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Prospective Comparative Study of Adult Circumcision with Circular Stapler Versus Dorsal Slit Technique

[1]Dr. P. Nikhil Bharadwaj, [2]Dr. Nivetha Uthayasuriyan, [3]Dr. Ajay Raja A, [4]Dr. SM Gurutham Prahalad Reddy, [5]Dr. Rajarajan Krishnamoorthy

[1]Junior resident, Department of general surgery, SRM Medical College Hospital and Research Centre, Faculty of medicine and health sciences, SRM institute of science and Technology, kattankulathur, Chengalpattu, Tamil Nadu, India
Email id: pb384l@ srmist.edu.in Orcid id: 0009-0002-0892-4489
[2]Junior resident,Department of General Surgery, SRM Medical College Hospital & Research Centre, Faculty of Medicine and Health Sciences, SRM institute of science and Technology, Kattankulathur, Chengalpattu, Tamil Nadu,India
Email id: niveuthayaOO@gmail.com Orcid id:0009-0008-4617-1311
[3]Professor, Department of general surgery, SRM Medical College Hospital and Research Centre, Faculty of medicine and health sciences, SRM institute of science and Technology, kattankulathur, Chengalpattu, Tamil Nadu, India
Email id: ajayraja@srmist.edu.in Orcid id: 0009000965263243
[4]Junior resident, Department of general surgery,SRM Medical College Hospital and Research Centre, Faculty of medicine and health sciences, SRM institute of science and Technology, kattankulathur, Chengalpattu, Tamil Nadu, India(Corresponding author)
Email id: Prahalad.official@gmail.com Orcid id: 0009-0004-1683-339 7
[5]Assistant Professor, Department of general surgery, SRM Medical College Hospital and Research Centre, Faculty of medicine and health sciences, SRM institute of science and Technology, kattankulathur, Chengalpattu, Tamil Nadu, India.
Email id: rajarajk@srmist.edu.in Orcid id: 0009-0007-3596-4124

ABSTRACT:

Background: Male circumcision is one of the most commonly performed surgical procedures worldwide and is undertaken for medical, hygienic, and cultural reasons. Conventional circumcision techniques such as the dorsal slit method are effective but may be associated with longer operative time, increased intraoperative blood loss, postoperative pain, and variable cosmetic outcomes. Recently, device-assisted techniques such as circular stapler circumcision have been introduced to improve surgical efficiency and patient outcomes. The present study was conducted to prospectively compare the safety, effectiveness, and postoperative outcomes of circular stapler circumcision with the conventional dorsal slit technique in adult male patients.

Methods: This prospective comparative study was conducted at tertiary care center over a period of 12 months. A total of 196 adult male patients undergoing elective circumcision were included and equally divided into two groups: Group 1 (Stapler technique, n = 98) and Group 2 (Dorsal slit technique, n = 98). Demographic characteristics, indications for circumcision, operative time, intraoperative blood loss, postoperative pain scores, wound healing duration, complications, cosmetic outcome, patient satisfaction, duration of hospital stay, and return to normal activities

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were recorded and analyzed. Statistical analysis was performed using SPSS software, and differences between groups were assessed using appropriate statistical tests with $p < 0.05$ considered statistically significant.

Results: The mean operative time was significantly shorter in the group 1(8.42 ± 1.96 minutes) compared with the group 2 (21.38 ± 3.74 minutes, $p < 0.001$). Intraoperative blood loss was also significantly lower in the group 1 (3.12 ± 1.04 ml) than in the group 2 (12.86 ± 3.48 ml, $p < 0.001$). Postoperative pain scores at 6, 24, and 48 hours were significantly lower in the group 1 ($p < 0.001$). Wound healing occurred faster in the group 1 (12.48 ± 2.16 days) compared with the group 2 (17.92 ± 3.84 days, $p < 0.001$). Postoperative complications were observed in 11.2% of patients in the group 1 and 26.5% in the group 2 ($p = 0.018$). Cosmetic outcomes and patient satisfaction were higher in the group 1, and the duration of hospital stay was significantly shorter (1.84 ± 0.62 vs 3.12 ± 1.08 days, $p < 0.001$).

Conclusion: The findings of the present study demonstrate that circular stapler circumcision offers several advantages over the conventional dorsal slit technique. The stapler method significantly reduces operative time and intraoperative blood loss while providing better postoperative comfort, faster wound healing, improved cosmetic outcomes, and higher patient satisfaction.

INTRODUCTION

For reasons related to faith, tradition, and health male circumcision is among the most traditional and frequent surgical procedures carried out globally. It is performed on both adult and juvenile populations and involves the preparatory skin, or foreskin, covering the surface of the male reproductive organ is cut off. Beyond local penile conditions, circumcision has been associated with broader public health benefits. Multiple epidemiological and Surgery reduces the risk of acquiring AIDS, HPV, and additional STDs, according to randomized trials. Meta-analyses and randomized trials conducted in different populations have shown a protective effect of circumcision against HIV transmission and genital ulcer disease, making it an important preventive strategy in high-risk settings (5–7). Despite its benefits, circumcision performed using conventional surgical methods for instance, the super incision or sleeve removal method is associated with certain limitations. Traditional techniques can be time-consuming and may cause problems such bleeding, oedema, infection, pain, and unsatisfactory cosmetic results. Reports from clinical studies and systematic reviews indicate that postoperative complications, though usually minor, remain a concern and may affect patient satisfaction and recovery (11–13). Furthermore, conventional procedures often require meticulous hemostasis and suturing, increasing operative time and technical demand, particularly in busy surgical settings (14,15).

In recent years, newer circumcision devices have been introduced to improve surgical efficiency and patient outcomes. Among these, circular stapler and disposable suture devices have gained popularity due to their ability to provide simultaneous cutting and stapling of the foreskin, thereby reducing operative time and intraoperative blood loss. Clinical trials and comparative studies have demonstrated that these devices may offer advantages such as shorter procedure duration, reduced postoperative pain, better cosmetic results, and faster wound healing compared with conventional techniques (16–20). Several randomized controlled trials and meta-analyses have reported lower complication rates and higher patient satisfaction with stapler-based or device-assisted circumcision, suggesting that these methods could represent a safe and effective alternative to traditional approaches (21–24).

The circular stapler device, in particular, has been developed to standardize the circumcision procedure and minimize intraoperative variability. It is made up of an exterior bell and an interior bell that encase the foreskin, allowing for precise excision and simultaneous stapling of the wound edges. This mechanism provides effective hemostasis and reduces the need for suturing, thereby simplifying the procedure and potentially improving surgical outcomes. Studies evaluating circular stapler circumcision in adults have demonstrated favorable findings include the length of the procedure, blood loss, frequency of complications, and aesthetic attractiveness (25–30). Nevertheless, despite these seeming advantages, there is still little use of these devices in many clinical settings, and more comparative research is required to verify

their effectiveness. A prospective comparison between circular stapler circumcision and the dorsal slit method can help determine variations in healing time, patient satisfaction, postoperative issues, intraoperative blood loss, and surgical time. Such evidence is crucial for guiding clinical decision-making and improving surgical practice. To analyze and compare the operating time between the circular stapler, dorsal slit technique. To assess the intraoperative blood loss in both groups and determine if the circular stapler reduces blood loss. To assess how frequently the two approaches, result in postoperative problems such bleeding, oedema, infection, and wound dehiscence. To compare the cosmetic results of circumcision utilizing the dorsal slit method versus the circular stapler. To compare the two groups' overall wound recovering times and patient satisfaction. In order to compare adult male genital mutilation utilizing a circular stapler with the traditional super incision procedure, the current study was conducted. By evaluating operative parameters, postoperative outcomes, and patient-reported satisfaction, this study aims to provide proof of the circular stapler method's clinical usefulness, safety, and effectiveness in adult circumcision. The results of this study should help improve surgical methods and enhancing patient outcomes in routine clinical practice.

MATERIAL AND METHODS:

Study Design: The research was carried out as a planned exploratory comparative study at teritery care center and investigation was done over a period of 12 months.

Inclusion criteria was male patients aged 18 years and above, patients choosing for elective circumcision (for medical, cultural, or personal reasons), patients who were in good general condition and able to undergo a modest surgical treatment, patients who given written informed agreement to involve in the study. While exclusion criteria was patients with coagulopathy or bleeding disorders, patients with known allergies to materials used in the circular stapler or conventional circumcision techniques. Patients with active genital infections, such as balanitis, sexually transmitted infections (STis), or other penile skin conditions. Patients with uncontrolled diabetes or other chronic systemic diseases that could impair wound healing. Patients currently undergoing immunosuppressive therapy or corticosteroid treatment. Patients who were unable or unwilling to follow postoperative care instructions.

Methodology: The study included every patient who met the inclusion criteria and was brought into the tertiary care center general surgery department for circumcision. Every patient involved in the study gave their informed consent. Two groups of patients were observed: Patients who had circumcision using the stapler technique made up Group 1, while those who underwent circumcision using the dorsal slit technique made up Group 2. Clinical history was taken thoroughly with demographic details such as age, sex, co-morbidities, and biochemical parameters. Patients were posted for the procedure after obtaining informed consent. During the procedure, intraoperative time and blood loss were recorded. Postoperative pain, healing time, edema, and infection were recorded and assessed in both groups.

Statistical Tools: Standard statistical software, including Microsoft Excel and SPSS (Statistical Package for the Social Sciences) version 25.0, was used to conduct statistical analysis for thecurrent study. The independent Student's t-test (or Mann-Whitney U test for non-parametric data) was used to compare continuous variables including healing time, intra-operative blood loss, and operative time between the two groups. These variables were expressed as mean ± standard deviation. The Chi-square test or Fisher's exact test were used to compare categorical data, such as postoperative complications, oedema, infection, and patient satisfaction, which were expressed as frequencies and percentages. Statistical significance was defined as a p-value of less than 0.05. Data were shown using charts, tables, and bar graphs and appropriate comparative statistical tests were applied to evaluate differences between Group A (stapler technique) and Group B (dorsal slit technique).

RESULTS

Age Distribution: The study included 196 patients, with 98 patients in each of Group 1 (stapler technique) and Group 2 (dorsal slit technique). Group 1's interquartile range (IQR) was 26–40 years, median age was 32 years, and mean age was 33.84 ± 9.62 years. The overall age distribution in the study population from 18 to 65 years. The most common age group in both study arms was 26–35 years, followed by 36–45 years. When the two groups' mean ages were compared using the independent Student's t-test, there was no statistically significant difference ($p = 0.78$), suggesting that the baseline age distribution of both groups was similar. (Table:1)

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Table 1: Age Distribution In Both Groups (n = 196)

Age group (years)	Group 1 Stapler (n=98)	%	Group 2 Dorsal slit (n=98)	%
18–25	18	18.4	16	16.3
26–35	34	34.7	36	36.7
36–45	24	24.5	25	25.5
46–55	15	15.3	14	14.3
56–65	7	7.1	7	7.1
Total	98	100	98	100

Socioeconomic Status: All 196 patients 98 in Group 1 (stapler technique) and 98 in Group 2 (dorsal slit technique) had their socioeconomic level evaluated. Socioeconomic classification was based on modified Kuppuswamy scale categories: lower, lower-middle, upper-middle, and upper class. In Group 1, 41.8% of patients belonged to the lower-middle class, 27.6% to upper- middle class, 20.4% to lower class, and 10.2% to upper class. In Group 2, 43.9% were lower- middle class, 26.5% upper-middle class, 19.4% lower class, and 10.2% upper class. The socioeconomic distribution of the two groups did not differ statistically significantly when compared using the Chi-square test (p = 0.93), indicating that both groups were comparable in baseline socioeconomic characteristics. (Table:2)

Table 2: Socioeconomic Status (n = 196)

Socioeconomic class	Group 1Stapler (n=98)	%	Group 2 Dorsal slit (n=98)	%
Upper class	10	10.2	10	10.2
Upper-middle	27	27.6	26	26.5
Lower-middle	41	41.8	43	43.9
Lower class	20	20.4	19	19.4
Total	98	100	98	100

p-value: 0.93 (Not significant)

Indications for Circumcision

The study included 196 adult male patients in total, with 98 patients each in Group 1 (stapler technique) and Group 2 (dorsal slit technique). In Group 1, phimosis accounted for 42.9% of cases, recurrent balanoposthitis 22.4%, recurrent infections 12.2%, personal hygiene 10.2%, and religious/cosmetic reasons 12.3%. In Group 2, phimosis accounted for 44.9%, recurrent balanoposthitis 21.4%, recurrent infections 11.2%, personal hygiene 9.2%, and religious/cosmetic reasons 13.3%. The two groups were equivalent in terms of surgical indications, according to statistical comparison, which revealed no significant difference between them (p = 0.94) (Table:3).

Table 3 : Indications For Circumcision (N = 196)

Indication	Group 1 Stapler (n=98)	%	Group 2 Dorsal slit (n=98)	%

Phimosis	42	42.9	44	44.9
Recurrent balanoposthitis	22	22.4	21	21.4
Recurrent infections	12	12.2	11	11.2
Poor hygiene	10	10.2	9	9.2
Religious/cosmetic	12	12.3	13	13.3
Total	98	100	98	100

p-value: 0.94 (Not significant)

Operative Time: The study comprised 196 individuals in all, 98 of whom were in Group 1 (stapler circumcision) and Group 2 (dorsal slit circumcision). Time for operation was recorded from the start of the procedure to completion of dressing. The average operative time in Group 1 was 8.42 ± 1.96 minutes, whereas in Group 2 it was 21.38 ± 3.74 minutes, demonstrating a markedly shorter duration for the stapler technique. The median operative time was 8 minutes (IQR: 7–10 minutes) in Group 1 and 21 minutes (IQR: 19–24 minutes) in Group 2. This indicates that stapler circumcision significantly reduces operative duration compared to the dorsal slit technique (Table:4).

Table 4: Operative Time Comparison (n = 196)

Parameter	Group 1 Stapler (n=98)	Group 2 Dorsal slit (n=98)	p-value
Mean operative time (min)	8.42 ± 1.96	21.38 ± 3.74	<0.001
Median (min)	8	21	
IQR	7–10	19–24	

Intraoperative Blood Loss: The study comprised 196 patients in total, with 98 patients in each of Group 1 (stapler technique) and Group 2 (dorsal slit technique). Standard gauze piece estimation and, when appropriate, suction measurement were used to monitor intraoperative blood loss. Group 1's mean intraoperative blood loss was 3.12 ± 1.04 ml, while Group 2's was

12.86 ± 3.48 ml, indicating much less blood loss in the stapler group. Group 1's median blood loss was 3 ml (IQR: 2–4 ml), while Group 2's was 12 ml (IQR: 10–15 ml). This suggests that when compared to the dorsal slit approach, stapler circumcision considerably lowers intraoperative hemorrhage. Since the data had a normal distribution, the mean and standard deviation were employed for analysis, and the dispersion assessment was supported by the median and IQR (Table:5)

Table 5 : Intraoperative Blood Loss (N = 196)

Parameter	Group 1 Stapler (n=98)	Group 2 Dorsal slit (n=98)	p-value
Mean blood loss (ml)	3.12 ± 1.04	12.86 ± 3.48	<0.001
Median (ml)	3	12	
IQR	2–4	10–15	

Postoperative Pain Assessment: The Visual Analogue Scale (VAS) was used to measure postoperative pain in all 196 patients six, twenty-four, and forty-eight hours following surgery. 98 individuals had stapler circumcision in Group 1, and 98 patients got dorsal slit circumcision in Group 2. The mean VAS score at 6 hours in Group 1 was 3.82 ± 0.94 compared to 6.14 ± 1.12 in

Group 2. At 24 hours, the mean pain score in Group 1 was 2.46 ± 0.88 compared to 4.38 ± 1.05 in Group 2. At 48 hours, the mean score further reduced to 1.32 ± 0.62 in Group 1 and 2.74 ±

0.81 in Group 2. At 24 hours, Group 1's median VAS score was 2 (IQR: 2–3), while Group 2's was 4 (IQR: 3–5). Group 1 saw a significantly significant decrease in postoperative pain at all time intervals ($p < 0.001$), according to statistical analysis utilizing an independent Student's t- test. These results show that, in comparison to the dorsal slit procedure, stapler circumcision is linked to much less postoperative pain. (Table:6)

Table 6: Postoperative Pain Scores (VAS)

Time after surgery	Group 1 Stapler (n=98)	Group 2 Dorsal slit (n=98)	p-value
6 hours	3.82 ± 0.94	6.14 ± 1.12	<0.001
24 hours	2.46 ± 0.88	4.38 ± 1.05	<0.001
48 hours	1.32 ± 0.62	2.74 ± 0.81	<0.001

Postoperative Complications: The study comprised 196 patients in total, 98 of them were in Group 1 (stapler technique) and Group 2 (dorsal slit technique). Bleeding, oedema, infection, wound dehiscence, and delayed healing were among the postoperative problems evaluated. Group 1 had lower overall complication rates than Group 2. Complications were noted in 11 patients (11.2%) in Group 1 and 26 patients (26.5%) in Group 2. Oedema was the most frequent consequence in both groups, followed by minor bleeding and moderate infection. In Group 1, postoperative edema occurred in 5.1%, bleeding in 2.0%, infection in 3.1%, and wound dehiscence in 1.0% of patients. In Group 2, edema occurred in 12.2%, bleeding in 5.1%, infection in 6.1%, and wound dehiscence in 3.1% of patients. Chi-square test ($p = 0.018$), suggesting that the stapler group experienced fewer issues. (table:7)

Table 7: Postoperative Complications (N = 196)

Complication	Group 1 Stapler (n=98)	%	Group 2 Dorsal slit (n=98)	%
Bleeding	2	2.0	5	5.1
Edema	5	5.1	12	12.2
Infection	3	3.1	6	6.1
Wound dehiscence	1	1.0	3	3.1
Total complications	11	11.2	26	26.5

p-value: 0.018 (Significant)

Wound Healing Duration: All 196 individuals in the research had their wound healing times measured; 98 participants in Group 1 (stapler circumcision) and 98 patients in Group 2 (dorsal slit circumcision). The mean wound healing duration in Group 1 was 12.48 ± 2.16 days, whereas in Group 2 it was 17.92 ± 3.84 days, demonstrating faster healing in the stapler group. The median healing duration was 12 days (IQR: 11–14 days) in Group 1 and 18 days (IQR: 15–21 days) in Group 2. An independent Student's t-test statistical comparison shows a significantly significant difference ($p < 0.001$) between the two groups. These findings indicate that stapler circumcision results in earlier wound healing

compared with the dorsal slit technique. (Table: 8) Table 8: Wound Healing Duration (N = 196)

Parameter	Group 1 Stapler (n=98)	Group 2 Dorsal slit (n=98)	p-value
Mean healing time (days)	12.48 ± 2.16	17.92 ± 3.84	<0.001
Median (days)	12	18	
IQR	11–14	15–21	

Cosmetic Outcome and Patient Satisfaction: At the 4-week follow-up, all 196 patients (98 in Group 1: stapler technique; 98 in Group 2: dorsal slit technique) had their cosmetic outcome and patient satisfaction evaluated. Based on the look of the scar, the cosmetic result was rated as superb, acceptable, satisfactory, or poor, symmetry, and patient perception. In Group 1, an excellent cosmetic outcome was observed in 61 patients (62.2%), good in 25 (25.5%),

satisfactory in 9 (9.2%), and poor in 3 (3.1%). In Group 2, excellent outcome was observed in 42

patients (42.9%), good in 30 (30.6%), satisfactory in 18 (18.4%), and poor in 8 (8.1%). Overall, favorable cosmetic outcome (excellent + good) was seen in 87.7% of patients in Group 1 compared with 73.5% in Group 2. A 5-point Likert scale (extremely satisfied to very dissatisfied) was used to gauge patient satisfaction. In Group 1, very satisfied patients were 64.3%, satisfied 24.5%, neutral 7.1%, and dissatisfied 4.1%. In Group 2, very satisfied were 45.9%, satisfied 28.6%, neutral 15.3%, and dissatisfied 10.2%. Chi-square statistical analysis revealed a noteworthy variation in overall satisfaction and cosmetic outcome between groups ($p = 0.012$). These findings indicate higher patient satisfaction and better cosmetic results in the stapler group. (Table: 9,10)

Table 9: Cosmetic Outcome (N = 196)

Outcome	Group 1 Stapler (n=98)	%	Group 2 Dorsal slit (n=98)	%
Excellent	61	62.2	42	42.9
Good	25	25.5	30	30.6
Satisfactory	9	9.2	18	18.4
Poor	3	3.1	8	8.1
Total	98	100	98	100

p-value: 0.012 (Significant)

Table 10: Patient Satisfaction

Satisfaction level	Group 1 Stapler	%	Group 2 Dorsal slit	%
Very satisfied	63	64.3	45	45.9
Satisfied	24	24.5	28	28.6
Neutral	7	7.1	15	15.3
Dissatisfied	4	4.1	10	10.2

p-value: 0.012 (Significant)

Duration of Hospital Stay

All 196 patients in the study, 98 of them were in Group 1 (stapler circumcision) and Group 2 (dorsal slit circumcision), had their length of hospital stay measured. Patients in the stapler group spent less time in the hospital, however most patients in both groups were released early. Group 1's mean stay was 1.84 ± 0.62 days, whereas Group 2's was 3.12 ± 1.08 days. In Group 1, the median length of hospital stay was two days (IQR: 1–2 days), while in Group 2, it was three days (IQR: 2–4 days). An independent Student's t-test comparison revealed a highly significant difference ($p < 0.001$) between the two groups, indicating that patients undergoing stapler circumcision had a shorter hospitalization compared with those undergoing dorsal slit circumcision. The shorter duration of hospitalization in the stapler group reflects reduced postoperative discomfort, fewer complications, and faster recovery. (Table: 11)

Table 11: Duration Of Hospital Stay (N = 196)

Parameter	Group 1 Stapler (n=98)	Group 2 Dorsal slit (n=98)	p-value
Mean stay (days)	1.84 ± 0.62	3.12 ± 1.08	<0.001
Median (days)	2	3	
IQR	1–2	2–4	

Return to Normal Activities: All 196 patients 98 in Group 1 (stapler circumcision) and 98 in Group 2 (dorsal slit circumcision) were evaluated for return to regular activities. Resuming regular daily tasks without any discomfort or limitations was referred to as normal activities. The average amount of time needed to resume regular activities in Group 1 was 5.42 ± 1.36 days, whereas in Group 2 it was 9.18 ± 2.44 days, indicating faster recovery in the stapler group. The median time was 5 days (IQR: 4–6 days) in Group 1 and 9 days (IQR: 7–11 days) in Group 2. An independent Student's t-test comparison revealed a highly significant difference ($p < 0.001$) between the two groups. This demonstrates that patients undergoing stapler circumcision returned to routine activities significantly earlier compared with those undergoing dorsal slit circumcision, reflecting faster recovery and less postoperative discomfort. (Table: 12)

Table 12: Return To Normal Activities (n = 196)

Parameter	Group 1 Stapler (n=98)	Group 2 Dorsal slit (n=98)	p-value
Mean days to return	5.42 ± 1.36	9.18 ± 2.44	<0.001
Median (days)	5	9	
IQR	4–6	7–11	

DISCUSSION

Age, Occupational Status and Educational Status: There were 196 adult male patients in the current study, with 98 individuals in each of the dorsal slit and stapler groups. The overall mean age of the study population was in the third to fourth decade, with Group 1 showing a mean age of 33.84 ± 9.62 years and Group 2 34.21 ± 9.48 years, there is no statistically significant change ($p > 0.05$). 26–35 years old accounted for the bulk of sick person, with 36–45 years old coming in second, followed by 36–45 years. Most participants were engaged in manual or semi-skilled occupations, reflecting the working-age population undergoing circumcision for functional and hygiene reasons. Educational status analysis showed that most patients had secondary level education, followed by graduates, with very few illiterate patients. These findings indicate that Young to elderly working men made up the majority of the study group with basic to moderate educational background, which is

consistent with patients seeking elective circumcision for medical or hygiene indications. These baseline demographic findings were comparable with previously published studies. Krishnamoorthy et al (25) reported a mean age of 35.2 ± 8.5 years among adult circumcision patients, with comparable baseline demographics between groups. Purushotham et al (30) observed that Similar to the current study, the majority of patients were between the ages of 26 and 35. Jaiswal et al (31) reported mean ages of 18.76 years and 18.13 years in their comparative study, indicating inclusion of younger adults but still within the active working population. Jin et al (28) included adult males aged 18–70 years, with most participants belonging to the economically productive age group. In pediatric-focused literature, Khan et al

(26) reported mean ages around 8–9 years, reflecting a different population; however, this highlights that adult circumcision studies consistently involve individuals in active occupational age groups. Overall, the current study's demographic composition is in line with previous research, where circumcision is most commonly performed in young and middle-aged males with comparable educational and occupational backgrounds. (Table 13)

Table 13: Comparing Demographic Profile With Other Studies

Parameter	Present study	Krishnamoorthy et al (71)	Khan et al (72)	Karaganvi et al (73)	Jin et al (74)	Purushotham et al (76)	Jaiswal et al (77)
Sample size	196	200	60	50	879	24	40
Age group	Adults ≥ 18 yrs	18–60 yrs	Pediatric	Adults	18–70 yrs	Adults	Adults
Mean age	~34 yrs	35.2 ± 8.5 yrs	8–9 yrs	Not specified	Adult cohort	Mostly 26–35 yrs	~18 yrs
Most common age	26–35 yrs	Working age adults	6–10 yrs	Young adults	Working age	26–35 yrs	Young adults
Occupational status	Majority working males	Working population	Not applicable	Not specified	Working males	Working adults	Students/young adults
Education	Secondary level majority	Comparable baseline	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed

Indications, Operative Time and Intraoperative Blood Loss: This distribution is consistent with adult circumcision indications reported in literature, where phimosis remains the primary clinical indication. With respect to operative parameters, the mean operative time in the present study was 8.42 ± 1.96 minutes in the stapler group compared with 21.38 ± 3.74 minutes in The group with dorsal slits ($p < 0.001$). Similarly, the stapler group experienced considerably less intraoperative blood loss (3.12 ± 1.04 ml) compared to the dorsal slit group (12.86 ± 3.48 ml, $p < 0.001$). These findings indicate that stapler circumcision is associated with shorter operative duration and better hemostasis. Previous investigations have revealed similar results. The stapler group's operating time was 7.8 ± 1.2 minutes, while the dorsal slit group's was 15.6 ± 2.1 minutes, according to Krishnamoorthy et al. (25), with

significant reduction in blood loss and complications. Karaganvi et al (27) observed operative time of 12.0 ± 2.5 minutes in stapler circumcision compared with 37.0 ± 7.5 minutes in conventional circumcision ($p < 0.001$). Jin et al (28) reported mean operative time of 6.8 ± 3.1 minutes and minimal blood loss (1.8 ± 1.8 ml) in stapler circumcision. Purushotham et al (30) demonstrated operative time of 6.8 ± 1.5 minutes in the stapler group compared with 24.2 ± 3.41 minutes in conventional circumcision, with significantly reduced blood loss (1.8 ± 0.68 ml vs 9.46 ± 1.19 ml). Huang et al (29) in a network meta-analysis also reported significantly reduced operative time and intraoperative blood loss with device-assisted circumcision techniques. These findings collectively support the observation that stapler circumcision significantly reduces operative time and intraoperative bleeding compared with conventional techniques (Table 14)

Table 14: Comparision Of Indications ,Operative Time And Blood Loss With Other Studies

Study	Common indication	Operative time (Stapler)	Operative time (Conventional)	Blood loss (Stapler)	Blood loss (Conventional)
Present study	Phimosis (~43– 45%)	8.42 ± 1.96 min	21.38 ± 3.74 min	3.12 ± 1.04 ml	12.86 ± 3.48 ml
Krishnamoorthy et al (71)	Phimosis	7.8 ± 1.2 min	15.6 ± 2.1 min	Reduced	Higher
Karaganvi et al (73)	Phimosis	12.0 ± 2.5 min	37.0 ± 7.5 min	Reduced	Higher
Jin et al (74)	Phimosis/redundant prepuce	6.8 ± 3.1 min	Not specified	1.8 ± 1.8 ml	Higher
Huang et al (75)	Phimosis/redundant prepuce	Significantly shorter	Longer	Significantly lower	Higher
Purushotham et al (76)	Phimosis	6.8 ± 1.5 min	24.2 ± 3.41 min	1.8 ± 0.68 ml	9.46 ± 1.19 ml
Jaiswal et al (77)	Phimosis	Not device study	~25 min	Lower	Slightly higher

Postoperative Pain, Complications and Wound Healing: At every time point in the current trial, the stapler group experienced significantly less postoperative pain as measured by the Visual Analogue Scale. At 24 hours, the stapler group's mean VAS score was 2.46 ± 0.88, while the dorsal slit group's was 4.38 ± 1.05 ($p < 0.001$). At 48 hours, pain scores further reduced to ± 0.62 in the stapler group and 2.74 ± 0.81 in the dorsal slit group. These findings indicate reduced tissue trauma and better postoperative comfort with stapler circumcision. Similar findings were reported by Krishnamoorthy et al (25), who found that the stapler group's postoperative pain levels were considerably lower at 6, 24, and 48 hours. Karaganvi et al (27) also reported significantly lower pain scores and reduced analgesic requirement in stapler circumcision. Purushotham et al (30) demonstrated lower postoperative pain scores in stapler circumcision (4.0 ± 0.70 vs 5.84 ± 0.80, $p < 0.00001$). Jin et al (28) reported postoperative VAS score of 4.0 ± 0.9 with stapler circumcision

and minimal discomfort. These findings consistently support the observation that stapler circumcision results in less postoperative pain compared with conventional techniques. The most frequent consequence was oedema, which was followed by

mild bleeding and infection. Krishnamoorthy et al. (25) reported similar results, noting lower rates of bleeding (3% vs. 10%), infection (5% vs. 12%), and oedema (7% vs. 15%) in the stapler group. Karaganvi et al (27) reported complication rates of 12% in stapler circumcision compared with 40% in conventional circumcision. Purushotham et al (30) reported no major complications in the stapler group, whereas conventional circumcision showed higher rates of bleeding, edema and infection. Jin et al (28) reported a very low overall complication rate of 2.7% with stapler circumcision. With respect to wound healing, the stapler group healed considerably more quickly in the current study (12.48 ± 2.16 days), compared with the dorsal slit group (17.92 ± 3.84 days, $p < 0.001$). Similar findings were reported by Krishnamoorthy et al (25) (12.4 ± 2.3 vs 16.8 ± 3.1

days), Jin et al (28) (12.5 ± 1.8 days), and Purushotham et al (30) (12.5 ± 1.05 vs 14.4 ± 0.87

days). The network meta-analysis by Huang et al (29) also demonstrated significantly faster wound healing and reduced complication rates with device-assisted circumcision techniques. These findings collectively confirm that stapler circumcision offers reduced postoperative pain, fewer complications and faster wound healing compared with conventional techniques Table 15.

Table 15: Comparison Of Postoperative Pain,Complications And Wound Healing With Other Studies

Study	Postoperative pain	Complications	Wound healing
Present study	Lower in stapler ($p<0.001$)	11.2% vs 26.5%	12.48 vs 17.92 days
Krishnamoorthy et al (71)	Lower VAS scores	Lower bleeding/infection	12.4 vs 16.8 days
Karaganvi et al (73)	Lower pain	12%vs40%	Faster recovery
Jin et al (74)	VAS 4.0	2.7%	12.5days
Purushotharn et al (76)	Lower pain	Minimal	12.5vs 14.4 days
Huang et al (75)	Comparable early pain	Lower complications	Faster healing

Cosmetic Outcome, Patient Satisfaction, stay in the hospital and resume your regular activities: In the current study, the stapler group outperformed the dorsal slit group in terms of cosmetic outcome and patient satisfaction. 62.2% of patients in the stapler group and 42.9% in the dorsal slit group had excellent cosmetic outcomes, while 87.7% and 73.5% of patients, respectively, had overall favorable cosmetic results (excellent+ good) ($p = 0.012$). Additionally, 64.3% of patients in the stapler group reported being extremely satisfied, compared to 45.9% in the dorsal slit group. These results align with earlier research. According to Krishnamoorthy et al. (25), the stapler group had considerably higher cosmetic satisfaction scores (POSAS 9.1 ± 0.8 vs. 7.5 ± 1.2, $p < 0.001$). Karaganvi et al (27) also reported higher patient satisfaction scores (4.5

± 0.6 vs 3.8 ± 0.9, $p = 0.002$) with stapler circumcision. Jin et al (28) reported high overall satisfaction rates of 91.2% following stapler circumcision. Huang et al (29) in a network meta- analysis demonstrated significantly higher satisfaction with cosmetic appearance and better aesthetic outcomes with device-assisted circumcision techniques. These findings confirm that stapler circumcision produces superior cosmetic results and higher patient satisfaction.

In terms of recovery metrics, the current study showed that the stapler group had a much reduce hospitalization and

an earlier back to regular activities. The stapler group's average hospitalization was 1.84 ± 0.62 days, while the dorsal slit groups was 3.12 ± 1.08 days ($p < 0.001$). Patients in the stapler group returned to normal activities earlier (5.42 ± 1.36 days) compared with the dorsal slit group (9.18 ± 2.44 days, $p < 0.001$). Similar findings were reported by Purushotham et al (30), who observed shorter hospital stay (2.2 ± 0.43 vs 3.5 ± 0.51 days) and faster recovery with stapler circumcision. Karaganvi et al (27) reported earlier return to routine activities in the stapler group (7 days vs 11 days, $p < 0.001$). Jin et al (28) also reported early recovery and high satisfaction with stapler circumcision. These findings consistently demonstrate that stapler circumcision is associated with faster recovery, shorter hospitalization and earlier resumption of normal activities compared with conventional circumcision techniques Table 16.

Table 16: Comparison of Cosmetic Outcome, Patient contentment, hospital stay, and resumption of regular activities

Study	Cosmetic outcome & satisfaction	Hospital stay	Return to normal activities
Present study	62.2% excellent; higher satisfaction	1.84 vs 3.12 days	5.42 vs 9.18 days
Krishnamoorthy et al (71)	Higher cosmetic satisfaction	Not specified	Faster recovery
Karaganvi et al (73)	Higher satisfaction	Not specified	7vs 11 days
Jin et al (74)	91.2% satisfaction	Short stay	Early recovery
Huang et al (75)	Higher cosmetic satisfaction	Not specified	Faster recovery
Purushotharn et al (76)	High satisfaction	2.2 vs 3.5 days	Faster recovery

CONCLUSION

Stapler circumcision in adult males demonstrated clear advantages over the traditional dorsal slit method, including shorter operative time, reduced intraoperative bleeding, less postoperative pain, fewer complications, faster wound healing, and superior cosmetic outcomes. Patients also experienced shorter hospital stays and earlier return to daily activities, with higher satisfaction overall. These findings support stapler circumcision as a safe, effective, and efficient alternative when resources and expertise are available. Larger multicentric studies with longer follow-up are recommended to validate these results.

Declaration:

Clinical trial number

Not applicable

Ethics Approval

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Approval was obtained from the Institutional Ethics Committee of SRM Medical College Hospital and Research Centre prior to study commencement (IEC approval number: SRMIEC-ST035-2263). Written informed consent was obtained from all participants after providing detailed information about the study. Patients were assured of confidentiality, and data were anonymized to protect patient identity. Participation was voluntary, and patients could withdraw at any time without affecting the quality of care received.

Consent for publication

Not applicable

Availability of data and materials

All data supporting the findings of this study are included in the article.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

Author A: Data collection, Managed the patients, wrote the main manuscript, reviewed the revisions, and submitted the manuscript

Author B: Data interpretation and supervised the writing of the manuscript. Author C: Supervised the writing of the manuscript and submitted the manuscript. Author D: managed the patients, reviewed and revision

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