

A Comparative Evaluation of Conventional Dissection, Plastibell, and Gomco Clamp Techniques for Neonatal Circumcision: A Focus on Wound Healing and Cosmetic Results

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ARTICLE INFO

Received: 30 Apr 2026
Accepted: 8 May 2026
Published Online: 17 May 2026

DOI: 10.5281/zenodo.20258225

Volume: 9, Number: 3, Page: 61-64

e-ISSN: 2789-5912
 ISSN: 2617-0817

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ABSTRACT

Background: Neonatal circumcision is a widely practiced procedure shaped by cultural, religious, and medical reasons, with early execution favored for quicker recovery and reduced complications. Methods encompass traditional dissection and device-assisted approaches (Gomco and Plastibell), leading to varying results. In Bangladesh, variations in practice and the skill of providers might affect outcomes. This research evaluated these three techniques regarding recovery, complications, aesthetic results, and parental contentment. **Methods & Materials:** A prospective observational study involving 150 neonates at Anwer Khan Modern Medical College Hospital evaluated Conventional Dissection, Plastibell, and Gomco circumcision methods (n=50 for each technique). Results comprised healing duration, complications, cosmetic evaluation (PAS), and parental contentment, assessed using SPSS v25 ($p < 0.05$ considered significant). Approval for ethical considerations and informed consent were secured. **Results:** A total of 150 neonates (n=50 per group) exhibited no differences at baseline. Traditional Dissection exhibited the quickest healing time (6.5 days), highest cosmetic rating (4.6 ± 0.5), and peak parental satisfaction (98%), succeeded by Gomco and Plastibell. Plastibell experienced the longest healing time (10.5 days) and the lowest satisfaction rate (86%). Overall complications were low (8.7%) and consistent among groups. **Conclusion:** All techniques were safe with minimal complications, but Conventional Dissection yielded the best overall results, followed by Gomco, whereas Plastibell had extended healing times and lower cosmetic and satisfaction ratings.

Keywords: Conventional Dissection Technique, Plastibell Technique, Gomco Clamp Technique, Neonatal Circumcision, Wound Healing, Cosmetic Results.

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INTRODUCTION

Neonatal circumcision represents one of the most frequently performed surgical procedures in pediatric practice worldwide [1]. Parental decision-making for circumcision is influenced by a combination of social, religious, cultural, and medical factors, and the procedure is widely performed by trained healthcare providers with generally favorable outcomes [2]. This procedure is frequently conducted in newborns, infants, and children due to religious, cultural, and medical factors; however, there is a deficiency of systematic reviews addressing complications related to the procedure in this age category [3]. Early neonatal circumcision is generally preferred, as it is associated with lower complication rates compared to later infancy or childhood. It is typically recommended before the period of mini-puberty (approximately 4 weeks to 3 months of age), as increasing vascularity and tissue development of the foreskin may elevate the risk of bleeding and procedural difficulty [4]. Despite its widespread practice,

circumcision is associated with potential complications, including bleeding, infection, injury to the glans or urethra, and rare but serious adverse outcomes, although overall complication rates remain low when performed under appropriate conditions [5]. Various surgical techniques are used for neonatal circumcision, broadly classified into conventional surgical dissection and device-assisted methods, including clamp-based (e.g., Gomco, Mogen) and ring-based systems (e.g., Plastibell, ShangRing) [6]. Each technique has distinct procedural characteristics, advantages, and potential risks. Plastibell circumcision operates through tight ligation that leads to ischemic necrosis of the foreskin, whereas the traditional method excises the foreskin without damaging the glans or frenulum [7,8]. The Gomco clamp, developed in the 1930s by Yellen and Goldstein, compresses and removes the foreskin while safeguarding the glans, employing anesthesia, bell positioning, clamp adjustment, and bandaging [9]. Ceylan et al. (2007) documented instances of severe

complications from circumcision, primarily bleeding, infection, and penile injuries, frequently associated with untrained practitioners, many of which necessitated surgical intervention [10].

In Bangladesh, neonatal circumcision is widely practiced; however, comparative evidence evaluating different surgical techniques remains limited. Existing observations suggest that both trained and untrained practitioners perform circumcisions in various settings, which may contribute to variability in healing outcomes and cosmetic results. The most commonly reported complications include bleeding, infection, and anesthesia-related issues, with improved outcomes generally associated with experienced operators and adherence to aseptic techniques [11]. Therefore, this study was conducted to evaluate and compare conventional dissection, Plastibell, and Gomco clamp techniques for neonatal circumcision, with particular emphasis on postoperative wound healing, complication rates, cosmetic outcomes, and parental satisfaction.

METHODS & MATERIALS

Study Design and Setting

This was a prospective comparative observational study conducted at Anwer Khan Modern Medical College Hospital (AKMMCH).

Study Population

A total of 150 neonates undergoing elective circumcision were enrolled and equally distributed into three groups:

- Conventional Dissection (n=50)
- Plastibell technique (n=50)
- Gomco Clamp technique (n=50)

Eligibility Criteria

Neonates were eligible for inclusion in the study if they were male infants aged ≤28 days, clinically stable, and deemed fit for elective circumcision. Only those whose parents or legal guardians provided written informed consent were enrolled. Neonates were excluded if they had any congenital penile anomalies such as hypospadias or epispadias, known or suspected bleeding disorders, severe systemic illness requiring intensive care admission, or a history of previous penile surgery.

Sampling Technique

A consecutive purposive sampling method was used until the required sample size was achieved.

Procedure and Group Allocation

Participants were assigned to one of the three circumcision techniques based on the procedure performed by trained surgeons under sterile operative conditions.

- Conventional Dissection: Surgical excision of the foreskin followed by hemostasis using standard techniques.
- Plastibell Technique: A Plastibell device was inserted under the foreskin, ligated, and the redundant foreskin excised.
- Gomco Clamp Technique: The foreskin was crushed and excised using a Gomco clamp after proper assembly and application.

All procedures were performed under standardized aseptic protocols.

Data Collection Procedure

Data were collected using a structured proforma. Baseline characteristics (age, birth weight, gestational age) were recorded. Intraoperative details and postoperative outcomes were documented during follow-up visits.

Outcome Measures

- Primary Outcomes:
 - Time to complete epithelialization
 - Complications within 30 days
- Secondary Outcomes:
 - Cosmetic outcome (Penile Appearance Score, PAS) at 3 months
 - Parental satisfaction (5-point Likert scale)

Statistical Analysis

Data were analyzed using SPSS version 25. Continuous variables were expressed as mean ± SD or median (IQR), and categorical variables as frequency and percentage. Kruskal-Wallis and Chi-square tests were used where appropriate. A p-value <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the institutional ethics committee of Anwer Khan Modern Medical College Hospital prior to study initiation. Written informed consent was obtained from parents or guardians of all participants. Confidentiality and anonymity were strictly maintained throughout the study.

RESULTS

Baseline Characteristics of the Study Participants

Table I shows total of 150 neonates were included in the study and equally distributed among the Conventional Dissection (CD), Plastibell (PB), and Gomco Clamp (GM) groups (n=50 each). The baseline characteristics were comparable across all three groups, with no statistically significant differences observed in age at circumcision, birth weight, or gestational age. The mean age at circumcision was similar among groups, with most procedures performed within the first two weeks of life. Birth weight and gestational age distributions were also comparable, ensuring baseline homogeneity.

Table I
Baseline Characteristics of the patients.

Variable	Category	Conventional Dissection (n=50), n (%)	Plastibell (n=50), n (%)	Gomco Clamp (n=50), n (%)
Age at circumcision (days)	Mean ± SD	9.6 ± 3.1	9.2 ± 2.8	9.4 ± 3.0
	≤7 days	18 (36)	20 (40)	19 (38)
	8–14 days	24 (48)	23 (46)	24 (48)
	>14 days	8 (16)	7 (14)	7 (14)
Birth weight (kg)	Mean ± SD	3.1 ± 0.4	3.0 ± 0.5	3.0 ± 0.4
	<2.5 kg	6 (12)	5 (10)	6 (12)
	2.5–3.5 kg	36 (72)	38 (76)	37 (74)
	>3.5 kg	8 (16)	7 (14)	7 (14)
Gestational age (weeks)	Mean ± SD	38.2 ± 1.4	38.3 ± 1.3	38.1 ± 1.5
	Preterm (<37)	5 (10)	4 (8)	5 (10)
	Term (37–41)	43 (86)	44 (88)	43 (86)
	Post-term (>41)	2 (4)	2 (4)	2 (4)

Wound Healing Outcomes

Table II presents the time to complete epithelialization differed significantly among the three groups (p<0.001). The

Conventional Dissection group demonstrated the fastest healing, with a median time of 6.5 days (IQR: 6–7), followed by the Gomco Clamp group at

8.0 days (IQR: 7–9). The Plastibell group showed the longest healing duration, with a median of 10.5 days (IQR: 9–12).

Table II
Wound Healing Time by Technique.

Technique	Median Healing Time (days)	IQR	p-value
Conventional Dissection	6.5	6–7	<0.001
Gomco Clamp	8.0	7–9	
Plastibell	10.5	9–12	

Complication Profile
Table III shows the overall complication rate was low (8.7%, 13/150), with no major adverse events reported. The Plastibell

group exhibited the highest complication rate (6%), primarily due to device retention. The Gomco Clamp group showed minor bleeding in 4% of cases, while the

Conventional Dissection group had the lowest complication rate (2%), mainly due to minor wound separation.

Table III
Complication Profile of Study Participants.

Complication	CD (n=50)	PB (n=50)	GM (n=50)
Minor bleeding	1 (2%)	0	2 (4%)
Infection	0	1 (2%)	0
Device retention	N/A	3 (6%)	N/A
Wound separation	1 (2%)	0	0
Total complications	2 (4%)	4 (8%)	2 (4%)

Cosmetic Outcomes
Table IV shows cosmetic outcomes assessed using the Penile Appearance Score (PAS) demonstrated statistically significant

differences among the groups ($p=0.02$). The highest mean PAS was observed in the Conventional Dissection group (4.6 ± 0.5), followed closely by the Gomco Clamp

group (4.5 ± 0.6). The Plastibell group had comparatively lower scores (4.0 ± 0.7), indicating relatively less favorable cosmetic outcomes.

Table IV
Cosmetic Outcomes (Penile Appearance Score).

Technique	Mean PAS $\pm$ SD	p-value
Conventional Dissection	4.6 ± 0.5	0.02
Gomco Clamp	4.5 ± 0.6	
Plastibell	4.0 ± 0.7	

Parental Satisfaction
Table V shows parental satisfaction at three months showed a statistically significant

difference among the groups ($p=0.048$). The highest satisfaction was reported in the Conventional Dissection group (98%),

followed by the Gomco Clamp group (94%) and the Plastibell group (86%).

Table V
Parental Satisfaction at 3 Months.

Satisfaction Level	CD (n=50), n (%)	PB (n=50), n (%)	GM (n=50), n (%)	p-value
Satisfied/Very satisfied	49 (98)	43 (86)	47 (94)	0.048
Neutral/Dissatisfied	1 (2)	7 (14)	3 (6)	

DISCUSSION

In our study, 150 neonates were evenly distributed among Conventional Dissection, Plastibell, and Gomco Clamp groups, exhibiting similar baseline traits. The average age at circumcision was somewhat greater during the late neonatal phase, while both birth weight and gestational age showed similarity among the groups, reflecting a uniform study population. These results align with Bowa et al. (2013). The research highlighted the importance of structured training, as 640 circumcisions were performed after registering 661 infants, with 3.2% being excluded due to ineligibility^[12]. The present findings show that Conventional Dissection resulted in the fastest healing, followed by Gomco Clamp, while Plastibell had the longest healing

time. The delayed healing with Plastibell is likely related to the presence of the device and the need for spontaneous separation, which prolongs epithelialization. These results are consistent with Sorokan et al. (2015), who reported that device-based circumcision methods, particularly Plastibell, are associated with a longer healing period compared to conventional surgical techniques. However, the study also emphasized that overall outcomes are largely influenced by operator experience, aseptic technique, and appropriate postoperative care rather than the method alone^[13]. Complication rates were minimal for all methods. Plastibell experienced somewhat more problems, primarily with device retention and sporadic infections, whereas Gomco and Conventional Dissection

demonstrated fewer and comparable complications. Bleeding was observed across all groups, and wound separation was noted solely in Conventional Dissection. In general, Gomco exhibited the highest safety profile. These results align with those of Weiss et al. (2010), who noted typically low rates of complications, with Plastibell being more susceptible to device-related issues^[3]. Cosmetic results varied notably, with Conventional Dissection achieving the highest PAS, succeeded by Gomco Clamp, while Plastibell recorded lower scores. This suggests superior cosmetic outcomes with surgical and clamp techniques compared to Plastibell. Alsowayan et al. (2024) noted variations in post-circumcision appearance between Gomco and Plastibell, with differing cosmetic perceptions associated with healing traits and methods^[14].

Parental satisfaction varied significantly, with the highest in the Conventional Dissection group, trailed by Gomco Clamp and Plastibell. This could be attributed to variations in recovery, minor issues, and device maintenance. Freeman et al. (2014) discovered that satisfaction among parents following newborn circumcision is usually elevated, yet it is affected by the technique used and postoperative results, especially regarding healing and appearance^[15].

All three circumcision methods were safe with low complication rates; however, Conventional Dissection demonstrated quicker healing, improved cosmetic results, and greater parental satisfaction, establishing it as the most preferred technique in this study.

CONCLUSION

Each of the three neonatal circumcision methods proved to be safe, featuring low rates of complications and no significant adverse events. Nonetheless, Conventional Dissection exhibited better results with quicker recovery, improved aesthetic outcomes, and greater parental satisfaction, whereas Gomco Clamp revealed similar safety and satisfactory results. Plastibell, while effective, was linked to a longer healing period and comparatively lower scores for cosmetic results and satisfaction. In general, the selection of method must take into account the clinical environment, the skill of the operator, and the ability for follow-up.

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