

Proximal Migration of Plastibell Ring in Appropriate-Size Plastibell Circumcision vs One-Size-Smaller Plastibell Circumcision

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ABSTRACT

Background: Circumcision is one of the oldest and most extensively executed surgeries worldwide, with Plastibell being the most common technique, though not without controversies. **Objective:** This study aims to see the impact of the size of the Plastibell in proximal migration of the ring, performed with an appropriate-size Plastibell device versus a one-size-smaller Plastibell device. **Study Design:** Prospective comparative study. **Settings:** Surgery and Urology Departments of Fauji Foundation Hospital, Lahore Pakistan. **Duration:** 11 months (February 2024 to December 2024). **Methods:** Male neonates and infants up to 6 months were enrolled and divided into two groups: Group A with appropriate-size Plastibell circumcision and Group B with one-size-smaller Plastibell circumcision. Patients were followed up for 1 week. Data were analyzed using SPSS v23, with significance at $p < 0.05$. **Results:** Out of 209 patients, proximal bell migration occurred in 12 cases – 10 in the appropriate-size group and 2 in the smaller-size group. Bleeding occurred in 6 cases – 4 in the appropriate-size group and 2 in the smaller group. Bell separation took longer in the one-size-smaller group. **Conclusion:** This study demonstrates that a one-size-smaller Plastibell device is safer compared to an appropriately sized Plastibell device regarding bell impaction.

Keywords: Plastibell circumcision, Proximal migration, Bleeding.

INTRODUCTION

Circumcision has been performed for thousands of years for various cultural, religious, and medical reasons and remains one of the most common surgical procedures worldwide, particularly in neonatal and infant males.¹ It is also advocated to have its potential health benefits, including a reduced risk of urinary tract infections, penile cancer, and sexually transmitted infections, including HIV.² Circumcision is also claimed to lower the bacterial infection of vagina and cervix cancer risk in female partners.³ Despite its widespread practice, the procedure is not without controversies and potential complications, which necessitate a careful consideration of the methods and devices used.^{4,5}

The Plastibell is popular and extensively used since it is simple to use, safe, and takes little time to complete.^{6,7,8} A ring made of transparent plastic with a handle is the Plastibell gadget, and it is available in different sizes from 1.1 to 1.7cm. There is a deep groove around the perimeter

of the ring. The bundle comes with a nylon thread.⁹ It is an easy surgical procedure that typically takes one to two weeks to recover from in both newborns and young children. Despite its popularity, the Plastibell device is associated with several complications, like proximal migration of the ring and bleeding that commonly occurs.^{10,17} The size of the Plastibell device used significantly influences the risk of these complications, and it is crucial for ensuring the safety and effectiveness of the procedure. However, there is no universally accepted standard for selecting the size of a Plastibell, and many practitioners rely on experience or trial and error.^{11,12}

This comparison aims to provide a clearer understanding of the impact of Plastibell size on the incidence of complications, enabling us to suggest whether or not a one-size-smaller Plastibell should be used in comparison with an appropriately sized Plastibell.

METHODS

This study was a prospective comparative study enrolling male neonates and infants aged less than 6 months who presented for circumcision at the Surgery and Urology Department of Fauji Foundation Hospital, Lahore during February 2024 to December 2024 (11 months) after the approval from Institutional Ethical Review Committee with approval number FFH/STATE/FIL/20. Informed consent was taken from the parents of the children. Children with penile abnormalities like chordee, buried penis, hypospadias and those having family history of bleeding disorder were not included in this study. Participants were randomly assigned to two groups: Group A and Group B via a lottery method. In Group A, Circumcision in this group was performed using an appropriately sized Plastibell device. The size of the Plastibell was determined by measuring the circumference of the glans penis at the level of the glandular ridge with the help of paper tape. The diameter (D) of the glans was calculated using the formula $C = \pi D$, where C is the circumference. This calculation ensured that the diameter was an appropriate size, with D equaling C/π or $0.32C$.¹¹ Group B: Circumcision in this group was performed using a Plastibell device that is 0.1 cm smaller than the size determined by the same measurements and calculations used in Group A. This deliberate under-sizing aims to evaluate the impact of a one-size-smaller device on the proximal migration of the bell.

Procedure: For both groups, circumcision was performed under standardized aseptic conditions by experienced surgeons to minimize variability in technique. The steps of the procedure were as follows: The infant was placed in a supine position. The genital area was cleaned with an antiseptic solution, and sterile drapes were applied. Dorsal penile nerve block was given using 1ml of 1% lignocaine without adrenaline in an insulin syringe @ 11 o'clock and 1 o'clock positions and waited for 5 minutes. Two artery forceps were applied at 3 and 9 o'clock positions. Foreskin was retracted after dorsal skin slit @ 12 o'clock position and adhesions between foreskin and the glans were gently separated. Residual smegma was cleaned. The foreskin was drawn to the normal position. In Group A: The appropriately sized Plastibell device was inserted, as determined by the measured circumference and calculated diameter. In Group B: The Plastibell device, 0.1 cm smaller than the calculated size, was inserted. Straight artery forceps were applied over the Plastibell to secure it in position. A ligature was carefully tied around the foreskin at the Plastibell ring groove. The skin distal to the ligature was carefully excised after removing the handle of the Plastibell device.¹³ Patients were observed for 10 minutes to monitor bleeding incidents and discharged on paracetamol drops

according to weight for pain management, sitz bath to maintain cleanliness, and as an aid in healing, and polymyxin B ointment to prevent the circumcised area from infection. Patients were followed up after 1 week in the OPD. If the bell has not fallen, then it was removed with the help of a cutter. In case of bleeding, we removed the bell and controlled bleeding with U-stitch at the frenulum with Vicryl 5/0.¹⁴

RESULTS

During 12 12-month study period, a total of 209 cases were selected, and the sample size was determined by the convenience sampling method as implemented by West,¹⁸ which was divided into two groups: Group A (appropriately sized Plastibell) and Group B (one-size-smaller Plastibell).

In Group A, 112 cases (53.6%) were included. The mean age was 38.68 ± 31.31 days. The mean circumference of the glans in Group A was 3.70 ± 0.33 cm. The mean diameter of the glans was noted to be 1.20 ± 0.09 cm. In this group, for each case, a size-matched Plastibell was used. The mean bell detachment time since operation was 3.84 ± 1.32 days, as given in Table 1.

In Group B, 97 cases (46.4%) were recruited. The mean age was 33.93 ± 23.01 days. The mean circumference of the glans was 4.11 ± 0.28 cm. The mean diameter of the glans was 1.33 ± 0.084 cm. We used the smaller size Plastibell. The mean time bell detachment since operation was 5.63 ± 1.25 days as shown in Table 1.

Table 1: Parameters According to Plastibell Size

Parameter	Appropriate-size Plastibell	One-size smaller Plastibell
Age (days)	38.68 ± 31.31	33.93 ± 23.01
Circumference (cm)	3.70 ± 0.33	4.11 ± 0.28
Diameter (cm)	1.20 ± 0.09	1.33 ± 0.084
Bell Detachment Time (POD)	3.84 ± 1.32	5.63 ± 1.25

Overall complications were noted in 18 / 209 cases (8.61%), out of which bell impaction was noted in 12/209 cases (5.74%) and bleeding was noted in 6/209 cases (2.87%). Bell impaction was noted in 10/112 cases (8.9%) in Group A, whereas only 2/97 cases (2.06%) of bell impaction were recorded in Group B. A definite relationship was found between the size of the Plastibell and the bell impaction rate, which becomes significantly high in appropriate-size Plastibell (Group A) as demonstrated by the chi-square test ($p = 0.033$) as summarized in Table 2.

Bleeding was noted in 4/112 cases (3.57%) in Group A, whereas 2 cases (2.06%) were noted to have bleeding in Group B. The chi-square test showed no statistically

significant association between group size and bleeding ($p = 0.515$) given in Table 2.

Bell detachment time (POD) was noted 3.84 ± 1.32 days in an appropriate-size Plastibell, which was low compared to a one-size-smaller 5.63 ± 1.25 days, as shown in Table 2.

Table 2: Procedural Complications According to Plastibell Size

Complications	Appropriate-size Plastibell (n=112) (53.6%)	One-size smaller Plastibell (n=97) (46.4%)	P-Value	Total (n=209)
Proximal migration of bell	10 (8.92%)	2 (2.06%)	0.033	12 (5.74%)
Bleeding	4 (3.57%)	2 (2.06%)	0.515	6 (2.87%)

DISCUSSION

Circumcision is one of the most commonly performed surgical procedures.¹⁵ The Plastibell circumcision method is the preferred method nowadays worldwide.¹⁰ The present study was conducted on neonates and infants up to six months using a Plastibell. Several studies have been reported in the literature that performed Plastibell circumcision in neonates and infants.^{4,6,16}

The complications of Plastibell circumcision, with proximal migration of the bell as the primary outcome in our study. Patients were divided into two groups based on the size of the Plastibell, i.e. appropriate-size Plastibell (Group-A) and one-size-smaller Plastibell (Group-B). Post-operative bleeding and bell detachment time were also noted as additional complications.

The overall complication rate spanning both groups in this study was 5.74%, which is consistent with other research showing complication rates between 7.4%⁵ and 16%⁸ for Plastibell circumcisions.

Proximal migration of the bell when noted in the appropriate-size Plastibell group (Group A) was higher, i.e., 8.92%, than the proximal migration cases reported in one-size smaller Plastibell group (Group B), i.e., 2.06%, which is comparable to the study done by Bodige *et al.* (2023), which showed that proximal migration of the Plastibell ring occurred in 2.6% of cases.⁸ Moosa, F. A., Khan (2010) noted proximal migration of the bell in 6.1% of cases.⁵ This proximal migration of the Plastibell ring is associated with the wrong size Plastibell device, especially the large-sized Plastibell leads to proximal migration as the large-sized ring may slip over the glans.^{1,5}

In our study, 1.9% of cases showed bleeding, which is closer to the results of a study carried out by Bodige *et al.* (2023), who reported bleeding as a minor complication in 2.6% of cases.⁸ This suggests that Plastibell circumcision generally carries a low risk of bleeding.

Bell detachment time in the appropriate-size Plastibell group (Group-A) was 3.84 ± 1.32 days, which is significantly lower than the bell detachment time in the one-size-smaller Plastibell group (Group-B), i.e., 5.63 ± 1.25 days, comparable to other studies done by Ekwunife OH *et al.*, showing the mean day of fall of the bell 3.79 days where whereas Ahmed, Nisar *et al.* showed a day of fall of the bell 7.8 ± 3.04 days.^{11,12}

CONCLUSION

The results of this study advocate that the Plastibell circumcision technique is both safe and effective, especially when a one-size-smaller Plastibell is used due to a lower rate of proximal migration of the bell and subsequently a lower need for secondary intervention for removal of the impacted bell. Further studies should explore the long-term outcomes and effectiveness of this method in different age groups and populations.

LIMITATIONS

One of the limitations faced during research was those patients whose diameters were 1.1cm, as there is no Plastibell device of 1.0 size, so all patients having a diameter of 1.1cm could only be included in Group A with an appropriate size Plastibell group.

Another limitation was that the process of measuring the circumference of the glans was rather manual method, and due to the lack of any standardized method, inter-personal variation is expected.

SUGGESTIONS / RECOMMENDATIONS

One-size-smaller Plastibell is preferred to minimize proximal migration. Standardized glans measurement and larger multi-age studies are warranted to confirm safety and efficacy.

CONFLICT OF INTEREST / DISCLOSURE

The authors declare no conflicts of interest.

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