8 and 15 years of age and could cooperate with the technique as in adults and adolescents. Halothane and Propofol were used in uncontrollable children.

According to Zoumenou [6] Atropine, Diazepam and Ketamine were used systematically as sedation and/or premedication before lumbar puncture in any uncooperative child. Hmamouchi [17] had used spinal anaesthesia with GA in 88%, sedation in 6% and alone in 12%.

4.4. Bupivacaine and Adjuvants for Spinal Anaesthesia

Bupivacaine isobaric 0.5% associated with Fentanyl was administered in 33 child-

ren (55%), Clonidine in 18 children (29.5%). This follows the formalised expert recommendations on locoregional anaesthesia in children according to Courrèges [4]. Adjuvants, even for short procedures, have advantages: they prolong the administration time of regular analgesics, reducing their cost.

Hyperbaric Bupivacaine 0.5% was used in Kabaachi's [18] series with Fentanyl and Clonidine as adjuvants. Kaabachi [18] using Clonidine in his series showed a prolongation of the duration of spinal anaesthesia 190 ± 42 minutes, which seems almost identical to our work. Rochette [19] with intrathecal Clonidine as adjuvant also showed a prolongation of the duration of spinal anaesthesia. Moreover, the superiority of hyperbaric Bupivacaine was questioned in 2000 in the series by Kokki H. [20]. We have remained within the limits of good practice by respecting the recommendations of experts on the baricity of Bupivacaine (here isobaric at 0.5%).

4.5. Spinal Anesthesia Equipment

The gauge of the lumbar puncture needle was 25 Gauge (100%) in diameter. Its length varied from 75 to 90 millimeters. In our context pediatric needles were not available. Our results differ from those of Hammoumi [12] who used 25 Gauge 25 mm and 22 Gauge 35 mm lumbar puncture needles. According to Aidan [21] the recommended spinal needle is 25 to 28 Gauge and 25 to 50 millimeters in length, pencil point with chuck. With the 25 Gauge the cerebrospinal fluid reflux was too slow and the needle more flexible without an introducer; but prevents post-spinal puncture headaches according to Eledjam [22]. The expert conference recommends the following lumbar puncture needles depending on the age of the child: premature babies 25 and 26 Gauge, infants 22; 25 and 26 Gauge, children 25 to 29 Gauge according to Courrèges [4].

Three quarters of the patients had received a crystalloid infusion of 5 ml/kg before spinal tap. Our dosage was half that of Kabaachi [18] who infused 10 ml/kg of Ringer's before spinal tap. However, we had no episodes of hypotension. At less than 8 years of age, the activity of the sympathetic system is less important than that of the parasympathetic system due to its immaturity according to Gorce P [23]. This physiological particularity in children reduces the risk of hypotension during spinal anaesthesia. This is not sufficient to explain the non-existence of hypotension in our context where three quarters of the patients were over 8 years old and hemodynamic monitoring had not been excluded.

More than three quarters of the patients were in a sitting position for the lumbar puncture. In our work the patients were quite cooperative because three quarters were between 8 and 15 years old. When the child was under sedation, the puncture was performed in the lateral decubitus position because the risk of respiratory distress in the seated position was increased with the flexion of the head. In lateral decubitus, one might be doubtful and might even have to make several punctures because of the slow reflux of cerebrospinal fluid. In contrast, in Kabaachi [18] the patients were in lateral decubitus position.

In 95% of cases, the spinal tap was performed between L4 and L5. Our results

are superior to those of Afane [6] who found the level of the puncture to be predominantly between L4 and L5 (58.19%). On the other hand, our results were lower than those of Afane [6] with regard to the level of puncture L3 - L4 (21.81%) and L5 - S1 (20%). The very high rate in our context was related to the fact that we were dealing with older children (8 - 15 years) with 75%. At this age the caudal end of the cord projects between L1 and L3. Puncture between L4 and L5 would avoid any damage to Adamkiewicz's artery, whose injury would lead to spinal ischaemia followed by permanent paraplegia according to Cook B [24]. The low rate of puncture level between L5 and S1 (3.3%) in our work was due to the fact that the youngest patient was 3 years old, so there were no infants or neonates in whom spinal puncture is usually done between L5 and S1.

The most commonly used drug for sedation was Ketamine 0.5 - 1 mg/kg. The dosage used here was in accordance with the literature Vivien B [25], in 35.5% of cases followed by Diazepam at a dosage of 0.2 mg/kg (50%) intravenously. During the surgical missions in Bangladesh in 2013 Aissaoui [10] used Ketamine at a dosage of 1 mg/kg in 6 patients for whom sedation with Midazolam alone was not sufficient. Kabaachi [18] administered Propofol continuously at a dosage of 0.3 - 0.5 mg/kg and as a single dose in 50% of patients. The dosage of Ketamine used in our context was similar to that of Aissaoui [10]. The use of Halothane in combination with Diazepam avoided reinjection of Ketamine. The intravenous route chosen in our series was linked to the concern for a rapid onset of action due to the high number of patients, especially during the pediatric surgery mission.

Eleven patients had had GA. Halothane was the most used general anaesthetic (82%) followed by Propofol (11.8%) and Sevoflurane (5.9%). Halothane was the most available and accessible volatile anaesthetic. The literature according to Giaufre E [26] recommends the application of EMLA anaesthetic cream 1 hour before for caudal and spinal anaesthesia in children, this cream was not available in our context.

Without the addition of Clonidine, the duration of the sensory block was between 60 and 150 minutes. The average duration was 106 ± 32.5 minutes with extremes of 90 and 190 minutes with the addition of Clonidine (0.5 µg/kg) (see **Table 3**). The duration of the surgery ranged from 35 to 185 minutes. For surgical procedures lasting longer than 90 minutes, especially in patients younger than 8 years, Clonidine was the adjuvant used. In a comparative study, Kabaachi [18] found a sensory block duration of 490 ± 35 minutes with Clonidine at a dosage of 2 µg/kg versus 200 ± 50 minutes without Clonidine. This difference is related to the fourfold higher dosage used in our study. It appears that Clonidine prolongs the duration of sensory block in both adults and children. Its administration at a dosage of 2 µg/kg could be the cause of hypotensive episodes, as was the case in the series by Kabaachi [18].

5. Complications

Only one patient (1.7%) had complications: hypotension, bradycardia, nausea and

dizziness. He was 11 years old and weighed 28 kg. The hypotension and bradycardia were related to a sympathetic block resulting in vasoplegia with associated dizziness, nausea and vomiting. Before the age of 8 years, there are no hemodynamic effects, which are more frequent in adults. In order to minimise hemodynamic effects, Clonidine was 15 µg (0.5 µg/kg), but according to the literature, intrathecal Clonidine in children is 1 to 2 µg/kg according to Cook B [24]. The same rate of arterial hypotension (1.5%) was found in a study conducted in Finland by Puncuh [27]. In Acharya's series [28] it represented 4.2% in children over 10 years of age. Arterial hypotension was the cause of cerebral hypoperfusion leading to dizziness and nausea. A bolus of 3 mg ephedrine, 0.2 mg atropine and oxygen resulted in a satisfactory outcome.

6. Conclusions

At the end of the study on the practice of spinal anaesthesia for paediatric surgery, the safety aspects were respected (anaesthesia consultation, adapted materials and drugs, available emergency materials and drugs, specialised personnel for the practice).

The practice was carried out more by the anaesthetic paramedics than the MARs. Only one size of spinal needle was used (25G) and only one type of local anaesthetic drug was used (Bupivacaine isobaric). It was performed alone, with sedation or with face mask GA.

Intra and postoperative complications were hypotension and digestive disorders.

Morbidity was low (1.7%) and mortality was zero.

Spinal anaesthesia was performed according to good practice but with shortcomings (few staff for the practice, no diversified spinal drugs, no diversified spinal needle).

Because of the low morbidity, it is necessary to promote its practice throughout the national territory for children's surgery.

The evolution was 100% favourable without death.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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