

# Outcome Analysis of Continuous Versus Interrupted Sutures for Adult Circumcision at a Tertiary Care Centre, Tamil Nadu, India

P PUVAI MURUGAN<sup>1</sup>, BHALAGURU IYYAN<sup>2</sup>, R SHREE VISHNU SIDDARTH<sup>3</sup>, P VAIRAMUTHU<sup>4</sup>



## ABSTRACT

**Introduction:** Circumcision is the most common reconstructive urological procedure all over the world with minimal complications. It comprises of surgical removal of the prepuceal skin from the penis. Bleeding and infection are the major complications associated with traditional interrupted sutured circumcision. Hence continuous suturing techniques were explored to replace the traditional interrupted absorbable sutures.

**Aim:** To compare the outcome of continuous and interrupted absorbable suturing techniques for adult circumcision.

**Materials and Methods:** This retrospective study was conducted at PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India, in 250 adult patients undergoing circumcision between January 2018 and December 2020 in a Tertiary Care Hospital in Southern India. Among the 250 adult patients, 125 patients underwent circumcision with continuous absorbable suturing techniques (group I) and 125 patients with interrupted absorbable suturing technique (group II). Comparative outcome analysis of both the groups was done based upon the following parameters-bleeding, infection, surgical wound dehiscence, swelling in

the phallus, Visual Analog Score (VAS) for pain assessment, readmission to the hospital, and cosmesis. The comparison of quantitative variables between the groups was done using chi-square test.

**Results:** In total, 250 adult patients were included in this study. The age was  $44.3 \pm 14.3$  years in continuous suture and  $43.4 \pm 13.6$  years in interrupted suture group. Balanitis with phimosis was the commonest indication for adult circumcision. The mean time taken for circumcision in group I and II was 14 minutes and 45 minutes, respectively. The average healing period was six days in group I and 13 days in group II. No major urological complications were observed in both the groups which might have required re admission. But fewer postoperative complications were encountered in group I with respect to wound infection ( $p$ -value=0.0002) and suture granuloma ( $p$ -value=0.02).

**Conclusion:** The present study demonstrated better postoperative outcomes, reduced surgical time, reduced suture material requirement, and better cosmesis in adult circumcision using continuous absorbable suturing technique compared to the traditional interrupted technique.

**Keywords:** Absorbable suture, Complications, Cosmesis, Diabetes, Phimosis

## INTRODUCTION

Circumcision is a common urological procedure, frequently carried out worldwide owing to its medical, sexual, and health benefits. Circumcision comprises of removal of the prepuceal skin from the penis and it is also performed in adolescents for cultural or religious reasons. It is estimated that globally, 37-39% of men are circumcised and in India, 13.5% of males are circumcised [1]. Several guidelines endorse male circumcision since it offers protection against the human immunodeficiency virus and the health benefits of newborn circumcision outweigh the risks [2,3].

Bleeding and infection are the major complications associated with circumcision. Hence, alternatively tissue adhesives and different suturing techniques are being explored to reduce the complications associated with traditional circumcision [4]. It has been reported that one-third of male patients with diabetes in India have balanitis with phimosis and need circumcision [5]. Patients with diabetes were at a very high risk of severe infection if they had phimosis and consequently poor hygiene [5]. Patients with diabetes and recurrent infections may be advised to undergo circumcision with many variations in the technique. Interrupted absorbable sutures are commonly performed all over the world to approximate the skin and the inner prepuce in circumcision [6].

A previous systematic review comparing continuous versus interrupted suturing techniques for repair of episiotomy found that continuous suturing was associated with less short-term pain when compared with interrupted suture technique [6]. Additionally,

another Cochrane systematic review involving 8184 primiparous and multiparous women found that the continuous suturing techniques for perineal closure were associated with less short-term pain, need for postoperative analgesia and suture removal than interrupted transcutaneous stitches [7]. Isoamyl cyanoacrylate glue is a sutureless circumcision method having better cosmesis, less postoperative pain, less surgical time and cost in pediatric circumcision [8-10]. Continuous sutures had better outcome and showed less wound dehiscence than interrupted sutures [11].

There is limited data available on outcome analysis of continuous versus interrupted suturing techniques for circumcision in Indian adults [12]. Therefore, there is a need to compare the outcomes of the continuous suturing technique with the traditional suturing technique for widespread adoption. Hence, the present retrospective study was conducted with the aim to assess the outcomes and complications with continuous and interrupted absorbable suturing techniques in adult circumcision.

## MATERIALS AND METHODS

This retrospective study was conducted at the PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India. Data were collected from January 2018 to December 2020 and data were analysed between February to April 2021. The study protocol was approved by the Institutional Ethics Committee (PSG/IHEC/2021/Appr/Exp/034). The written informed consent was obtained from every patient before enrollment in the study.

**Inclusion criteria:** Total 250 patients, aged between 18 to 72 years and who presented either with phimosis, balanitis, balanoposthitis, Balanitis Xerotica Obliterans (BXO), culture proven urinary tract infection or religious cause were enrolled in this study.

**Exclusion criteria:** Patients aged <18 years, with paraphimosis, bleeding diathesis, previous penile surgery, and patients who were lost to follow-up were excluded from this study. Patient who were advised for the circumcision and presented in the department within the study period, were enrolled in the study.

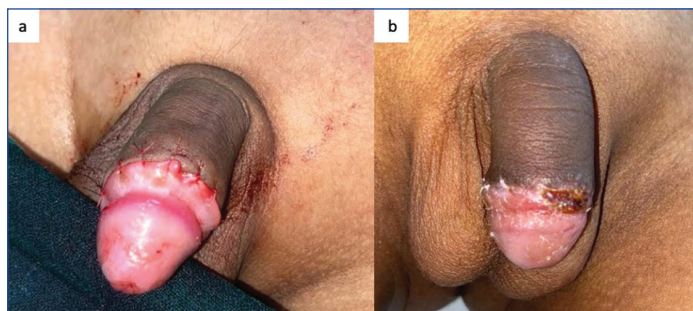
Based on the suturing techniques, patients were divided into two groups; group I (n=125, patients who underwent circumcision followed by continuous absorbable suture technique 5-0) and group II (n=125, patients who underwent circumcision followed by interrupted absorbable suture technique 5-0). All the patients were operated by a single urologist between January 2018 to December 2020. All the adult circumcisions were performed by sleeve method [13].

### Study procedure

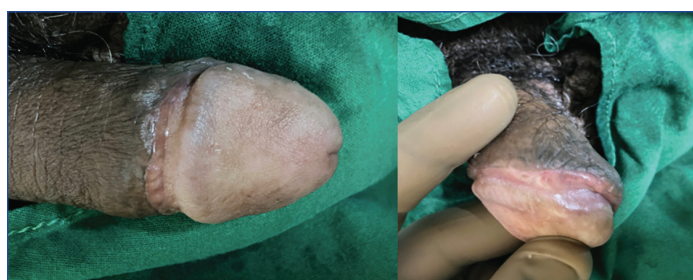
**Surgical preparation:** Plain 1% lignocaine was used at a dose of 2 mg/kg body weight. The local anesthetic was injected with a 25G insulin needle. The dorsal penile nerves which were located at the 11 and 1 O'clock positions were blocked. This was followed by a circumferential ring block. The skin was prepared using 10% povidone solution, a topical anti-infective and antiseptic. All the patients received antibiotics preoperatively (6 hr prior to incision) and post operatively for five days. The preoperative antibiotic regimen used was amikacin (10 mg/kg once daily) / third generation cephalosporin (Ceftriaxone 20-30 mg/kg twice daily) and this was based upon local microbial resistance patterns [13].

**Surgical technique:** Patients were placed in supine position and draped sterile. A circumferential incision was made proximal to the corona and dorsal slit was made using Metzenbaum scissors to cut the outer prepuceal skin followed by complete haemostasis using bipolar cautery. Outer prepuceal skin was removed circumferentially followed by approximation of the inner prepuceal skin, proximal 1 cm to the corona in continuous technique using 5-0 absorbable suture in group I and interrupted technique using 5-0 absorbable suture in group II. On the ventral aspect, a frenular artery was coagulated with bipolar cautery and was followed by inverted U stitches [13]. Prepuceal skin was sent for histopathological examination. Wound dressing was done with a chlorhexidine gauze dressing.

[Table/Fig-1,2] are representative images of continuous and interrupted sutures, respectively.



[Table/Fig-2]: Representative images of interrupted suture a) immediate postoperative b) stitch picture.



[Table/Fig-1]: Representative images of continuous suture.

**Post-operative period:** A local antiseptic ointment was applied over the surgical site. All the patients received a course of antibiotics (amoxicillin 500 mg and Clavulanate 125 mg combination) and analgesics for five days with a local antiseptic ointment along with the surgical site. Patients were allowed to bathe after the 3<sup>rd</sup> postoperative day. All the patients were admitted for day care surgery and followed up in the outpatient department for three months.

**Postoperative Follow-up and discharge:** By comparing the two groups, outcomes were analysed in view of post operative pain, bleeding, infection, swelling, surgical wound dehiscence, and cosmesis. Operative and recovery time were noted. Post operative pain was evaluated by Visual Analogue Scale (VAS) at 4 h, 12 h, and 48 h and graded as mild, moderate, and severe according to the score [14,15]. The post operative pain was divided into mild (1-3), moderate (4-7) and severe (8-10). The wound was assessed for cosmesis using Modified Hollander cosmesis scale which has five clinical variables: step off borders, edge inversion, wound margin separation, contour irregularities, excess inflammation [16,17]. The wound was assigned 0 or 1 (0 for yes, 1 for no) point each for the step off the borders, contour irregularities puckering, wound margin separation, wound edge inversion and, excess inflammation. Overall appearance was graded as very good, good, acceptable and bad. Assessment of cosmesis was carried out after 2 months by another urologist, who had not performed the circumcision in this study.

Wound infection: defined as serous discharge with the positive organism on culture. The wound infection was divided into a mild infection (a minimal discharge and color change in the wound area) and moderate infection (an occasional leakage in the wound area or minimal necrosis) on the suture line. Inflammation was defined as redness and swelling around the sutured site [12].

### STATISTICAL ANALYSIS

Statistical analysis was done using Statistical Package for Social Sciences (SPSS) software version 18.0 (SPSS Inc., Chicago, IL, USA). Continuous variables were expressed as mean and Standard Deviation (SD) whereas categorical variables were given as numbers (percentage). Quantitative data were analysed by t-test and qualitative data was analysed by chi-square test. The level of statistical significance was taken as p-value<0.05. The collected data was analysed using descriptive statistical tool.

### RESULTS

**Demographical Characteristics:** In total, 250 patients were enrolled in the study. The age was 44.3±14.3 years in continuous suture and 43.4±13.6 years in interrupted suture group. The average time taken for the procedure in group I was 14 mins (range: 10-18 mins) and group II was 45 mins (range: 30- 60 mins). The average healing period was between five to seven days with a mean of six days in group I and 10-15 days with a mean of 13 days in group II.

**Histopathological Examination:** Histopathological examination revealed that 195 (78%) had balanitis with phimosis followed by BXO 30 (12%), recurrent balanoposthitis 12 (4.8%), recurrent urinary tract infections 8 (3.2%), chronic urinary retention with phimosis 5 (2%) [Table/Fig-3]. No major urological complications were observed in both the groups which are mandatory for readmission.

Indication for circumcision	n (%)
Balanitis with phimosis	195 (78)
BXO	30 (12)
Recurrent balanoposthitis	12 (4.8)
Recurrent urinary tract infections	8 (3.2).
Chronic urinary retention with phimosis	5 (2)

[Table/Fig-3]: Indication for circumcision.

**Comparison of Post-Operative Complications:** Incidence of excessive bleeding was comparatively lower among patients from group I 18 (14.4%) than group II 29 (23.2%) ( $p=0.0756$ ). Only one patient from group II presented with wound dehiscence, while incidence of wound dehiscence was not observed among patients from group I. Wound infection {10 (8.0%) vs. 32 (25.6%);  $p=0.0002$ } and suture granuloma {2 (1.6%) vs. 14 (11.2%);  $p=0.0200$ } were significantly lesser among group I compared to group II. However, surgical site oedema was found to be higher in patients from group I compared to group II {42 (33.6%) vs. 24 (19.2%);  $p=0.0100$ }. Minimal swelling was observed in group II in early post operative period but later it was retroceded with oral analgesic and topical antiseptic cream. All patients with mild and moderate infections were treated with antiseptic cream and oral antibiotics and recovered well within 10-16 days [Table/Fig-4].

Post-operative complication	Group I (n=125), n (%)	Group II (n=125), n (%)	p-value
Bleeding	18 (14.4)	29 (23.2)	0.0756
Wound infection	10 (8.0)	32 (25.6)	0.0002
Surgical site oedema	42 (33.6)	24 (19.2)	0.01
Suture granuloma	2 (1.6)	14 (11.2)	0.02
Wound dehiscence	-	1 (0.8)	-

**[Table/Fig-4]:** Comparison of complications in continuous versus interrupted suture for adult circumcision.  
p-value calculated using Chi-squared test

**Cosmesis Score Assessment:** After two months, an assessment of cosmesis was carried out by another urologist, who had not performed the circumcision in this study. All the patients came for follow up post operatively. Circumcision done in group I (very good:  $n=111$ , 88.8%) was cosmetically superior to the patients in group II (very good:  $n=48$ , 38.4%) in which sutured marks were usually observed ( $p<0.0001$ ). Higher satisfaction levels were observed in the continuous suture technique [Table/Fig-5].

Cosmesis score	Group I (n=125), n (%)	Group II (n=125), n (%)	p-value
Very good	111 (88.8)	48 (38.4)	<0.0001
Good	9 (7.2)	62 (49.6)	<0.0001
Acceptable	5 (4.0)	13 (10.4)	0.0508
Bad	-	2 (1.6)	-

**[Table/Fig-5]:** Cosmesis score in continuous and interrupted absorbable sutures after circumcision.  
p-value calculated using Chi-squared test

**Visual Analogue Score Assessment:** Post operative pain assessment was done using a visual analog pain scoring system [Table/Fig-6]. The visual analog score was mild in majority of the patients in group I {4 h= 102 (81.6%) vs. 94 (75.2%), 12 h= 112 (89.6%) vs. 103 (82.4%), 48 h= 117 (93.6%) vs. 113 (90.4%)} than group II. No major surgical complication was seen except penile oedema around the proximal portion of the penis and wound infection in group I.

Post-operative pain	Mild (1-3) n (%)	Moderate (4-7) n (%)	Severe (8-10) n (%)
<b>VAS after 4 hours</b>			
Group I	102 (81.6)	20 (16.0)	3 (2.4)
Group II	94 (75.2)	24 (19.2)	7 (5.6)
p-value	0.2198	0.5073	0.1976
<b>VAS after 12 hours</b>			
Group I	112 (89.6)	13 (10.4)	-
Group II	103 (82.4)	20 (16.0)	2 (1.6)
p-value	0.1016	0.1918	-
<b>VAS after 48 hours</b>			
Group I	117 (93.6)	8 (6.4)	-

Group II	113 (90.4)	12 (9.6)	-
p-value	0.2640	0.3520	-

**[Table/Fig-6]:** Visual analogue score of post-operative pain.  
Data is presented as n (%)

## DISCUSSION

The present study demonstrated a shorter operative time with less postoperative pain, less healing period and better cosmesis in continuous absorbable suturing technique as compared to interrupted absorbable suturing technique in adult male patients with phimosis as the most common indication followed by BXO, recurrent balanoposthitis, recurrent urinary tract infections, and chronic urinary retention.

The most common indications for circumcision are phimosis, balanoposthitis, recurrent balanoposthitis, BXO, recurrent urinary tract infections and religious rituals [18]. Extensive literature showed that data comparing the continuous and interrupted technique using absorbable suture in adult patients in terms of clinical outcomes, complications, and cosmesis are scarce [12,19]. Studies have reported the use of these techniques in circumcision and also in other conditions such as obstetrics, surgery of abdomen or groin, and mass closure of transverse incisions in paediatrics [20-22].

A single centre study reported by Ravindraanandan M et al., in 201 male circumcisions with a continuous wound closure also reported phimosis as the most common indication followed by dyspareunia, chronic balanitis, paraphimosis, posthitis and retention [23]. Diabetes was associated with acquired phimosis in almost 2/3 of cases [5]. Dorsal slit technique and sleeve technique are the two common techniques in adult circumcision. Guillotine techniques were performed in paediatric populations with surgical equipments including Gomco, Mogen, Plastic Bell, Tara Ring, and Shang clamps used for better results [24]. The sleeve technique was used in the present study groups with the only difference between the two groups being the use of continuous absorbable suturing technique vs. interrupted absorbable suture technique.

Raut A showed that the sutureless technique were cosmetically superior and wound healing was found to be better as compared to sutured group patients [12]. In the present study, the average healing period was faster in patients with continuous technique than in sutured group patients (6 vs. 13 days).

Literature reports that the frequency of complications associated with circumcision increases with the age of the patient [25]. Early complications of male circumcision include bleeding, haematoma, infection, lacerations of the penis, injury to the glans penis, meatal stenosis, urinary retention, and buried penis [18]. A delayed complication includes suture granuloma, foreign body reaction, and disfiguration. The most common surgical complications of circumcision observed in the present study were oedema, bleeding, and wound infection. These complications were greater in group II (interrupted suture) than in group I. Ravindraanandan M et al., [23] did not report any major post operative complications with continuous suturing circumcision. However, a clinical trial in paediatrics, reported less wound dehiscence rate with interrupted absorbable suture in the mass closure of transverse incision in children [22].

Patients with diabetes are at very high risk for severe infection if they have phimosis and consequently poor hygiene [5]. Diabetics with recurrent infections may be advised to undergo circumcision [5]. The cyanoacrylate glue is a tissue adhesive an alternative to suture, has better cosmetic and less operative time [12]. In paediatric cases, suture less tissue adhesive techniques have been reported to be safe but more cost effective than tissue adhesives [26]. Thermocautery-assisted circumcision has become a practical and rapid method for circumcision in regions where circumcision is a common procedure with minimal complications [27]. The



cosmetic result of a classic circumcision is not easily acceptable in a community. Minimal excision of the prepuceal skin which includes the fibrous tissue in order to achieve a redundant outer layer of the skin and reapproximation of the traumatic edges with 5-0 absorbable interrupted sutures give more cosmetic than the classic circumcision [28]. The use of Intracorporeal 10 µg of alprostadil injection during circumcision is considered to be safe with no complications and better cosmetic results [29]. In a clinical study of women undergoing episiotomy, it was observed that the continuous suturing technique was associated with less pain and was rapid as compared to interrupted technique [30]. Similar outcomes were observed in the present study.

The use of interrupted sutures with octyl cyanoacrylate offers several advantages of faster skin closure and the application of octyl cyanoacrylate is less painful and less invasive than standard suturing techniques. Moreover, it yielded comparable cosmetic results to standard suturing techniques [31]. Patients who underwent circumcision without sutures had better cosmesis post-operatively and during follow-up periods [12]. Similarly, in the present study, higher satisfaction levels were observed in continuous suture technique.

Researchers have been suggesting that continuous repair technique is better than interrupted suture methods in terms of perineal pain [32]. Previous comparative study comparing the postoperative pain scores between continuous and interrupted circumcision technique. The results showed that mild pain was more common in interrupted suture technique as compared to continuous suture technique with no need for analgesics in any of these patients [12]. Cyanoacrylate is a better alternative to sutures due to its ease of application, decreased scarring, decreased pain, and better cosmetic results with no discomfort. Sharma PP depicted the sutureless circumcision technique as a feasible alternative to suture for an adult population with less postoperative pain [33]. Similarly, in the present study majority of patients from continuous suture technique group had less pain as compared to traditional interrupted suturing technique group. The stitch marks were more in patients with continuous suture technique groups as compared to interrupted absorbable sutures. This method helps to get rid of the use of traditional dressings like chlorhexidine gauze, which are incorporated within sutures, and hence cause pain during their removal. Absence of interrupted sutures gives better cosmetic results.

### Limitation(s)

Surgeon's satisfaction was not evaluated in terms of wound closure time and the ease of application. Another limitation of the present study was the small sample size in both groups, therefore further studies with larger sample sizes are required to support these findings.

### CONCLUSION(S)

The present study demonstrated better postoperative outcomes, reduced surgical time, reduced suture material requirement and better cosmesis in adult circumcision using continuous absorbable suturing technique than interrupted technique. Few surgical complications were noted in both the groups that did not require rehospitalisation. Overall study indicated that continuous absorbable suturing technique was the better option than interrupted technique for management of adult circumcision. However, large scale multicentric studies are needed to conclude robustly which treatment modality is better.

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#### PARTICULARS OF CONTRIBUTORS:

1. Consultant, Department of Urology, PSG Institute of Medical Science and Research, Coimbatore, Tamil Nadu, India.
2. Consultant, Department of Urology, PSG Institute of Medical Science and Research, Coimbatore, Tamil Nadu, India.
3. Consultant, Department of Urology, PSG Institute of Medical Science and Research, Coimbatore, Tamil Nadu, India.
4. Consultant, Department of Urology, PSG Institute of Medical Science and Research, Coimbatore, Tamil Nadu, India.

#### NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr Bhalaguru Iyyan,  
PSG Institute of Medical Science and Research, Coimbatore, Tamil Nadu, India.  
E-mail: drbhalaguru@yahoo.com

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