Original Article

Wound Healing and Cosmetic Outcomes in Neonatal Circumcision Using Three Different Techniques

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Abstract

Background: Circumcision of a male child is an integral part of some African cultures. An ideal technique of neonatal circumcision should be simple, safe and heal satisfactorily with good cosmetic appeal. The aim was to compare conventional dissection (CD), Plastibell (PB) and Gomco (GM) techniques of circumcision in neonates in terms of wound healing, wound healing complications, cosmetic outcome and parental satisfaction. **Materials and Methods:** A total of 144 male neonates were randomised into three study groups: CD, GM and PB groups. All procedures were performed under local anaesthesia as day case. Superficial wound healing was assessed on the 7th post-operative day. The cosmetic outcome of the three techniques was assessed by a plastic surgeon and the parents using a 4-point Likert scale on the 4th post-operative week. **Results:** The three groups were comparable in terms of age ($P = 0.207$) and weight ($P = 0.098$) at circumcision. There was satisfactory wound healing in 48 (100%) patients in the GM group, compared to 47 (97.8%) in the CD group and 45 (93.8%) in the PB group ($P = 0.324$). Wound healing complications were recorded in seven patients, 1 (2.1%) in the CD group with wound infection, 5 (10.4%) in the PB group with moderate pain despite the use of analgesia and 1 (2.1%) patient with skin bridge in the CD group. The plastic surgeon and the parents rated the cosmetic outcome of CD higher than the other two techniques. **Conclusion:** There is no significant difference in superficial wound healing amongst the three circumcision techniques. The cosmetic outcome of CD was significantly better than that of GM and PB circumcisions.

Keywords: Cosmetic outcome, neonatal circumcision, wound healing

Introduction

Circumcision of a male child is the most common surgery performed globally.[1] The prevalence of circumcision in this part of the world is over 80%, with majority performed in the neonatal period.[1] The techniques of circumcision are diverse, and the method of circumcision may account for the differences in the outcome of the procedure.[2] Satisfactory healing of the circumcision wound is paramount to having a good cosmetic outcome. Superficial wound healing in circumcision occurs within 5–7 days.[3] Less attention is often paid to healing, cosmesis and the expectations of parents on the outcome of the procedure.

The aims of the study were to compare wound healing, wound healing complications, cosmetic outcome and level of parental satisfaction amongst three techniques of neonatal circumcision.

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Materials and Methods

This is a hospital-based, prospective, randomized clinical study conducted over 6 months. The sample size for the study was calculated using the statistical formula for comparison of proportions. The variables used in calculating the sample size were from a study by Nagdeve *et al*.,[4] in which 97.9% of parents in the Plastibell (PB) group and 80.2% in the conventional dissection (CD) group expressed satisfaction with the cosmetic outcome of the procedure. Power was set at 80% and confidence interval (CI) at 95%. This gave a total of 142 in addition to an attrition rate of 10%. However, 144 neonates were recruited into the study to have equal numbers of neonates in each group. Healthy, appropriate for gestational age and term male neonates were included in the study. The

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exclusion criteria were neonates whose parents did not give consent to be part of the study, and neonates with conditions that preclude circumcisions such as the presence of bleeding disorders, severe physiologic jaundice, pathologic jaundice, congenital genital anomalies (hypospadias, epispadias, buried penis, micropenis and webbed penis) and severe pustular groin rashes.

Using simple randomisation technique, 48 neonates were randomised into each of the study groups which were CD, Gomco (GM) and PB groups. Randomisation was done by generating 144 square ballot papers, 48 for each group. All 144 papers were rolled up and were kept in a big envelope. The papers were then shuffled thoroughly. Parents who had consented to the study were asked to pick a ballot each from the big envelope on the day of surgery. The ballot papers were reshuffled after each pick. The randomisation was without replacement as picked ballots were not replaced.

The neonates were circumcised using the technique of circumcision that corresponded to the group they were randomised into. The circumcisions were performed by three paediatric surgeons who were experienced in the three techniques being studied. All procedures were performed as day case under local anaesthesia (dorsal penile nerve block and subcutaneous ring block) using plain 1% lidocaine at a dose of 3 mg/kg. The size of the PB and GM used was dependant on the size of the glans penis of the patients. For CD, wounds were closed with interrupted stitches placed at 12, 3, 6 and 9 o'clock positions using Vicryl 5/0 suture. The wounds of neonates who had GM circumcision were not sutured.

All neonates were observed for 2 h after the procedure to ensure that there was no active bleeding from the surgical site. The neonates were discharged home on syrup paracetamol (PCM) at 10 mg/kg/dose eight hourly for 48 h postoperatively. No antibiotics were given, and the circumcision wounds were left open. The parents were counselled on avoidance of faecal contamination of the wound, application of ointments and hot fomentation. The parents were asked to subjectively assess and note the degree of pain their babies had within 48 h after the procedure.

The patients were evaluated at the outpatient clinic postoperatively on the 3rd day, 7th day and 4th week. Superficial wound healing was assessed on the 7th post-operative day. Satisfactory wound healing was defined as the presence of a completely apposed wound edge and the absence of exudate, scab and oedema. Cosmetic outcome of the three techniques was assessed on the 4th post-operative week using a 4-point Likert scale independently by the parents and a single plastic surgeon. The plastic surgeon was blinded to the technique of circumcision that was used for each of the neonates. Parameters that were considered by the plastic surgeon in the assessment of the cosmetic outcome included circumferential visibility of the glans and corona, appearance of the circumcision scar (regular/irregular) and the presence/absence of complications.

Data obtained from the study were analysed using SPSS® version 21 software package for Windows (SPSS Inc., Chicago, IL, USA). Pearson Chi-square was used for comparison of qualitative variables. Quantitative variables were compared using analysis of variance. Mean, standard deviation and CI were provided as appropriate. $P < 0.05$ was considered statistically significant.

Results

The mean age of the patients recruited into the study was 15.26 ± 6.73 days (range 2.0–25.0 days), and the mean weight was 3.67 ± 0.59 kg (range 2.50–5.50 kg). One hundred and one (70.1%) parents circumcised their children for sociocultural reasons and 21.5% for religious reasons, whereas 12 (8.3%) parents clearly indicated that their reason was to satisfy both their religious and cultural obligations. The three groups were comparable in terms of age ($P = 0.207$) and weight ($P = 0.098$) at circumcision [Table 1].

On the 7th post-operative day, wound healing was observed to be satisfactory in 48 (100%) patients in the GM group [Table 2]. Unsatisfactory healing was noted in 1 (2.1%) patient in the CD group whose wound was infected (evidenced by purulent discharge, erythema, oedema and tenderness around the wound). Three (6.2%) patients in the PB group still had their PB rings *in situ* on the 7th day, thus the edges of their wounds could not be adequately assessed for healing. The mean time for PB rings to fall off was 4.94 ± 1.25 days (range 2–8 days).

The early complications of wound healing in the study were wound infection and undue pain. Wound infection occurred in 1 (2.1%) patient in the CD group and none in the other two groups. This gave an overall wound infection rate of 0.69%. The infection resolved with the application of gentamicin cream. Despite the use of PCM syrup in the 1st 48 h of surgery, 10.4% of patients in the PB group had moderate pain as assessed by the parents while none in the other two groups had this degree of pain. The difference amongst the three groups was statistically significant ($P < 0.0001$). None of the patients in the three groups had severe pain [Table 3].

Wound healing complication that was recorded on the 4th post-operative week was Grade 2 skin bridge. This was seen in 1 (2.1%) patient in the CD group and none in the other two groups. The skin bridge occurred in the patient whose wound was infected. Another late complication that was recorded in the study but which was not related to wound healing was redundant prepuce. A total of 16 (11.1%) patients had redundant prepuce, 11 (68.8%) were in the PB group, representing 22.9% of patients in this group. The remaining 5 (31.2%) were in the GM group.

Table 4 highlights the cosmetic outcome of the three techniques as assessed by the plastic surgeon and the parents on the 4th post-operative week. A significant percentage of the CD group, 47.9% ($n = 23$), was judged by the plastic surgeon to have an excellent outcome. This was closely followed by the

Table 1: Comparison of baseline characteristics of patients in the three study groups

	Mean±SD (CI)			*P*
	GM	PB	CD	
Age (days)	14.08±7.19 (12.00–16.71)	15.17±6.16 (13.38–16.95)	16.52±6.72 (14.57–18.47)	0.207
EGA (weeks)	39.54±1.17 (39.20–39.88)	38.58±1.22 (38.23–38.94)	38.73±1.30 (38.35–39.11)	<0.0001
Weight (kg)	3.71±0.65 (3.52–3.90)	3.52±0.59 (3.349–3.69)	3.77±0.55 (3.61–3.93)	0.098

SD: Standard deviation, CI: Confidence interval, EGA: Estimated gestation age, GM: Gomco, PB: Plastibell, CD: Conventional dissection

Table 2: Proportion of patients with satisfactory and unsatisfactory wound healing in the three study groups on the 7th post-operative day

Wound healing	GM, *n* (%)	PB, *n* (%)	CD, *n* (%)	*P*
Satisfactory	48 (100)	45 (93.8)	47 (97.9)	0.324
Not satisfactory	0	3 (6.2)*	1 (2.1)	

*Plastibell rings were still *in situ* on the 7th day. GM: Gomco, PB: Plastibell, CD: Conventional dissection

Table 3: Parental assessment of post-operative pain in patients in the three study groups

Severity	Technique			*P*
	GM, *n* (%)	PB, *n* (%)	CD, *n* (%)	
No pain	39 (81.2)	20 (41.7)	31 (64.6)	<0.0001
Minimal pain	9 (18.8)	23 (47.9)	17 (35.4)	
Moderate pain	0	5 (10.4)	0	
Severe pain	0	0	0	

GM: Gomco, PB: Plastibell, CD: Conventional dissection

Table 4: Cosmetic outcomes of the three circumcision techniques

	GM, *n* (%)	PB, *n* (%)	CD, *n* (%)	*P*
Plastic surgeon				
Excellent	21 (43.8)	6 (12.5)	23 (47.9)	<0.0001
Good	22 (45.8)	30 (62.5)	24 (50.0)	
Fair	4 (8.3)	11 (22.9)	1 (2.1)	
Bad	1 (2.1)	1 (2.1)	0	
Parents				
Excellent	44 (91.7)	41 (85.4)	46 (95.8)	0.436
Good	4 (8.3)	5 (10.4)	1 (2.1)	
Fair	0	2 (4.2)	1 (2.1)	
Bad	0	0	0	

GM: Gomco, PB: Plastibell, CD: Conventional dissection

Table 5: Level of parental satisfaction with the outcome of the three circumcision techniques

Level of satisfaction	GM, *n* (%)	PB, *n* (%)	CD, *n* (%)	*P*
Very satisfied	44 (91.7)	42 (87.5)	47 (97.9)	0.121
Satisfied	4 (8.3)	4 (8.3)	0	
Neutral	0	1 (2.1)	0	
Dissatisfied	0	1 (2.1)	1 (2.1)	
Very dissatisfied	0	0	0	

GM: Gomco, PB: Plastibell, CD: Conventional dissection

GM group, 43.8% (n = 21), whereas only 12.5% (n = 6) of the PB group was judged to be excellent. One (2.1%) patient in each of the GM and PB groups and none in the CD group were assessed to be bad (P < 0.0001).

Forty-six (95.8%) parents judged CD to have an excellent outcome compared to 44 (91.7%) GM and 41 (85.4%) PB circumcision [Table 4]. No patient in the three groups was judged to have a bad cosmetic outcome. There was no significant statistical difference in the cosmetic outcome assessed by the parents for the three groups (P = 0.436).

Forty-seven (97.9%) parents in the freehand group were very satisfied with the outcome of the circumcision, while 44 (91.7%) parents in GM and 42 (87.5%) in PB groups also expressed this level of satisfaction [Table 5]. Dissatisfaction was expressed by 2.1% (n = 1) of parents in each of the PB and freehand groups but none in the GM group. There was no statistical difference in the level of parental satisfaction with the three procedures (P = 0.121).

Discussion

The mean age of patients in this study reflects the cultural practices in Nigeria, where circumcisions are performed early in the neonatal period. The mean age of patients in this study was similar to what was reported by Jimoh *et al*.[5] in their study on PB circumcision in 2276 male infants.

The method of circumcision has been reported as one of the factors that affect healing after circumcision;[2] however, in this study, wound healing was found to be comparable amongst the three techniques. This suggests that the method of circumcision may not adversely affect healing of circumcision wounds. This was supported by findings by Malik *et al*.,[6] on comparing wound healing in the conventional open method and bone cutter method. Wound healing was found to be satisfactory on the 5th day in 98% of patients who were circumcised using the bone cutter technique and in 96% of those who had the CD.[6]

In this study, all patients in the GM group had satisfactory wound healing, this could be attributed to the fact that the technique allowed for complete excision of the prepuce at the time of surgery without retention of any part of the device or sutures. That delayed healing was seen in the patient with wound infection was not surprising because the presence of infection usually results in an exaggerated and prolonged inflammatory phase of wound healing.[7] Healing could not be

adequately assessed in patients whose PB rings were yet to fall off by the 7th post-operative day. The continuous presence of the PB ring prevented complete apposition of the edges of the wound and this also impaired adequate evaluation of the edges of the wound and of healing in such patients.

Despite the use of PCM syrup, a significant number of parents in the PB group felt their babies still had pain. This was comparable to findings by Freeman *et al*.;[2] in their study, perceived pain scored by the parents was reported to be significantly higher in the PB group than in the GM group. This, however, was contrary to the findings by Fraser *et al*.[8] their study showed that 30% of parents whose children were circumcised using the CD method reported post-operative pain to be significant compared to 24% of parents whose children had PB circumcision. The higher degree of pain in the CD group was attributed to the need for a change of wound dressing.[8]

Skin Bridge (preputial adhesion) was recorded only in the CD group. This was similar to findings by Bastos Netto *et al*.[9] in which the CD group was found to have a high incidence of preputial adhesions. Twenty-five percent of patients in the CD group had preputial adhesions compared to 6.4% in the PB group in another related study.[4] Amir *et al*.[10] had 21% prevalence of preputial adhesions in 1000 patients circumcised using GM clamp. The low incidence of skin bridge in this study may have resulted from the smaller number of subjects compared to the other studies.

Absorbable sutures are traditionally used for the closure of circumcision wounds in CD. The disadvantage of using these sutures include the formation of small granulomas, stitch marks and sinuses.[11,12] Sutures that are rapidly absorbed are preferred to reduce the incidence of these complications.[12] Sutureless circumcision with tissue glues is also being increasingly used, and they have the added advantage of reduction in the duration of surgery and better cosmetic outcomes.[11,12] However, when compared to sutures, they have a low wound-breaking strength within the 1st few days of surgery,[11] and this may increase the risk of wound dehiscence with their use.

The better cosmetic outcome of GM circumcision over PB circumcision reported by parents in this study was similar to findings by Freeman *et al*.[2] In their study, 83% of parents rated the cosmetic outcome of GM circumcision to be excellent compared to 77% of parents for PB circumcision. Fraser *et al*.,[8] however, reported better cosmetic outcome with PB circumcision than CD method. In their study, 60% of patients in the PB group were rated to have a good cosmetic outcome, compared to 45% in the CD group. The cosmetic outcome in patients in the PB group was rated lower than the other two groups because of the higher incidence of the redundant prepuce in the PB group in this study. The incidence of redundant prepuce was low with CD because the technique allowed for adequate dissection and complete excision of the prepuce.

The number of parents that expressed a high level of satisfaction with the outcome of the procedure was higher in the CD group than in the other two groups; however, the difference was not statistically significant. Findings by Nagdeve *et al*.[4] contradicted the findings in this study, as more parents in the PB group claimed satisfaction with the cosmetic result than those in the CD group (97.9% vs. 80.2%). The most significant predictor of parental satisfaction in their study was the amount of prepuce that was excised and the cosmetic outcome of the procedure. Circumcisions in their study were performed by various calibres of surgeons including family physicians and obstetricians. Parental satisfaction with CD was lower in their study because the outcome of this technique was dependant on the skill and experience of the surgeon who performed the procedure. The PB technique required less experience, and outcomes are usually influenced by device-related complications.[4] Freeman *et al*.[2] reported no difference between GM and PB circumcisions regarding the overall level of parental satisfaction. The most significant predictor of parental satisfaction in their study was also the amount of foreskin that was excised. Amir *et al*.[10] reported 3 out of 1000 parents were dissatisfied with the outcome of GM circumcision, two of which became cosmetically acceptable to the parents after 2 years of follow-up. This was, however, a retrospective study in which there may be a problem of recall during the parental assessment of the cosmetic outcome of the procedure.

Parents in this study expressed a high level of satisfaction with the three techques because the assessment of parental satisfaction was based solely on the cosmetic outcome of the procedure. Other factors such as pain, analgesic requirement, wound infection and post-operative care of the wound which could have also significantly affected their level of satisfaction were not considered. This was because parental satisfaction was assessed on the 4th post-operative week, there could be a problem of recall if these factors were to be used in grading parental satisfaction with the outcome of the procedure.

The study design was limited in the fact that wound healing was qualitatively assessed. A quantitative assessment, like time to complete wound healing, would have aided in determining which of the three circumcision techniques heals faster than the others.

The areas of future research that were identified in this study were:

1. Determining the time to complete wound healing in the three techniques
2. An objective scoring system for assessing the cosmetic outcome of neonatal circumcision.

Conclusion

Wound healing was satisfactory amongst the three groups on the 7th post-operative day. Wound healing was significantly complicated by undue pain in the PB group. Cosmetic outcome of CD was significantly better than that of GM and

PB techniques. There was no significant difference in the level of parental satisfaction amongst the three circumcision techniques.

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Conflicts of interest

There are no conflicts of interest.

References

1. World Health Organization, and Joint United Nations Programme on HIV/AIDS (UNAIDS). Neonatal and Child Male Circumcision: A Global Review. Geneva: World Health Organization; 2010. Available from: https://www.malecircumcision.org/sites/default/files/document_library/Neonatal_child_MC_global_review.pdf. [Last accessed on 2023 Jan 14].
2. Freeman JJ, Spencer AU, Drongowski RA, Vandeven CJ, Apgar B, Teitelbaum DH. Newborn circumcision outcomes: Are parents satisfied with the results? Pediatr Surg Int 2014;30:333-8.
3. World Health Organization. Manual for Early Infant Male Circumcision under Local Anaesthesia. Geneva: World Health Organization; 2010. Available from: http://whqlibdoc.who.int ›publications›9789241500753_eng. [Last accessed on2023 Jan 14].
4. Nagdeve NG, Naik H, Bhingare PD, Morey SM. Parental evaluation of postoperative outcome of circumcision with Plastibell or conventional dissection by dorsal slit technique: A randomized controlled trial. J Pediatr Urol 2013;9:675-82.
5. Jimoh BM, Odunayo IS, Chinwe I, Akinfolarin OO, Oluwafemi A, Olusanmi EJ. Plastibell circumcision of 2,276 male infants: A multi-Centre study. Pan Afr Med J 2016;23:35.
6. Malik S, Ahmad SA, Habib A. Comparison of post circumcision complications and wound healing in infants by conventional open method and bone-cutter method. Pak Armed Forces Med J 2015;65:478-81.
7. Guo S, Dipietro LA. Factors affecting wound healing. J Dent Res 2010;89:219-29.
8. Fraser IA, Allen MJ, Bagshaw PF, Johnstone M. A randomized trial to assess childhood circumcision with the Plastibell device compared to a conventional dissection technique. Br J Surg 1981;68:593-5.
9. Bastos Netto JM, de Araújo JG Jr., de Almeida Noronha MF, Passos BR, de Bessa J Jr., Figueiredo AA. Prospective randomized trial comparing dissection with Plastibell® circumcision. J Pediatr Urol 2010;6:572-7.
10. Amir M, Raja MH, Niaz WA. Neonatal circumcision with Gomco clamp – A hospital-based retrospective study of 1000 cases. J Pak Med Assoc 2000;50:224-7.
11. Ozkan KU, Gonen M, Sahinkanat T, Resim S, Celik M. Wound approximation with tissue glue in circumcision. Int J Urol 2005;12:374-7.
12. Martin A, Nataraja RM, Kimber C, Pacilli M. The use of tissue glue for circumcision in children: Systematic review and meta-analysis. Urology 2018;115:21-8.