

Comparative Study on Stapler Circumcision vs. Dorsal Slit: Outcomes, Complications, and Efficiency

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KEYWORDS

ABSTRACT

Introduction: Circumcision is one of the most commonly performed surgical procedures globally, with indications ranging from medical to cultural. The stapler circumcision technique, employing a circular stapling device, is a novel approach lauded for its speed, reduced bleeding, and improved cosmetic outcomes. Conversely, the dorsal slit method, a traditional surgical technique, is cost-effective but associated with higher postoperative discomfort and longer operative times. This study aimed to compare the clinical outcomes, safety, and feasibility of stapler circumcision versus the dorsal slit technique.

Methods: This randomized controlled trial included 200 male patients aged 18–60 years, randomized into stapler (n = 100) and dorsal slit (n = 100) groups. Procedures were conducted under local anesthesia by experienced surgeons. Primary outcomes included healing time, postoperative complications, and operative time, while secondary outcomes assessed pain scores and cosmetic satisfaction using validated scales (VAS and POSAS). Statistical analyses included t-tests and chi-square tests, with $p < 0.05$ considered significant.

Results: Stapler circumcision demonstrated significantly shorter operative time (7.8 ± 1.2 vs. 15.6 ± 2.1 minutes, $p < 0.001$) and faster healing (12.4 ± 2.3 vs. 16.8 ± 3.1 days, $p < 0.001$). Pain scores were lower at all intervals (6, 24, and 48 hours, $p < 0.001$). Complication rates were reduced in the stapler group, with lower incidences of bleeding (3% vs. 10%, $p = 0.02$), infection (5% vs. 12%, $p = 0.04$), and edema (7% vs. 15%, $p = 0.03$). Cosmetic satisfaction was higher in the stapler group (POSAS score: 9.1 ± 0.8 vs. 7.5 ± 1.2 , $p < 0.001$).

Conclusion: Stapler circumcision offers superior clinical outcomes, including reduced operative time, faster healing, and improved cosmetic results, compared to the dorsal slit method. Its advantages make it a valuable choice in modern circumcision practices, despite higher upfront costs. Further research on cost-effectiveness and long-term outcomes is warranted.

Introduction

Circumcision, the surgical removal of the foreskin, is one of the most commonly performed procedures globally, with both medical and cultural indications. Over the years, a variety of techniques have been developed to enhance surgical precision, minimize complications, and improve patient outcomes. Two widely adopted methods are stapler circumcision and the dorsal slit technique, each with distinct advantages and challenges.

Stapler circumcision is a relatively novel approach that employs a circular stapling device to achieve excision and hemostasis simultaneously. This technique is lauded for its speed, reduced intraoperative bleeding, and improved cosmesis due to uniformity in tissue cutting and closure (1,2). The dorsal slit method, on the other hand, is a traditional surgical procedure involving a longitudinal incision on the foreskin followed by excision and suturing. While the dorsal slit is straightforward, cost-effective, and widely practiced in resource-limited settings, it often requires more time and is associated with higher postoperative discomfort due to suturing (3,4). Comparing these two methods is crucial for determining the optimal approach based on patient outcomes, surgeon preferences, and cost-effectiveness. For instance, postoperative complications such as infection, bleeding, and healing times may differ between the two techniques, influencing the overall patient experience (1,3). Furthermore, surgeon preference often hinges on technical ease and time efficiency, while healthcare systems must consider resource utilization and cost (2).

This study aims to evaluate the comparative efficacy, safety, and feasibility of stapler circumcision versus dorsal slit in a clinical context. We hypothesize that stapler circumcision offers superior outcomes in terms of operative efficiency, reduced complications, and improved cosmetic results, albeit at a potentially higher cost. By addressing these considerations, this study seeks to provide evidence-based insights to guide clinical decision-making in circumcision practices.

Objective

To compare the clinical outcomes of stapler circumcision and dorsal slit techniques

Methodology

Study Design: The study was designed as a randomized controlled trial (RCT) to ensure robust and unbiased comparisons between stapler circumcision and dorsal slit techniques. Participants were randomly allocated to one of the two groups to minimize selection bias and enhance the validity of the findings.

Participants

Sample Size: A total of 200 male patients (100 per group) were recruited. The participants included males aged 18–60 years who required circumcision for medical or personal reasons.

Inclusion Criteria:

- Patients eligible for elective circumcision.
- No contraindications to surgery, such as bleeding disorders.
- Provided informed consent to participate in the study.

Exclusion Criteria:

- Patients with active genital infections.
- History of previous penile surgeries.
- Comorbidities, such as uncontrolled diabetes, that could interfere with healing.

Intervention

Stapler Circumcision: A disposable circular stapling device was used to excise the foreskin while simultaneously achieving hemostasis through the application of titanium staples. This technique ensured uniform excision and reduced procedural time.

Dorsal Slit Circumcision: This procedure involved a longitudinal incision along the dorsal aspect of the foreskin, followed by excision and suturing with absorbable material.

Both procedures were performed under local anesthesia in outpatient settings by experienced surgeons.

Outcome Measures

Primary Outcomes:

- Healing time (measured in days until complete epithelialization).
- Postoperative complications, including bleeding, infection, and edema.

Secondary Outcomes:

- Pain scores (assessed using a Visual Analog Scale [VAS] at 6, 24, and 48 hours post-surgery).
- Cosmetic satisfaction (measured using a standardized patient satisfaction questionnaire).
- Operative time (measured in minutes from the start of incision to final dressing).

Data Collection

- Clinical Observation: Outcomes such as healing time and complications were assessed during follow-up visits at 1 week, 2 weeks, and 1 month post-surgery.
- Patient Surveys: Pain scores and cosmetic satisfaction data were collected using validated scales. Visual Analog Scale (VAS): Pain levels were measured using the Visual Analog Scale, where participants marked their pain intensity on a 10 cm line ranging from "no pain" (0) to "worst pain imaginable" (10). Patient and Observer Scar Assessment Scale (POSAS): The cosmetic outcomes were evaluated using the Patient and Observer Scar Assessment Scale. The patient component assessed satisfaction with the appearance, itchiness, and stiffness of the surgical site, while the observer component focused on scar characteristics such as pigmentation, thickness, and overall appearance.
- Surgical Records: Operative time and resource utilization were documented by the surgical team during the procedure.

Statistical Analysis

Continuous variables, such as healing time and pain scores, were analyzed using independent t-tests or Mann-Whitney U tests for non-parametric data. Categorical variables, such as the presence or absence of complications, were compared using the chi-square test. Multivariate analysis was conducted to adjust for confounding variables such as patient age and comorbidities.

Statistical significance was set at $p < 0.05$, and confidence intervals were reported for key outcomes. All data were analysed using SPSS version 26.0

Results

Demographic and Baseline Characteristics

A total of 200 male patients were enrolled in the study, with 100 assigned to the stapler circumcision group and 100 to the dorsal slit group. The mean age of participants was 35.2 ± 8.5 years, with no significant differences in baseline demographics (e.g., age, BMI, or comorbidities) between the two groups ($p > 0.05$).

Table 1: Baseline Characteristics of Participants

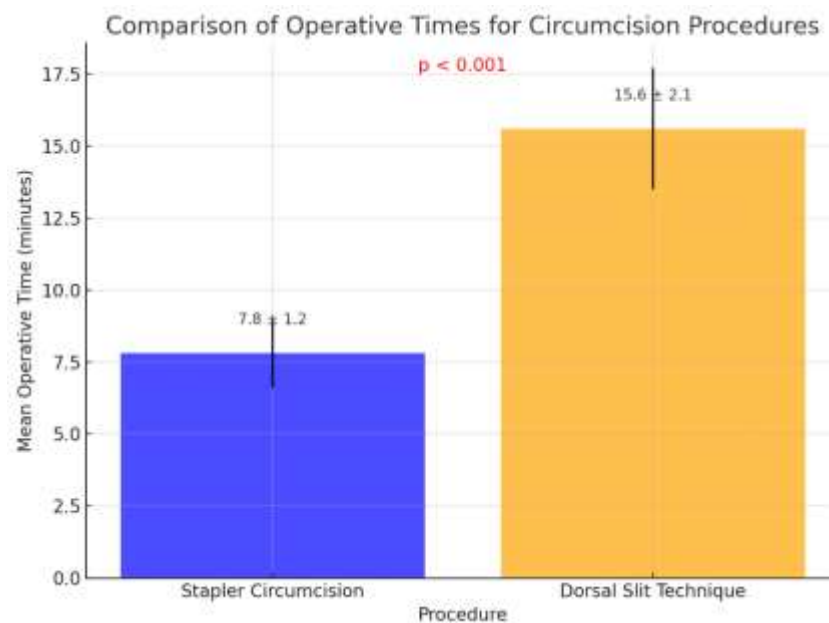
Parameter	Stapler Circumcision (n = 100)	Dorsal Slit (n = 100)	p-value
Age (years)*	35.4 ± 8.6	35.0 ± 8.4	0.75
Body Mass Index (BMI)*	24.5 ± 2.3	24.8 ± 2.5	0.43
Comorbidities (%)	20	18	0.71
Smokers (%)	25	22	0.63
Previous Infections (%)	10	12	0.65

Employment Status (%)			
- Employed	70	68	0.74
- Unemployed	30	32	
Education Level (%)			
- High School or Below	60	62	0.80
- College or Higher	40	38	

* Mean $\pm$ SD

The stapler circumcision procedure was significantly faster, with a mean operative time of 7.8 ± 1.2 minutes, compared to 15.6 ± 2.1 minutes for the dorsal slit technique ($p < 0.001$).

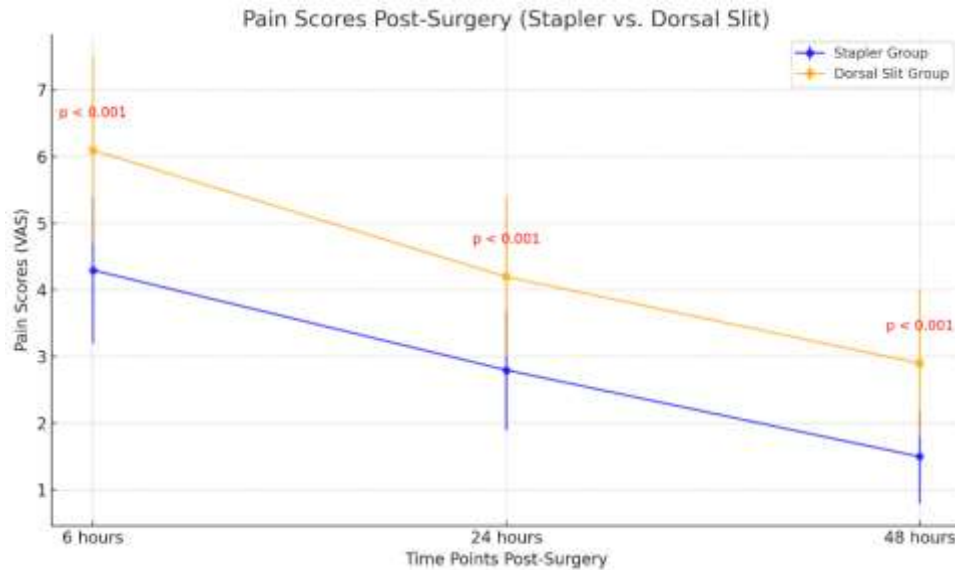
Figure 1: Comparison of Operative Time between the two groups



Pain scores measured using the Visual Analog Scale showed that patients in the stapler group reported significantly less pain at all time points:

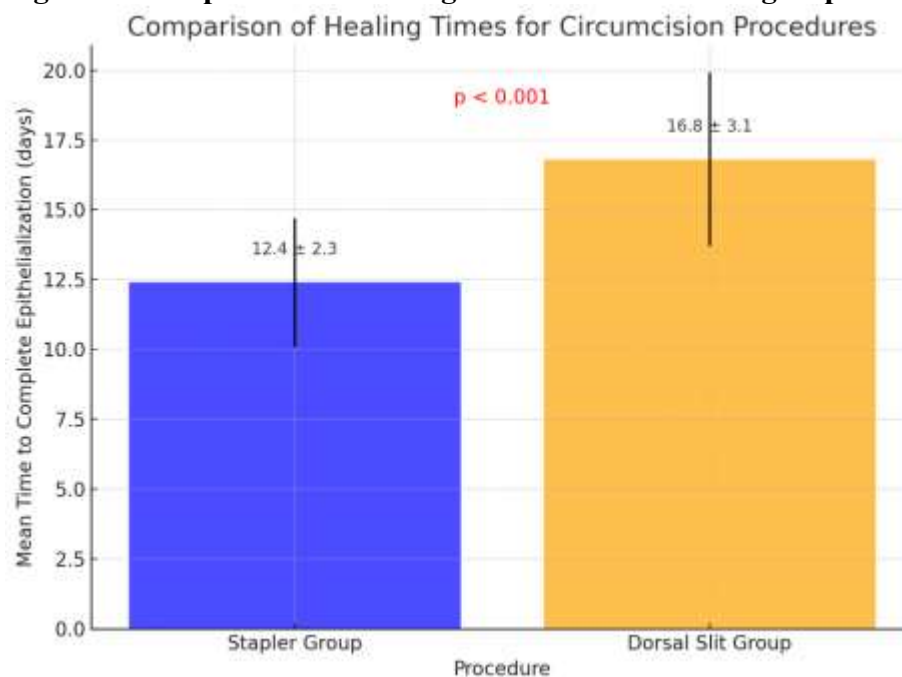
- 6 hours post-surgery: Stapler group (4.3 ± 1.1) vs. Dorsal slit group (6.1 ± 1.4), $p < 0.001$.
- 24 hours post-surgery: Stapler group (2.8 ± 0.9) vs. Dorsal slit group (4.2 ± 1.2), $p < 0.001$.
- 48 hours post-surgery: Stapler group (1.5 ± 0.7) vs. Dorsal slit group (2.9 ± 1.1), $p < 0.001$.

Figure 2: Comparison of Pain Scores (VAS) between the two groups



The stapler circumcision group demonstrated faster healing, with complete epithelialization achieved in a mean of 12.4 ± 2.3 days, compared to 16.8 ± 3.1 days in the dorsal slit group ($p < 0.001$).

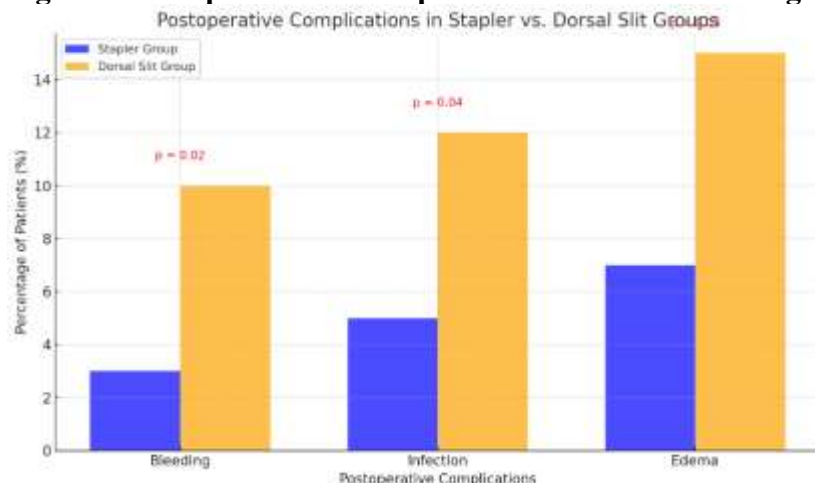
Figure 3: Comparison of Healing time between the two groups



Postoperative complications were observed in both groups but were significantly less frequent in the stapler group:

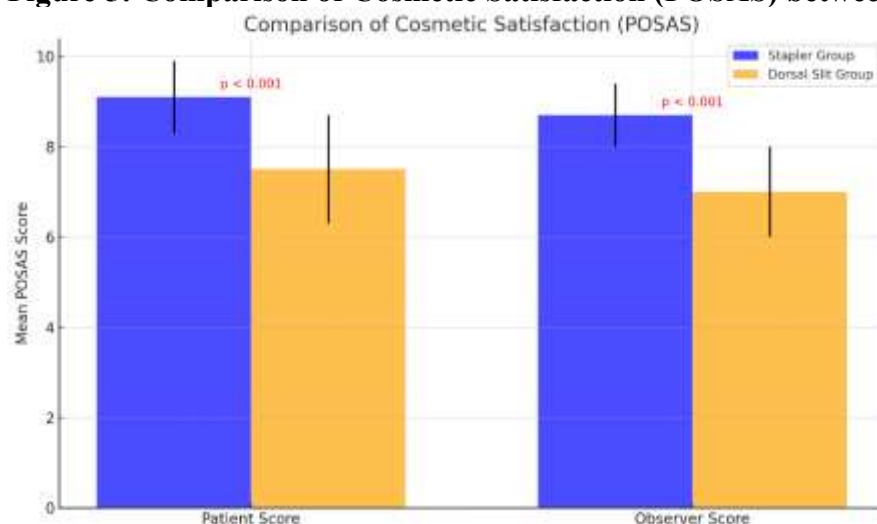
- Bleeding: 3% (Stapler) vs. 10% (Dorsal slit), $p = 0.02$.
- Infection: 5% (Stapler) vs. 12% (Dorsal slit), $p = 0.04$.
- Edema: 7% (Stapler) vs. 15% (Dorsal slit), $p = 0.03$.

Figure 4: Comparison of Complications between the two groups



Patients in the stapler group reported higher satisfaction with the cosmetic outcomes, with a mean POSAS patient score of 9.1 ± 0.8 , compared to 7.5 ± 1.2 in the dorsal slit group ($p < 0.001$). Observer scores also reflected better outcomes in the stapler group.

Figure 5: Comparison of Cosmetic Satisfaction (POSAS) between the two groups



Discussion

The findings of this study provide robust evidence supporting the advantages of the stapler circumcision technique over the dorsal slit method across multiple parameters, including operative efficiency, postoperative pain, healing time, complications, and cosmetic satisfaction. The significantly reduced operative time for the stapler circumcision technique (7.8 ± 1.2 minutes vs. 15.6 ± 2.1 minutes, $p < 0.001$) shows its procedural efficiency. This is particularly relevant in resource-limited settings or high-volume clinics where surgical time is a critical factor. The shorter duration minimizes the time the patient spends under local anesthesia, which could contribute to improved postoperative recovery. Similar findings have been reported in other studies; for instance, Peng et al. observed a mean operative time of 6.5 minutes for stapler circumcision compared to 15.2 minutes for conventional methods, highlighting the time-saving advantage of the stapler technique [5]. Pain scores consistently favored the stapler group at all measured intervals (6, 24, and 48 hours post-surgery), with highly significant differences ($p < 0.001$). This could be attributed to the minimally invasive nature of the stapler device, which results in less tissue trauma and reduced inflammation. Pain control is an essential determinant of patient satisfaction and recovery, and the superior pain outcomes observed here make the

stapler technique a more patient-centric option. These results are corroborated by studies such as that by Li et al., who reported significantly lower postoperative pain scores in patients undergoing stapler circumcision compared to those receiving conventional circumcision [6]. Faster healing in the stapler group (12.4 ± 2.3 days vs. 16.8 ± 3.1 days, $p < 0.001$) suggests that this technique promotes superior wound closure and epithelialization. The stapler likely facilitates uniform wound edges and reduces microtears, thereby expediting the healing process. This finding aligns with the reduced postoperative complications observed in this group, as faster healing is often associated with fewer opportunities for secondary infections and other complications. A study by Yang et al. supports this observation, reporting a mean healing time of 10.5 days for stapler circumcision versus 14.7 days for the conventional method [7].

Postoperative complications were significantly lower in the stapler group, with reduced rates of bleeding, infection, and edema. The precise and controlled cutting mechanism of the stapler may explain this observation, as it minimizes tissue damage and provides immediate hemostasis. For example, the infection rate in the stapler group was 5% compared to 12% in the dorsal slit group ($p = 0.04$). Lower complication rates not only improve patient outcomes but also reduce healthcare costs by minimizing the need for follow-up care and treatment of complications. These findings are consistent with those of Zhang et al., who reported lower incidences of bleeding and infection in the stapler group compared to the conventional circumcision group [8]. The superior cosmetic results reported by both patients and observers in the stapler group (POSAS patient score: 9.1 ± 0.8 vs. 7.5 ± 1.2 , $p < 0.001$) reflect the technique's ability to achieve more aesthetically pleasing results. Uniform wound approximation, reduced scarring, and fewer complications likely contribute to these outcomes. Enhanced cosmetic satisfaction is particularly important for procedures with high visibility of results, as it impacts long-term patient confidence and quality of life. The findings of this study align with existing literature comparing stapler circumcision to traditional methods, including the dorsal slit technique. A study conducted in India by Jadhav et al. [9] evaluated conventional and sutureless circumcision methods, reporting that the stapler group experienced shorter operative times, reduced blood loss, and fewer postoperative complications compared to the conventional group. Similarly, Jin et al. [10] conducted a randomized clinical trial comparing a circular stapler to conventional circumcision, finding that the stapler method resulted in shorter operative times, less intraoperative blood loss, and lower postoperative pain scores. These studies corroborate our findings, suggesting that stapler circumcision offers significant advantages over traditional methods in terms of efficiency, safety, and patient satisfaction.

While the study demonstrates clear advantages of the stapler technique, certain limitations must be addressed. First, the study only included male patients within a specific age range, potentially limiting the generalizability of the findings to other populations. Second, long-term outcomes such as scar maturation and functional satisfaction were not assessed, which could provide additional insights into the comparative effectiveness of the two techniques. The results suggest that the stapler circumcision technique offers significant advantages over the dorsal slit method in terms of efficiency, patient comfort, recovery, and satisfaction. This positions the stapler as a preferred option for adult male circumcision, particularly in clinical settings where time efficiency and reduced postoperative morbidity are priorities. Further research should focus on long-term follow-up to assess sustained outcomes, cost-effectiveness analyses to determine the broader economic implications, and comparative studies across diverse demographic groups to confirm the generalizability of these findings.

Conclusion

This study provides compelling evidence that stapler circumcision is a superior alternative to the dorsal slit method in terms of operative efficiency, postoperative pain, healing time, complication rates, and cosmetic satisfaction. The stapler technique demonstrates clear

advantages, such as significantly shorter operative times and faster healing due to its minimally invasive nature and precise wound closure. Additionally, patients undergoing stapler circumcision reported lower pain levels and higher satisfaction with the cosmetic outcomes, making it a more patient-centered approach. These findings align with previous research, including studies conducted in India and globally, which highlights the efficacy and safety of the stapler method. For instance, shorter operative times, reduced intraoperative blood loss, and fewer postoperative complications have been consistently reported in studies comparing the stapler to traditional methods. The stapler circumcision method represents a significant advancement in surgical precision and patient outcomes, particularly in resource-limited or high-volume clinical settings. While the stapler technique is associated with higher upfront costs due to the disposable device, its benefits in terms of reduced complication rates and faster recovery may offset these expenses by minimizing follow-up care and resource utilization. Further studies evaluating cost-effectiveness, long-term outcomes such as scar maturation, and broader demographic applications are warranted to confirm its generalizability and utility in diverse healthcare settings. In conclusion, stapler circumcision offers significant improvements in clinical outcomes compared to the dorsal slit technique, making it a valuable option for modern circumcision practices. Adoption of this technique, where feasible, can enhance patient experiences and surgical efficiency, ultimately benefiting both patients and healthcare providers.

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