

Plastibell circumcision: Comparison between neonates and infants

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Abstract

Background: The Plastibell circumcision technique has gained popularity worldwide. It has a low bleeding risk which makes it suitable for a vulnerable population and in late circumcision. However, several problems resulting from prolonged retention of the Plastibell ring were reported.

Objectives: The objectives of this study were to assess the outcomes of circumcision performed using Plastibell devices, report ring-related complications, and compare the complications of the technique between neonates and infants.

Methods: This was a retrospective cohort study that was conducted in a total of 989 male neonates and infants who had Plastibell circumcision performed by a single surgeon between June 2006 and February 2018. Postoperative complications were reported and compared between the two age groups. The indications of the Plastibell technique were religious in 988 patients and urinary tract infection in 1 patient.

Results: During the study period, Plastibell circumcision was performed in 633 neonates and 356 infants. The average ages of neonates and infants were 14 ± 2 days and 3 ± 0.5 months, respectively. Complications developed in 89 cases, 4.4% in neonates and 17% in infants ($P < 0.001$). The retained ring was the most common complication in 46 cases (4.6%), followed by excess skin in 21 cases (2%). Bleeding occurred in 10 cases (1%), infection in 7 cases (0.7%), and hematoma in 2 cases (0.2%).

Conclusion: Complications of Plastibell circumcision are significantly higher in infants than in neonates, and ring retention is the most common complication in both the groups. However, the risk of severe hemorrhage is low making it a good option for infants in the outpatient setting.

Keywords: Circumcision, complications, Plastibell

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INTRODUCTION

Male circumcision is widely performed worldwide for religious, cultural, social, and medical purposes. In Islamic countries, the religious purpose is the leading indication

of circumcision with a smaller percentage of cases which are performed for medical indications such as paraphimosis, phimosis, recurrent urinary tract infections, and balanoposthitis.^[1]

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Several circumcision techniques were described such as Gomco clamp, Plastibell,^[2] bone cutter method, Mogen clamp, dorsal slit (open cut) method,^[3] and PrePex device.^[4] Beyond these methods, the Plastibell circumcision device is a clear plastic ring with different sizes and handle intended for male circumcision. The ring, which comes in different sizes, has a deep furrow running circumferentially. Although it is a simple technique, it has several precautions including the use of adequately sized bells, tightly securing the ligatures, and close postoperative follow-up which are necessary to decrease the development of postoperative complications.^[5] Plastibell circumcision was first reported in 1956;^[6] currently, it became a popular tool for circumcision in neonates and infants.^[7] Ring circumcision had the advantage of lower risk of bleeding compared to the conventional circumcision which makes it more suitable for circumcision in bleeding vulnerable and late-presenting patients.^[8] However, it bears the risk of complications, especially ring-related complications. The Plastibell circumcision technique yielded good outcomes, and the risk of complication varied in the published literature.^[7]

The objectives of this study were to assess the outcomes of circumcision performed using Plastibell devices, report ring-related complications, and compare the complications of the technique between neonates and infants.

METHODS

Study design

This is a retrospective cohort study, in which a total of 989 male neonates and infants who had Plastibell circumcision between June 2007 and February 2018 were included in this study. The study was approved by the Institutional Biomedical Ethical Committee, Faculty of Medicine, Umm Al Qura University, with application number (159) on March 2014, and the parents' consent to retain data and use them for research purpose was obtained at the time of the procedure. The research was conducted according to the principles of the World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects."

Patients

The study participants were divided into two groups according to their age: early circumcision group (neonates, $n = 633$) who had circumcision from 0 to 1 month and a late circumcision group (infants, $n = 356$) who had circumcision from 2 to 6 months of age. Preprocedural and procedural data included child age, weight, indications of circumcision, mode of anesthesia, Plastibell size, and the time required for the device to falloff. Postoperative procedure-related

complications were reported and compared between neonates and infants.

Operative technique

The technique was done under local anesthesia using 2.5% lidocaine plus 2.5% prilocaine cream. Patients were positioned in the supine position and restrained by circumcision board. The prepuce was separated from the glans, and the foreskin in the dorsum was slapped at 12 O'clock for 10 s and split until corona was evident. The foreskin was carefully freed from the original glans, which was adjusted with a suitable size of Plastibell™ tool; sizes between 1.2 and 1.7 cm were utilized. The site was examined carefully for meatal opening, the presence of any bleeding, and correct positioning of the ligature. All the patients were discharged the same day, and the device care instructions were given to the parents who were asked to return to the clinic if bell separation surpassed 7 days.

Statistical analysis

Statistical analyses were performed using SPSS 11.5 software (IBM Corporation, Chicago, IL, USA). Continuous variables were presented as mean \pm standard deviation and compared using *t*-test. Categorical variables were presented as number and percentage and compared with the Chi-squared test or Fisher's exact test if the expected frequency is <5 . Patients were grouped according to their age into neonates and infants. $P < 0.05$ was considered statistically significant.

RESULTS

In the period from June 2006 to February 2018, a total of 989 patients had circumcisions. The mean age of the study population was 2.1 months, 356 (36%) were infants, and their mean age was 3.2 ± 0.5 months, and 633 (64%) were neonates with a mean age of 14 ± 2 days. All the procedures were performed by a single surgeon and under local anesthesia. The most common Plastibell ring size used was 1.2 cm in neonates and 1.5 cm in infants with volumes degraded from 1.1 to 1.7 cm [Table 1].

The indications for circumcision were religious in 988 patients and urinary tract infection in 1 patient. Of the total 989 children subjected to circumcisions, the efficacious rate of Plastibell circumcision was 91% ($n = 900$) with

Table 1: Age, weight, and size of the Plastibell compared between neonates and infants

	Neonates ($n=633$)	Infants ($n=356$)	<i>P</i>
Age (months)	0.467 \pm 0.067	3.2 \pm 0.5	<0.001
Weight (kg)	3.05 \pm 0.2	5.43 \pm 0.15	<0.001
Size of the Plastibell	1.2 \pm 0.02	1.5 \pm 0.1	<0.001

Continuous data are presented as mean \pm SD. SD: Standard deviation

no complications reported postoperatively. The average time for the device to fall off was 6.5 days. Minor complications were reported in 89 children (9%). In neonates, complications occurred in 28 patients (4.4%). The most commonly reported complication was retained Plastibell ring ($n = 13$; 2%) [Figures 1 and 2]. In infants, 61 patients (17%) developed complications; the most common was retained ring in 33 (9.3%) patients. Retained ring occurred more significantly in infants ($P < 0.001$).

The retained ring caused constriction of the glans penis and swelling of the tip of the penis and had to be detached by umbilical cord clamp cutter/ring cutter 1 week postcircumcision even if the skin was not completely separated [Figure 3].

Other observed complications included localized superficial infection occurred in seven children, three neonates and four infants [Table 2], and bleeding was recorded in ten cases, two neonates and eight infants. The overall complications of bleeding, hematoma, retained ring, proximal migration of the ring, and ischemia were higher ($P < 0.001$) in infants compared to the neonates.

DISCUSSION

Circumcision is the most common pediatric surgical procedure with an estimated incidence of 1:3 males worldwide.^[9] The most common indications of male circumcision are religious and social reasons, and almost all the native Saudis are circumcised.^[1] Potential benefits of circumcision were reported and include treatment of phimosis, reduction of urinary tract infection, sexually transmitted diseases, and risk of cancer to the female partner; however, it bears the potential risk of bleeding and infection, and it is currently not routinely recommended by some Western societies.^[10,11] Complications are associated with all circumcision techniques, and the complication rate of the operation ranges between 0.19% and 3.1%.^[12]

The Plastibell method gained wide acceptability globally,^[13] and the recorded complication rate with this tool was estimated to be 2%–3% with a very wide range of severity.^[13,14] The Plastibell method can be performed under local anesthesia.^[15] In Saudi Arabia, most of the circumcisions are done as an outpatient procedure or in the nursery for newborn infants. In our series, all patients had Plastibell circumcision under local anesthesia. The two most common complications were stuck off the ring [Figure 2] and bleeding. Other reported complications include dysuria, incomplete separation of Plastibell device [Figure 1], bell impaction, inadequate skin removal, excessive loss of skin, and proximal migration of the ring.^[16]



Figure 1: A case of Plastibell circumcision with partial retention of the ring



Figure 2: A case of Plastibell circumcision with complete retention of the ring



Figure 3: A case of Plastibell circumcision after the complete separation of the ring

In our study, ten (1%) patients had postcircumcision bleeding which occurred mainly in the infant group ($n = 8$; 2.2%). All

Table 2: Comparison of the Plastibell complications between neonates and infants. Categorical data are presented as number and percent

	Neonates (n=633), n (%)	Infants (n=356), n (%)	P	Total (n=989)
Retained ring	13 (2.05)	33 (9.2)	<0.001	46 (4.6)
Bleeding	2 (0.3)	8 (2.25)	0.006 (exact test)	10 (1)
Excess skin	9 (1.4)	12 (3.37)	0.04	21 (2.1)
Infection	3 (0.5)	4 (1.12)	0.25 (exact test)	7 (0.7)
Urine retention	1 (0.2)	1 (0.3)	>0.99 (exact test)	2 (0.2)
Ischemia	0 (0)	1 (0.3)	0.37 (exact test)	1 (0.1)
Hematoma	0	2 (0.5)	0.13 (exact test)	2 (0.2)
Total complication	28 (4.4)	61 (17)	<0.001	89 (9)

bleeding cases were managed conservatively, and no patient required conversion to the conventional circumcision under general anesthesia. Bleeding is usually simple, and it comes from the mucosal layer or more common from the frenulum area. It can be managed by different simple techniques, but the most important is to observe the baby for 15 min after the procedure, and if bleeding continues, strip of ribbon gauze or KALTOSTAT® (Alginate Calcium Sodium Dressing) 1 cm wide and 1–2 cm long can be applied beneath the Plastibell ring and the dorsal part of the glans through dissecting forceps. The gauze pushes the ventral part of the glans against the ring and compresses the frenular vessels.^[17]

In this study, the Plastibell ring was stuck in 46 cases (4.6%) which occurred mainly in infants ($n = 33$; 9%) and was removed manually. Ring retention near the glands was the most common complication in this study and has been recognized by others.^[18] After neonatal circumcision, the proximal movement of the Plastibell ring can cause abrasion to the phallus, which may require a cosmetic operation. In the major case reports, only 3/2000 (0.015%) patients gained complications with device slippage.^[19,20] The retained or proximal migration of the Plastibell ring can result from the extreme strain on the foreskin during Plastibell device engagement and in case of selection of a smaller rather than a larger Plastibell device.^[21] All serious complications from this technique happened with chronic compression of the plastic ring on the pineal gland or shaft causing pressure necrosis and fistula formation. It is better to bring the baby in 1 week after circumcision for examination, and the ring must be removed at the 1-week time even if the skin was not completely separated.

Several studies demonstrated that circumcision in infancy is better than in childhood or later in life, and conveys minimal risks of complications, whereas surgical complications in infants represent only 0.2%–0.6% as recorded by many authors.^[22,23] This value may become higher and reached 2%–10% in older and smaller studies.^[24] For infants who require circumcision, the incidence of bleeding is higher mainly due to increase in the activity of the child which may

disturb the circumcision wound, and Plastibell circumcision becomes a handy technique to decrease the chance of bleeding with good cosmetic result. It was observed in this study that neonates had a less overall complication (4.4%), especially with bleeding (0.3%) and retained ring (2%) compared to infants (17%, 2.2%, and 9.2%, respectively).

The age of infants constitutes a “window of opportunity” for performing the circumcision; for many reasons, it is usually accompanied by lower costs and low rate of complications in this age group. In addition, the infants at this age have less mobility; therefore, it is easy to apply local anesthetics. The technique is simple and wound healing is rapid; additionally, the cosmetic results are excellent, and cost-effectiveness is satisfactory.^[25]

It is very important to be done by a surgeon or a trained practitioner with adequate parental education about the technique and the expectations. Careful selection for appropriate Plastibell size and strict removal of the ring after 1 week may prevent serious complications due to proximal migration of the ring.

CONCLUSION

Plastibell circumcision is a simple, safe, satisfactory, and easily learned technique for infant circumcision, provided that the correct device size is selected, and the ligature is secured tightly. Although the rate of circumcision complications using the Plastibell is markedly higher in infants in contrast to neonates, it is still a good option for infant circumcisions in the outpatient setting because of the meager complication rate, especially postoperative bleeding.

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Conflicts of interest

There are no conflicts of interest.

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