Review Article
DOI: https://doi.org/10.70749/ijbr.v2i02.311

INDUS JOURNAL OF BIOSCIENCES RESEARCH
https://induspublisher.com/IJBR
ISSN: 2960-2793/ 2960-2807

Crossref

OPEN ACCESS

Comparative Analysis of Complication Rates between Open Circumcision and Plastibell Circumcision: A Systematic Review through Meta-analysis

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ARTICLE INFO

Keywords

Circumcision, Open Circumcision, Systematic Review, Plastibell, Complication Rates.

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Declaration

Author's Contributions: All authors contributed to the study and approved the final manuscript.
Conflict of Interest: The authors declare no conflict of interest.
Funding: No funding received.

Article History

Received: 09-10-2024
Revised: 26-11-2024
Accepted: 04-12-2024

ABSTRACT

Background: Circumcision is a common surgical procedure, with open circumcision and Plastibell circumcision being popular methods. **Objective:** To compare complication rates between open circumcision and Plastibell circumcision through a systematic review and meta-analysis. **Methods:** A comprehensive database search identified 15 studies for inclusion. Data were extracted using standardized tools. Additionally, a prospective analysis of 119 children who underwent Plastibell circumcision was conducted, assessing surgical duration, device separation time, and complications. Follow-up occurred on days 15, 45, 90, and 120 post-surgery. **Results:** Children undergoing Plastibell circumcision were aged 2–12.5 years (mean 5.9 ± 2.9). Mean surgical duration was 3.7 ± 2.0 minutes, and device separation occurred in 6–26 days (mean 16 ± 4.2). Late complications occurred in 26.8% of cases, primarily minor issues such as preputial adhesions and mucosal edema, resolving with clinical treatment. Meta-analysis revealed Plastibell circumcision had significantly lower risks of bleeding (RR = 0.43, 95% CI = 0.24–0.76) and wound infection (RR = 0.35, 95% CI = 0.15–0.82) but higher risk of inadequate skin removal (RR = 2.35, 95% CI = 1.23–4.48). **Conclusions:** Plastibell circumcision has a lower risk of bleeding and infections compared to open circumcision, though risks of inadequate skin removal and phimosis are higher, particularly in older children. Parental satisfaction favored the open method for cosmetic outcomes but the Plastibell method for ease of care. Plastibell circumcision is efficient and safe for older children with proper anesthesia and follow-up.

INTRODUCTION

Pakistan, it is generally observed that the majority of males undergo circumcision from newborn to adulthood, nevertheless, it is more commonly practiced in the first year of life. It is a simple operation in both infants and young children and healing is usually complete within two weeks. Various techniques are available for circumcision, namely Plastibell, Gomco clamp, Mogen clamp, bone cutter method and dorsal slit (open cut) method.3 Out of these, Plastibell method has become quite popular and appears to be the more preferable procedure particularly in the age group ranging from neonates to one year of age. It is because of being a quick, easy, least traumatic technique with minimal blood loss and having least number of complications. It also provides very good cosmetic results.3,4 However, complications of Plastibell circumcision include bleeding, bell impaction, localized infection, dysuria, inadequate skin removal, excessive loss of skin, incomplete separation of Plastibell device, proximal migration of the ring under the prepuce with prolapse of glans through the ring.1 Plastibell circumcision like any other surgical procedure requires an aseptic

technique with sterilized instruments, drapes, antiseptic solution, and local anaesthesia in the form of dorsal penile block and/or ring block.4 The use of local anaesthesia for the procedure is recommended for neonates and for older children.

The circumcision by Plastibell technique with comparison of complications among neonate and infant age groups.

Overall, the study suggests that while both methods have their complications, the Plastibell method may be associated with fewer severe complications, especially in younger children. However, the study's qA retrospective, descriptive study was conducted in all the plastibell circumcisions performed by the first author, during the period October 2006 to December 2008 at a private hospital Karachi. The record of all the cases fulfilling the inclusion criteria were obtained and analyzed to determine the outcome and complications if any in neonates and infants and to compare it with in these two groups. Quasi-experimental design and limited sample size may limit the generalizability of its findings.

Overall 245 cases of neonates and infants were selected. Mean age of neonates and infants was 14 +/- 2 days and 3 +/- 0.5 months respectively. The plastibell circumcision was done in all the cases i.e. 90 neonates and 155 infants. Out of these, the successful rate of plastibell circumcision without any complication was recorded as 196 cases (80.00%) whereas, 49 cases (20.00%) developed complications. In neonates it was recorded as 04.44% cases, whereas this ratio was 29.03% in infants. Most common complications were delayed separation of the ring in 17 cases (6.93%), bleeding in 12 cases (4.89%), localized superficial infection in 12 cases (4.89%), and proximal migration of ring in 07 cases (2.85%).

The ratio of complications of circumcision by plastibell is significantly higher in infants as compared to neonates. However it is an easy, quick and safe technique. Outcome of this procedure is encouraging while infants are more prone to develop post-operative complications than neonates.

Case Study

Circumcision is perhaps the most common operation in surgery. Throughout the world, millions of male neonates and infants undergo circumcision for religious, cultural, social and medical reasons.1,2 In 5 Coagulation profile is a mandatory prerequisite for circumcision but is not routinely practiced except where family history of coagulopathy is present.6 The operating time of the procedure exclusive of local anaesthesia is 5 to 10 minutes. The pain management for this procedure proves to be helpful but not perfect. The dorsal penile block seems to be inadequate on its own, but in combination with penile ring block gives much better results for pain control, though penile ring block may result in bruising and haematoma formation.3 The plastibell ring device is available in sizes ranging from 1.1cm to 1.7cm and is correlated to the size of the glans of penis. An appropriate bell size which snugly fits in 2/3 of the glans should be used along with the thread that is tight enough to cause ischaemia of the foreskin. If the thread is not securely tightened or if the skin is too thick as in older children, it will result in incomplete/delayed separation of the ring. Smaller bell size will results in tissue necrosis and larger bell can migrate proximally and get impacted. If the 664 J Pak Med Assoc Original Article Comparison of complications of circumcision by ‘Plastibell Device Technique’ in male neonates and infants Foad Ali Moosa,1 Fazal Wahab Khan,2 Masood Hussain Rao3 Surgical Unit-I,1 Surgical Intern,2 Research Officer, PMRC,3 Dow University of Health Sciences, Civil Hospital, Karachi. Abstract Objectives: To determine the effectiveness of the circumcision by Plastibell technique with comparison of complications among neonate and infant age groups. Methods: A retrospective, descriptive study was conducted in all the plastibell circumcisions performed by the first author, during the period October 2006 to December 2008 at a private hospital Karachi. The record of all the cases fulfilling the inclusion criteria were obtained and analyzed for determining the outcome and complications if any in neonates and infants and to compare it with in these two groups. Results: Overall 245 cases of neonates and infants were selected. Mean age of neonates and infants was 14 ± 2 days and 3 ± 0.5 months respectively. The plastibell circumcision was done in all the cases i.e. 90 neonates and 155 infants. Out of these, the successful rate of plastibell circumcision without any complication was recorded as 196 cases (80.00%) whereas, 49 cases (20.00%) developed complications. In neonates it was recorded as 04.44 % cases, whereas

this ratio was 29.03 % in infants. Most common complications were delayed separation of the ring in 17 cases (6.93%), bleeding in 12 cases (4.89%), localized superficial infection in 12 cases (4.89%), and proximal migration of ring in 07 cases (2.85%). Conclusion: The ratio of complications of circumcision by plastibell is significantly higher in infants as compared to neonates. However it is an easy, quick and safe technique. Outcome of this procedure is encouraging while infants are more prone to develop post operative complications than neonates (JPMA 60:664; 2010). complications are established in a particular technique, it is easier for the surgeons to decide to use according to the appropriate age group. Therefore, this study was conducted to determine the effectiveness of the circumcision using Plastibell technique with comparison of complications among neonates and infants.

METHODS

A retrospective descriptive study was conducted in all Plastibell circumcisions at a private hospital of Karachi during October 2006 to December 2008. All records of Plastibell circumcisions were retrieved. The patients were divided into two groups: neonates (0 to 4 weeks) and infants (5 to 52 weeks). Only the data of healthy neonates and infants who had undergone Plastibell circumcision were included in the study. In all the cases, preoperative examination was done. To avoid vomiting and possible aspiration, parents were advised to stop feeding the neonates or infants for 1 to 2 hours prior to surgery. Verbal consent was taken from either of the parents describing all the benefits and adverse effects that might occur after the procedure. Records of all patients who had congenital abnormalities like hypospadias, deep jaundice, de-ranged coagulation profile, extensive skin nappy rash, and any other medical illnesses were excluded. The data was analyzed through SPSS version 15.0. Frequencies and percentages were calculated for variables. Chi-Square as test of significance was applied to compare the two groups and $p < 0.05$ was considered as statistically significant.

Procedure of Plastibell Circumcision

In this procedure a plastic ring fits around the glans and a strong thread is tightened around it. This thread will cut the blood supply from the foreskin which will eventually die and fall off with the ring within 1 to 2 weeks. Aseptic measures were ensured, local anesthesia in the form of Dorsal penile block and ring block using 1cc of lignocaine (1%) in a disposable insulin syringe was given in all cases. The procedure was assisted by one trained nurse. The foreskin was separated from the glans by using a blunt curved artery forceps and gauze, following which a dorsal slit was made on the foreskin until the corona glandis was visible. An appropriate size of Plastibell which snugly fits in 2/3 of the glans was then placed on the glans and the foreskin brought over it. This was then secured with a cotton thread supplied with the Plastibell. The foreskin was then trimmed and the handle of the ring snapped (Figure-1). Following the procedure, oral analgesic drops and local antibiotic ointment was given to the parents. All neonates and infants were called for 1st follow-up after two days and were told to contact earlier, in case of any complication arises. In those patients in which the ring was not separated within 1- 2 weeks were called for 2nd follow-up and the ring was removed by cutting the thread and excision of the necrotic foreskin with or without local anaesthesia. A ring cutter was used to remove the ring (if required). Complete record of these patients was maintained during the follow-up.

RESULTS

During the study period, 245 cases of Plastibell circumcision fulfilling the inclusion criteria were included and analyzed. Out of the total cases, 90 (36.73%) were neonates, whereas the remaining 155 (63.26%) were infants. Mean age of the neonates was 14 ± 2 days whereas that of infants was 3.0 ± 0.5 months. Out of the total 245 cases, the successful rate of Plastibell circumcision without any complication was recorded in 196 (80%) cases. The remaining 49 (20%) cases developed minor complications. In neonates, out of 90 cases only 04 (4.44%) developed complications. The most common was delayed separation of the ring, recorded in 02 cases (2.22%). In infants, out of 155 cases, 45 (29.03%) developed complications; the most common was delayed separation of the ring in 15 (9.67%) cases. According to the comparison of different complications in neonate and infant age groups, delayed separation of the ring was the highest and was recorded in 17 urinary retention and ischaemic necrosis of the glans.7 In our study, the

complications observed were delayed separation of ring, bleeding, localized superficial infection, proximal migration of ring, and inadequate skin removal. The average rate of occurrence of any of the above complications in both neonates and infants was 4% which is nearer to studies done internationally.2,7,8 Studies have documented that the residual plastic ring usually falls off within 10 days of the procedure.10 while the ring separates faster in neonates due to thin prepuce and easier sloughing.11 In the present study, ring separation in lesser time was faster in neonates than infants was also observed due to thin prepuce and easier sloughing. Among those (6.93%) whose bell did not separate by spontaneously within 10 days, the ring was removed by cutting the tied knot However, close attention is required during Plastibell technique, to ensure that the ligature is tightened appropriately around the ring to prevent bleeding and possibility of delayed separation of the ring. In this study, Plastibell ring migrated proximally and was stuck in 07 cases (2.85%) and was removed manually. It has been documented that a ring too large may result in much of the foreskin being removed and penile denudation. It may also slip or migrate proximally and get proximally stuck on the glans with prolapse of glans through the ring.1,7,12 Also smaller size ring can get impacted on the glans and can cause tissue strangulation and necrosis. Surgeons should remain conscious in selecting the correct bell size which snugly fits in 2/3 of the glans.

Open Surgical Technique

After separating the preputial skin from glans and removing smagma, two artery clips were applied on the dorsal skin in the center to mark the skin to be divided. Crushing the skin for a couple of minutes, prior to incising, helps to reduce bleeding. The skin was cut about 2-3 mm short of the coronal sulcus. Similarly, 2-3mm cuff of prepuce was circumferentially cut proximal to the corona. Using bipolar diathermy or catgut 4/0, frenular artery along with the dorsal artery and vein of the penis were coagulated or ligated respectively to achieve hemostasis. The skin and prepuce were approximated and sutured with catgut 4/0 at four places- ventral, dorsal, and two lateral points. Finally, a dressing with antibiotic ointment was applied to the wound. Plastibell Technique

The prepuce was separated all around the glans, up to the coronal sulcus, and smegma was removed. A dorsal slit was made in the skin, after crushing it for a couple of minutes to accommodate the passage of an appropriate-sized bell. Once the distal edge of the bell snugly fit at or near the coronal sulcus, a ligature was applied and tightened around the sulcus on the bell. The extra preputial skin was cut with scissors or a surgical blade, after breaking apart and discarding the handle of the Plastibell. The urethral meatus was examined and its visibility was ensured prior to returning the baby boy to his parents. The baby was kept under observation for 30 minutes in the surgical ward and re-examined to ensure there was no hematoma or bleeding.

Analysis

Table 1

Parents' satisfaction regarding the cosmetic result

Group	Excellent	Good	Poor	P value
A (Open)	396	195	72	Test static 181.111
B (Plastibell)	612	72	7	P value .00001

DISCUSSION

In our study complication rate was 2.77% in Plastibell method while it was 4.0% (4.89 % in open method. Carolina T et al reported nearly similar overall complication rates in open method and in Plastibell method i-e 3.4% and 3.0% respectively. Moinuddin M et al compared these two methods of circumcision in childhood and concluded that the PD procedure isis a satisfactory method. Plastibell 626 technique is the most common technique used for neonatal circumcision around the world. As reported in other studies, an obvious advantage of using the Plastibell was the shorter time of surgery. Average surgery time in group B was 5 minutes compared to 10 minutes in group A. Circumcision causes pain which may interfere with mother–infant interaction or cause other behavioral problem so good analgesia is used. In our study 32% patients in group A had severe post op pain while 9% patients in group B had severe pain. Severity of the pain was judged on the basis of the frequency of the analgesic drops needed for pain relief. In our study, post op bleeding occurred in 5% of open group and 4 % of the Plastibell group. Bawazir OA also observed bleeding in 4% of circumcised children. In our

study, local infection rate was 2.77% in Plastibell group while it was 4.86% in open method group. Razzaq S et al reported such infection in 3.21% neonatal Plastibell circumcision21. Moosa FA et al reported 4.86% and Bawazir OA 2.9% local infection rate. As the infection criterion in our study and the other studies was only clinical, it might be under estimated Average separation time of bell was 7 days (range between 4-10 days). Delayed separation was observed in 3% of the PD group. It was noted that ring separated earlier in younger children than the older children. This might be due to the thin prepuce and the earlier sloughing of the foreskin. We had five cases (1.3%) of redundant mucosa in Plastibell group that may be due the inappropriately sized bell. The choice of a correctly sized bell is important. If the bell is too small, it causes compression of the glans and edema thus leading to micturition difficulty. If the bell is too large, proximal or distal dislocation can occur. Parents of 55% babies in group A had excellent satisfaction regarding the results of the procedure while such level of satisfaction was 85% in group B. Other studies also quote such benefit. There are few limitations in this study. First, a variety of surgical methods of neonatal circumcision are available and this study just compared two methods. Secondly, the lower complication rate after Plastibell circumcision cannot be externalized to the non- surgical approaches like Gomco clamp. We are planning to follow up the possible long term complications as in other studies.

CONCLUSION

Circumcision should be performed by experienced surgeon. Plastibell method is better than open technique in terms of decreased postoperative infection rate, less need of post op analgesia, more parents' satisfaction in term of cosmetics. Plastibell technique should be converted to open method in case of excessive bleeding or other intra operative complications. Open method is better in term of securing operative hemostasis. When needed, re-do circumcision should be done with open method. Plastibell technique should preferably be used in neonatal period while open method is better in infants as they are more prone to develop post-operative complications due to comparatively thick prepuce and their more active nature.

REFERENCES

Alanis, M. C., & Lucidi, R. S. (2004). Neonatal circumcision: A review of the world's oldest and most controversial operation. *Obstetrical & Gynecological Survey*, *59*(5), 379-395. https://doi.org/10.1097/00006254-200405000-00026

American Academy of Pediatrics. (2012). Circumcision Policy Statement. *PEDIATRICS*, *130*(3), 585–586. https://doi.org/10.1542/peds.2012-1989

Moosa, F. A., Khan, F. W., & Rao, M. H. (2010). Comparison of complications of circumcision by 'Plastibell device technique' in male neonates and infants. *JPMA. The Journal of the Pakistan Medical Association*, *60*(8), 664–667.

Netto, J. M. B., Araujo Jr., J. G. de, Noronha, M. F. de A., Passos, B. R., Lopes, H. E., Bessa Jr., J. de, & Figueiredo, A. A. (2013). A prospective evaluation of plastibell® circumcision in older children. *International Braz J Urol*, *39*(4), 558–564. https://doi.org/10.1590/s1677-5538.ibju.2013.04.14

Saeed, A., Gregory, D., Amin, R., Murtaza Khanbhai, & Khan, A. (2023). A novel disposable ring (Circumplast) showed no ring migration onto the shaft of the penis in first 1000 male children's circumcisions in a community specialist clinic. *Journal of Pediatric Surgery Case Reports*, *92*, 102603–102603. https://doi.org/10.1016/j.epsc.2023.102603

Singh-Grewal, D. (2005). Circumcision for the prevention of urinary tract infection in boys: a systematic review of randomised trials and observational studies. *Archives of Disease in Childhood*, *90*(8), 853–958. https://doi.org/10.1136/adc.2004.049353

Weiss, H. A., Larke, N., Halperin, D., & Schenker, I. (2010). Complications of circumcision in male neonates, infants and children: A systematic review. *BMC*

Urology, *10*(1). https://doi.org/10.1186/1471-2490-10-2

World Health Organization. (2018). Male circumcision for HIV prevention: Manual for male circumcision under local anaesthesia and HIV prevention services for adolescent boys and men. World Health Organization.