

# Perioperative Management of Circumcision in Children: Is there a Difference between African and European Hospitals?

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## Abstract

**Context:** The circumcision is the most frequent procedure in paediatric surgery worldwide, performed for medical and ritual purposes. In developing countries, because of the difficult accessibility to healthcare, even a common procedure could be unsafe. **Aims:** The aim of the article is to compare the perioperative and anaesthesiological management of circumcision in children between two Italian and two sub-Saharan African hospitals. **Materials and Methods:** Medical records of paediatric circumcision from January 2014 to December 2016 have been reviewed. The involved hospitals were: Padua (Italy), Ferrara (Italy), Sao José em Bor (Guinea Bissau) and Yaoundé (Cameroun). **Results:** In Padua, 77 circumcisions were performed, 19 of these (24.6%) were ritual. In 75 children (97.4%), locoregional anaesthesia (LRA) together with sedation was used; only one complication (1.3%) occurred. In Ferrara, 200 interventions were done, 140 (70%) ritual; general anaesthesia was administered to 183 (93.5%) patients. There were five complications (2.5%). In Bissau, 53 procedures were performed, 21 (39.6%) ritual; in 34 children (64.1%), LRA with sedation was preferred. Two complications (3.8%) were reported. In Yaoundé, 60 children were circumcised, 15 (25%) for ritual purposes; in 51 (85%), only LRA was performed; there was only one (1.7%) complication. In the African hospital, no post-operative analgesia was administered. **Conclusion:** Despite the different anaesthesiological techniques, the study shows no difference in rate of complications for the in-hospital setting. Training of the local medical team in pain management and post-operative care should be emphasised.

**Keywords:** Children, circumcision, developing countries, loco-regional anaesthesia

## INTRODUCTION

The circumcision is one of the most common surgical procedures in paediatric surgery worldwide. It can be performed for various reasons not only medical but also religious, cultural and social. Among the world population, one of three males is circumcised and the procedure is almost universal in West and Central Africa, among Muslim and Hebraic populations and in the United States.<sup>[1]</sup>

In literature, there is no clear evidence that supports the influence of training and setting on the outcomes of circumcision,<sup>[2]</sup> but it is reported that the main determinant of complications is poor hygiene during the practices.<sup>[3]</sup> However, in developing countries, accessibility to healthcare is still difficult and it is related to socioeconomic factors;<sup>[4]</sup> moreover, even the health service may sometimes not be able to provide the standard of care.

Peri-procedural and anaesthesiological management is deeply influenced by age-related differences in anatomy, physiology and drug-metabolism among. All these aspects may impact on the outcomes of surgical procedures.

The procedure is similar among different surgeons from different countries; therefore, it is easy to compare the clinical outcomes of different foreign centres.

The aim of the study is to compare the circumcisions' perioperative and anaesthesiological care in four centres belonging to different countries and with a different social setting. By reporting the anaesthesiological management and

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surgical and anaesthesiological-related rate of complications, this work aimed to assess the safety and feasibility of in-hospital anaesthesia for circumcision in low-income countries, especially focusing on the loco-regional techniques.

## MATERIALS AND METHODS

The study design is a retrospective multicentre case-series. We reviewed medical records of patients, aged 0–18 years, who underwent circumcision from 2014 to 2016 in the following centres: Padua University Hospital (Italy), Ferrara University Hospital (Italy), Sao José em Bor Pediatric Hospital (Guinea Bissau) and the Obstetric-Gynaecological Hospital of Yaoundé (Cameroun). We collected personal data, anaesthesiological management, time of intervention, length of hospital stay, rate of complications and other clinical aspects.

We considered as complication all the major adverse events reported in the charts according to the Clavien–Dindo classification.<sup>[5]</sup> We excluded all the cases of minor complications (Grade I) and the poor cosmetic results because of the shortness of the follow-up.

## RESULTS

A total of 390 circumcisions were performed, 195 (50%) for ritual purposes and the other 195 (50%) for medical reasons, i.e., phimosis and recurrent urinary tract infections.

One hundred ninety-seven patients (50.5%) underwent the procedure within 1 and 5 years of age, while only 38 patients (9.7%) were younger than 1 year at the time of surgery. 103 of 195 patients (52.8%) of patients who underwent circumcision for medical reasons were older than 5 years.

Body weight was more than 20 kg in 142 children (36.1%) and only 40 patients (10.2%) weighted <10 kg at the time of surgery.

The duration of the surgical procedure was available only for three centres and it took <45 min in 281 (84.3%) procedures.

The length of stay was <12 h in 290 patients (74.4%), while in only 17 (4.4%), the hospital stay was longer than 1 day. All the clinical data of the population are shown in Table 1.

The techniques of anaesthesia performed in the different hospitals are summarised in Table 2. The medications administered during the hospital stay are shown in Tables 3 and 4.

The overall rate of complications was 2.3% (9/390), both for surgical or anaesthesiological reasons; fortunately, only one case was Grade III according to Clavien–Dindo classification, while the others were Grade II.

In the following subheadings, the single-hospital results are reported.

### Padua university hospital (Italy)

Seventy-seven circumcisions were performed, 19 (24.7%) for ritual purposes. The mean age in the group for medical reasons

was 8 years, while children undergone ritual circumcision were 3-year-old on average.

The paediatric anaesthesiologists in Padua preferred loco-regional anaesthesia (LRA) together with sedation; the LRA consists in dorsal penile nerve block with levobupivacaine, basing its dose and concentration on the weight and age of the patient. General anaesthesia using laryngeal mask airway (LMA) was only needed twice (2.6%).

For the pain management, acetaminophen was the leading drug together with tramadol if needed, during the intervention and after it. Topic antibiotic (gentamicin) was given to every patient.

We found only one complication (1.3%) and it was an infection of the surgical site.

### Ferrara university hospital (Italy)

Two hundred children underwent circumcision, 140 (70%) for ritual purposes. The mean age in the group for medical reasons was 8 years, while in the other, it was 3 years.

One hundred and eighty-seven (93.5%) general anaesthesias (GAs) were performed, 113 of these (56.5%) by tracheal intubation (TI) and 74 (37%) by LMA. In 88 children (44%), the GA was combined with LRA. Only in 13 cases (6.5%), the combination of sedation with LRA was used.

For the pain management during the surgical procedures, different drugs were given in combination: non-steroidal anti-inflammatory drugs, opioids and acetaminophen.

After the procedure, all the patients were given acetaminophen and topic antibiotic (gentamicin). It is remarkable that anti-haemorrhagic administration was needed in seven children because of pre-existing bleeding predisposition.

Five complications (2.5%) were experienced: one neuromuscular blockade, one bronchospasm, two cases of dyspnoea and one post-procedural bleeding, easily handled by compressive dressing and administration of tranexamic acid.

### Sao José em Bor pediatric hospital (Guinea Bissau)

Fifty-three circumcisions were performed, 21 (39.6%) for ritual purposes. The mean age in the group for medical reasons was 6 years, while in the other, it was 16 years.

The largest part of the procedures was shorter than 30 min.

In 34 children (64.1%), sedation with LRA was administered, while 16 patients (18.9%) were given only LRA. The LRA performed in this centre is a dorsal penile nerve block.

After the surgery, pain medications were given only if needed and the acetaminophen was the first choice.

Two complications (3.8%) were identified, but the causes remained unknown.

### Yaoundé gynaecological-obstetric hospital (Cameroun)

Sixty circumcisions were performed, 15 (25%) for ritual purposes. The mean age in the group for medical reasons was 2 years, while in the other, it was 4 years.

**Table 1: Clinical data of the population**

Clinical variables	Padua	Ferrara	Sao José em Bor	Yaoundé
Age (years)				
<1	6 (4) 7.8%	3 (2) 1.5%	3 (0) 5.7%	26 (4) 43.3%
1- 5	24 (11) 31.2%	130 (115) 65.0%	16 (0) 30.2%	27 (7) 43.3%
>5	47 (4) 61.0%	67 (23) 33.5%	34 (21) 64.2%	7 (4) 11.7%
Body weight (kg)				
<10	4 (3) 5.2%	3 (3) 1.5%	8 (3) 15.1%	25 (4) 41.7%
10- 20	24 (11) 31.2%	124 (110) 62.0%	32 (13) 60.4%	28 (9) 46.7%
>20	49 (5) 63.6%	73 (27) 36.5%	13 (5) 24.5%	7 (2) 11.7%
Duration (min)				
<30	19 (6) 24.7%	49 (22) 24.5%	34 (12) 64.2%	Unknown
30- 45	42 (9) 54.5%	119 (114) 59.5%	18 (9) 34.0%	Unknown
>45	16 (4) 20.8%	32 (4) 16.0%	1 (0) 1.9%	Unknown
Length of stay (h)				
<12	71 (19) 92.2%	139 (99) 69.5%	22 (11) 41.5%	58 (13) 96.7%
12- 24	3 (0) 3.9%	57 (39) 28.5%	22 (9) 41.5%	1 (1) 1.7%
>24	3 (0) 3.9%	4 (2) 2.0%	9 (1) 17.0%	1 (1) 1.7%

() number of ritual circumcisions

**Table 2: Techniques of anaesthesia**

Techniques	Padua	Ferrara	Sao José em Bor	Yaoundé
LRA	-	-	10 (2) 18.9%	51 (12) 85.0%
GA (TI)	-	60 (38) 30.0%	1 (0) 1.9%	9 (3) 15.0%
LRA + sed	75 (19) 97.4%	13 (10) 6.5%	36 (17) 67.9%	-
LRA + GA (TI)	-	53 (43) 26.5%	6 (2) 11.3%	-
GA (LMA)	2 (0) 2.6%	39 (27) 19.5%	-	-
LRA + GA (LMA)	-	35 (22) 17.5%	-	-

() number of ritual circumcisions. LRA: Loco-regional anaesthesia, GA: General anaesthetics, TI: Tracheal intubation

**Table 3: Perioperative medications**

Medications	Padua	Ferrara	Sao José em Bor	Yaoundé
NSAIDs	-	161 (111) 80.5%	8 (5) 15.1%	-
Opioids	-	164 (113) 82.0%	17 (10) 32.1%	-
Acetaminophen	77 (19) 100%	36 (24) 18.0%	23 (2) 43.4%	-
Corticosteroids	-	55 (45) 27.5%	-	-
None	-	3 (3) 1.5%	5 (4) 9.4%	60 (15) 100%

() number of ritual circumcisions. NSAIDs: Non-steroidal anti-inflammatory drugs

**Table 4: Post-operative medications**

Medications	Padua	Ferrara	Sao José em Bor	Yaoundé
Acetaminophen	77 (19)	200 (140) 100%	-	-
NSAIDs	14 (4)	-	-	-
Opioids	18 (7)	-	-	-
Oral AB	-	2 (1) 1.0%	-	-
Topic AB	77 (19)	200 (140) 100%	-	-
Anti-acid	-	1 (1) 0.5%	-	-
Anti-haemorrhagic	-	7 (1) 3.5%	-	-
BDZ	-	10 (4) 5.0%	-	-
None	-	-	53 (21) 100%	60 (15) 100%

() number of ritual circumcisions. NSAIDs: Non-steroidal anti-inflammatory drugs, BDZ: Benzodiazepines

No pain medications were given during and after the intervention; in 51 children (85%), only the LRA was used and nine patients (15%) required IT.

One (1.7%) complication was described. It was a urethral fistula and re-intervention was needed.

## DISCUSSION

Circumcision is one of the most common surgical procedures among infants and even neonates; it is worth to mention that one in three males is circumcised worldwide, reaching 76.3% in Muslim areas.<sup>[6]</sup> Despite the global spread of this intervention, it is not free from adverse events and their rate could be 8.1% in developing countries.<sup>[3]</sup>

In the populations of the study, there was no difference of complications related to the anaesthesia or to surgery itself; the number of procedures performed in Padua, Bissau and Yaoundé is similar.

The rate of ritual circumcisions performed in Ferrara is consistently higher, according to the different social environment of the children in its area of responsibility. The number of ritual procedures in the African hospital is surprisingly low despite the wide diffusion of the circumcision among the population. According to a recent survey,<sup>[7]</sup> 59% of the interventions were performed by informal providers, especially the infants of the lowest income households and the children who live far from the health facilities. This choice may be due by socioeconomic reasons, as previously mentioned. The costs for the procedures seemed not to be the main reason for this preference, regarding the fact that even informal providers require a compensation and sometimes the payment could be an in-kind contribution.<sup>[7]</sup> The authors speculated that the lack in medical training could raise the rate and the severity of complications, even if a large cohort found no differences between formal and informal procedures (9.8% vs. 7.2%), whereas poor hygiene was the major determinant for the occurrence of adverse events.<sup>[3]</sup> However, another article showed that most of the families, facing a morbidity related to informal circumcision, searched for healthcare in an informal facility; it should be considered as a potential bias for the collection and the reporting of data.<sup>[7]</sup>

The age at surgery, consequently the body weight, for ritual circumcision is different. Padua and Ferrara share the same mean age, according to the guidelines of the main society of the western countries<sup>[8]</sup> to improve the safety of the procedure and to minimise the risks related to the anaesthesia. Preclinical data confirmed potential side effects of GA drugs on the immature brain,<sup>[9]</sup> and a multicentre international *in vivo* study showed that <1 h of GA in infancy could not influence the neurodevelopment.<sup>[10]</sup> Therefore, the FDA suggested delaying elective surgery in children younger than 3 years.<sup>[11]</sup> In Guinea Bissau, the age is sensibly higher because of the traditions of the country where the circumcision is considered as a rite of passage to adulthood.

Even if our series presented a wide range of age, environmental factors may determine substantial differences in body composition among the population of our study and children's body weight was reported considering its potential impact on the choice of anaesthesiological devices and for drug doses.

In these African hospitals, circumcision for medical purposes is performed at a younger age than Italian facilities. Possible reasons are the incidence of early infective complications and the prevention of infectious diseases.<sup>[12]</sup>

Moreover, in developing countries, a successful conservative treatment for phimosis or not retractable foreskin which could avoid the intervention in 35% of cases<sup>[13]</sup> is difficult to pursue because of the shortage of resources and the lack of compliance. Furthermore, circumcision is sometimes associated to other surgical procedures to spare time and assets.

Ambulatory procedures are considered extremely painful if the pain is under-treated; regional anaesthesia is safe and it could minimise morbidity after ambulatory interventions. In Padua, the LRA is the first choice together with a sedation; a huge expertise is required to be effective and safe with LRA, as it could reduce the amount of GA performed, according to the recent evidence in literature.<sup>[12,14]</sup> It requires an optimal patient selection and high-skilled training in handling paediatric airways;<sup>[15]</sup> in case of unsuccessful LRA or complication, the protocol at Padua University Hospital includes the use of LMA as a safe option. The same management is followed in the hospital in Guinea Bissau because of the strong partnership with the team from Padua. It is relevant to quote that LRA is spread in other sub-Saharan countries.<sup>[16]</sup> In Yaoundé, LRA is administered without sedation or GA if the circumcision is the only procedure during surgery. In literature, this approach is discouraged because it could increase complications of regional anaesthesia, children stress and anxiety among the parents.<sup>[17]</sup> Nevertheless, this could be a way to decrease the costs and to minimise the risk of adverse events due to GA or airway management.

The choice of the different anaesthesiological techniques mainly relied on the expertise of the medical teams. In Padua, LRA was preferred for two main reasons: the creation of a paediatric-dedicated anaesthesiological team and the long experience in training with this technique. Consequently, as previously mentioned, the same protocols were transferred to the Bissau's team. In contrast, in Ferrara, there are no anaesthesiologists that exclusively work with children and the preference of the technique is left to the single. Finally, the similar situation was described in Yaoundé. To date, in low-income settings, the paucity of drugs, devices and well-trained medical personnel could play a major role in the choice of the techniques of anaesthesia.

The overall rate of complications of the four hospitals is comparable and it is similar to the rate described in literature, which reports a median frequency of 1.5%.<sup>[18]</sup> Due to the sample size, it is not possible to establish if the medical circumcision

is more at risk of complications than the ritual procedure. Only one patient in Cameroun needed a re-intervention as far as we know. Some cases of adverse events due to anaesthesia were described in Ferrara that lengthened the post-operative observation without severe consequences; all these patients underwent GA with oral intubation.

Further multicentre studies, confronting the management for common procedures, should be promoted, even among different continents. This could increase the skills and the expertise of local medical personnel.

Despite its originality, the limitations of the study are the retrospective design, the low number of patients and the difficulty of to collect clinical data in developing countries, especially for what concerns follow-up updates. Ideally, it is worth strengthening the collaboration with developing countries' hospitals to gather data and standardise the ambulatory surgery to minimise costs and risk of complications.

## CONCLUSION

The epidemiology of the population that undergoes circumcision is influenced by medical, cultural and social aspects. Despite the completely different environments, circumcision is safely feasible in developing countries, even when performed under different anaesthiological techniques, but the absence of sedation should be discouraged. A strong partnership among western countries and developing countries is advisable to train medical teams in standardising the procedures and in taking care the patients in the postoperative. Once again, the study emphasises the importance of in-hospital circumcision to improve pain management and to decrease the rate of complications.

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## Conflicts of interest

There are no conflicts of interest.

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