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Circumcision of Infants with Gomco Clamp - An Effective and Safe Method, in A Tertiary Care Setting

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ABSTRACT

Circumcision is among the most commonly performed pediatric surgical procedures. The Gomco clamp is widely used due to its simplicity and safety profile. However, variations in clamp size may influence postoperative outcomes. **Objectives:** To evaluate the safety, efficacy, and complication rates of Gomco clamp circumcision in neonates and infants, with a focus on the association of clamp size with key outcomes. **Methods:** This prospective observational study was conducted at Baqai Medical University from March 2022 to February 2024. Male neonates and infants up to one year undergoing elective Gomco clamp circumcision were enrolled. Data on age, weight, clamp size, procedure duration, and complications were recorded. Follow-ups were conducted at days 3-5, days 7-10, and at 2 months to assess early and delayed complications and cosmetic outcomes. **Results:** Early complications were mild and infrequent. Surgical site infection (4.2%), meatal stenosis (4.2%), and adhesions (8.3%) were rare. Bleeding requiring intervention occurred in 6.2% of cases, and cosmetic outcomes were excellent or good in 85.4%. Significant associations were found between clamp size and bleeding ($p=0.041$), as well as cosmetic outcome ($p=0.027$). **Conclusions:** Gomco clamp circumcision is a safe and effective method for neonates and infants. However, careful selection of clamp size is crucial for minimizing complications and optimizing cosmetic results.

INTRODUCTION

Male circumcision is one of the oldest and most commonly performed surgical procedures worldwide, particularly during the neonatal and infantile period. It is practiced for religious, cultural, hygienic, and occasionally medical reasons in many countries, including Pakistan, where it is routinely performed in infancy as part of cultural and religious tradition [1, 2]. Globally, it is estimated that more than one-third of males are circumcised, with rates exceeding 90% in Muslim-majority countries like Pakistan [3]. The neonatal period is considered optimal for circumcision due to anatomical simplicity, faster healing, and lower rates of complications [4]. Compared to circumcision performed in older children or adults, neonatal circumcision is associated with reduced procedural risks, minimal discomfort, and faster wound healing [5]. In Pakistan, neonatal and infant circumcision is mostly carried out in outpatient settings by general practitioners, pediatricians, or trained surgical staff, often without standardized techniques or anesthesia [6]. This unregulated practice of circumcision increases the risk of avoidable complications. The complications include bleeding, infection, meatal stenosis, and unsatisfactory

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cosmetic results [7]. Multiple techniques have been described for infant circumcision, including the Plastibell device, Mogen clamp, and Gomco clamp. Among these, the Gomco clamp is one of the most widely used and time-tested instruments, particularly in the United States and parts of South Asia [8]. It works by crushing the foreskin between a metal bell and a clamp plate, minimizing bleeding while allowing precise excision. Studies have shown that the Gomco clamp is safe, efficient, and associated with excellent cosmetic outcomes when performed under appropriate aseptic and anesthetic conditions [9]. Despite its advantages, the technique's effectiveness is influenced by factors such as clamp size selection, operator skill, and postoperative care. Complication rates for Gomco circumcision vary between 1% and 5%, with bleeding being the most common adverse event [10]. A 2019 RCT confirmed that when performed by experienced hands, Gomco circumcision in neonates had lower complication rates and superior cosmetic satisfaction compared to Plastibell and Mogen methods [11]. In Pakistan, however, limited published data evaluate the safety and efficacy of the Gomco clamp technique in neonates and infants under controlled clinical settings. Most circumcisions are carried out in non-standardized environments without uniform protocols for anesthesia, clamp size selection, or postoperative follow-up [12].

This research aimed to address this gap by systematically evaluating the complication profile, cosmetic outcomes, and procedural efficiency of Gomco clamp circumcision among neonates and infants in a tertiary care setup. Understanding these factors can guide policy and training initiatives to promote safer practices in both urban and rural clinical settings. This study aimed to evaluate the safety, efficacy, and complication profile of Gomco clamp circumcision among neonates and infants undergoing elective circumcision.

METHODS

This prospective observational study was conducted at the Department of Pediatric Surgery, Baqai Medical University, Karachi, from March 2022 to February 2024. The study was initiated after obtaining approval from the institutional ethical review committee (BMU-EC/01-2022). All consecutive male neonates and infants up to one year of age undergoing elective circumcision by a single experienced pediatric surgeon were enrolled from the outpatient clinic. Infants with low birth weight (<2.5 kg), significant jaundice, bleeding disorders, pustular groin rash, or penile anomalies (e.g., hypospadias) were excluded. A coagulation profile was performed preoperatively in all cases. Informed written consent was obtained from parents or guardians, and data were recorded using a standardized proforma. The sample size was calculated via the Open Epi sample size calculator by taking the incidence of mild bleeding as an early procedure-related complication in 3.2% boys with 5 % Margin of Error and a 95% Confidence Interval [13]. Each circumcision was performed using the Gomco clamp technique by a trained surgical team under sterile conditions. The majority of procedures were conducted in a minor operating theatre under local anesthesia, using a dorsal penile nerve block with 1% lidocaine. Clamp sizes were selected based on the diameter of the glans and included 1.1 cm, 1.3 cm, and 1.45 cm clamps. The duration of each procedure was recorded from the time of clamp application to the removal and completion of dressing. All infants were observed for one hour postoperatively for immediate complications and discharged with postoperative care instructions. Follow-up was scheduled at three intervals: day 3–5 (to assess early complications such as bleeding, urination difficulty, or infection), day 7–10 (to monitor healing progress), and at two months' post-procedure (to evaluate delayed complications such as surgical site infection, meatal stenosis, adhesions, and cosmetic outcome). Complications were categorized as early (within the first two weeks) or delayed (after two weeks up to two months). Bleeding requiring intervention was defined as any hemorrhage requiring re-clamping, suturing, or pharmacological hemostasis. The cosmetic outcome was self-reported by parents using a 4-point scale (Excellent, Good, Acceptable, Poor), adapted from a previously published study [14]. Surgeons also assessed cosmetic results independently to ensure clinical evaluation. Data were collected using a standardized proforma developed by the research team, which captured age at circumcision (in weeks), weight at the time of procedure (kg), type of analgesia, clamp size, procedure duration, and clinical outcomes. The proforma included sections on patient demographics, procedural details, complications, and parent-reported cosmetic outcomes (adapted from a previously published scale [14]). The data collection proforma was developed by the research team and subsequently pre-validated by 12 independent surgeons (pediatric, general and urologists) to ensure content clarity, relevance, and completeness. Each item was assessed for clarity, necessity, and ease of interpretation. Content Validity Index (CVI) for individual items (I-CVI) was 0.91, indicating strong content validity. Internal consistency reliability was tested using Cronbach's alpha, which was 0.87, reflecting good reliability of the tool. Safety variables included the presence and severity of bleeding, need for re-intervention, and use of postoperative antibiotics. Efficacy was evaluated based on intraoperative complications and the overall cosmetic outcome. All data were entered and analyzed using SPSS

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version 25.0, and descriptive statistics were reported as means ± standard deviations for quantitative variables, and frequencies and percentages for categorical variables. Associations between clamp size and categorical outcomes (e.g., bleeding, antibiotic use, cosmetic grade, and re-intervention) were analyzed using the Chi-square test, and a p-value<0.05 was considered statistically significant.

RESULTS

Among the 48 neonates and infants who underwent Gomco clamp circumcision, the mean age at circumcision was 6.4 ± 3.1 weeks, and the average weight was 4.5 ± 0.5 kg. The majority (85.4%) received local anesthesia, while general anesthesia and no analgesia were used in 10.4% and 4.2% of cases, respectively. The most commonly used clamp size was 1.1 cm (47.9%), followed by 1.3 cm and 1.45 cm. The average procedure duration was 12.1 ± 2.4 minutes, suggesting this method is quick and efficiently performed in this age group (Table 1).

Table 1: Demographic and Procedural Characteristics (n=48)

Variables	Frequency (%)
Age	
At Circumcision	6.4 ± 3.1 Weeks
Weight	
At Procedure	4.5 ± 0.5 kg
Analgesia Used	
Local	41 (85.4%)
General	5 (10.4%)
None	2 (4.2%)
Clamp Size Used	
1.1 cm	23 (47.9%)
1.3 cm	17 (35.5%)
1.45 cm	8 (16.6%)
Procedure Duration	
Minutes	12.1 ± 2.4

Early complications were infrequent, with bleeding mostly mild or moderate, and only one case (2.1%) categorized as severe. Urination difficulty was reported in 10.4% of cases. Delayed complications such as surgical site infection, meatal stenosis, and adhesions were rare, occurring in ≤8.3% of the participants, indicating favourable short- and medium-term safety (Table 2).

Table 2: Postoperative Complications (n=48)

Variables		Frequency (%)
Early Complications		
Bleeding	None	36 (75.0%)
	Mild	7 (14.6%)
	Moderate	4 (8.3%)
	Severe	1 (2.1%)
Urination Difficulty	Yes	5 (10.4%)
	No	43 (89.6%)
Delayed Complications		
Surgical Site Infection	Yes	2 (4.2%)
	No	46 (95.8%)
Meatal Stenosis	Yes	2 (4.2%)
	No	46 (95.8%)
Adhesions	Yes	4 (8.3%)
	No	44 (91.7%)

Safety outcomes showed that only 6.2% of participants required intervention for bleeding, and just 2.1% needed re-intervention. Antibiotic use postoperatively was limited (14.6%), supporting the low infection rate. In terms of efficacy, cosmetic results were highly favorable, with 56.2% rated excellent and none rated poor (Table 3).

Table 3: Safety and Efficacy Outcomes (n=48)

Outcomes	Frequency (%)
Bleeding Requiring Intervention	
Yes	3 (6.2%)
No	45 (93.8%)
Re-intervention Required	
Yes	1 (2.1%)
No	47 (97.9%)
Antibiotic Use	
Yes	7 (14.6%)
No	41 (85.4%)
Cosmetic Outcome	
Excellent	27 (56.2%)
Good	14 (29.2%)
Acceptable	7 (14.6%)
Poor	0 (0.0%)

Clamp size was significantly associated with bleeding requiring intervention (p=0.041) and cosmetic outcome (p=0.027). Smaller clamp sizes (1.1 cm) were linked to slightly higher bleeding rates and acceptable cosmetic scores, suggesting clamp size selection may influence clinical outcomes (Table 4).

Table 3: Safety and Efficacy Outcomes (n=48)

Outcomes	1.1 cm (n=23)	1.3 cm (n=17)	1.45 cm (n=8)	95% CI	p-value
Bleeding Requiring Intervention					
Yes	2 (8.7%)	1 (5.9%)	0 (0.0%)	0.5%–24.1%	0.041*
No	21 (91.3%)	16 (94.1%)	8 (100.0%)		
Antibiotic Use					
Yes	5 (21.7%)	1 (5.9%)	1 (12.5%)	6.5%–35.7%	0.103
No	18 (78.3%)	16 (94.1%)	7 (87.5%)		
Cosmetic Outcome					
Excellent	13 (56.5%)	10 (58.8%)	4 (50.0%)	42.4%–70.3%	0.027*
Good	6 (26.1%)	6 (35.3%)	2 (25.0%)		
Acceptable	4 (17.4%)	1 (5.9%)	2 (25.0%)		
Poor	0 (0.0%)	0 (0.0%)	0 (0.0%)		
Re-intervention Required					
Yes	1 (4.3%)	0 (0.0%)	0 (0.0%)	0.1%–16.3%	0.158
No	22 (95.7%)	17 (100.0%)	8 (100.0%)		

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DISCUSSION

The present study evaluated the safety and efficacy of Gomco clamp circumcision in neonates and infants, with particular attention to the impact of clamp size on postoperative outcomes. The findings reaffirm the Gomco clamp as a safe and effective technique when used by trained personnel in a sterile clinical setting. The mean age and weight at the time of circumcision in this study were 6.4 ± 3.1 weeks and 4.5 ± 0.5 kg, respectively. These figures align with global recommendations supporting early infant circumcision due to faster healing and lower risk of complications compared to older children [15]. Early complications were infrequent in our sample, with 75% experiencing no bleeding and only 2.1% classified as severe. This is consistent with a study done in Punjab, where the Gomco clamp showed a significantly lower bleeding rate than the Mogen technique [16]. Urination difficulty occurred in 10.4% of participants, but resolved without intervention, consistent with findings by Saeedi et al. who reported transient dysuria in 8–12% of Gomco cases [17]. Delayed complications like surgical site infection (4.2%), meatal stenosis (4.2%), and adhesions (8.3%) were rare in our cohort. These rates are notably lower than those seen in circumcisions performed with Plastibell, which has been associated with up to 10–15% risk of delayed complications [5]. Safety outcomes in Gomco circumcision were favourable: bleeding requiring intervention was noted in only 6.2% of cases, and only one infant (2.1%) required re-intervention. Antibiotic use was limited to 14.6%, further supporting the low rate of infectious complications. These results are comparable to a Canadian retrospective review that reported an overall complication rate of 6.4% for Gomco procedures in infants under 3 months of age [18]. Cosmetic outcomes were excellent or good in 85.4% of cases, and none were rated poor. This aligns with findings by Freeman et al. who concluded that the Gomco clamp yielded the highest cosmetic satisfaction among circumcision techniques [14]. Importantly, our study identified statistically significant associations between the clamp size of the Gomco clamp and two key outcomes: bleeding requiring intervention (p=0.041) and cosmetic outcome (p=0.027). Smaller clamp sizes (particularly 1.1 cm) were associated with higher bleeding rates and more acceptable rather than excellent cosmetic grades. These findings are supported by research from Michigan, USA, where improper bell size selection was a leading factor for both bleeding and suboptimal cosmetic results [19]. This emphasizes the critical need for precise preoperative assessment and appropriate bell selection. A recent study also highlighted that over-tightening or improper Gomco clamp bell size selection could cause increased tissue trauma, leading to bleeding and delayed wound healing. Moreover, operator training has been shown to significantly impact complication rates, underscoring the need for standardized training protocols [20]. The low rate of re-intervention (2.1%) in our study is consistent with literature from high-income settings where structured follow-up and proper technique were applied [21].

CONCLUSIONS

Gomco clamp circumcision in neonates and infants was found to be a safe and effective procedure with minimal complications and high cosmetic satisfaction. Early and delayed complications were rare. A significant association was observed between clamp size and both bleeding requiring intervention and cosmetic outcome, highlighting the importance of appropriate clamp selection. The technique remains a reliable option when performed by trained professionals under sterile conditions.

Authors Contribution

Conceptualization: BAS
Methodology: BAS, AGA, SA, SQ, KA
Formal analysis: SMAB, KA
Writing review and editing: AGA, SA, SQ

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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