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Keywords

Hypospadias; Urethral plate;
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Abbreviations

TIP, tubularized incised-plate

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Does the suturing technique (continuous versus interrupted) have an impact on the outcome of tubularized incised plate in hypospadias repair with adequate urethral plate? A prospective randomized study

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Summary

Introduction

Hypospadias is one of the most common anomalies of male external genitalia. The aim of hypospadias repair is to achieve a normal phallus with a satisfactory functional and cosmetic result and to develop a single and consistent urinary stream while in standing position. The introduction of tubularized incised plate (TIP) urethroplasty by Snodgrass in 1994 resulted in revolutionizing management of different types of hypospadias. While there is consensus on the use of absorbable sutures in hypospadias repair, there are no specific guidelines for the suturing technique and the technique itself remains debatable.

Objective

To compare the outcome of interrupted- and continuous-suture in hypospadias repair using TIP technique.

Study design

This was a prospective randomized study. It comprised 260 uncircumcised hypospadiac boys with adequate urethral plate who underwent TIP repair. Boys with glanular, recurrent, proximal hypospadias and inadequate urethral plate were excluded from

the study. The boys were randomized into two groups: Group A consisted of 130 boys who underwent TIP repair using continuous subcuticular suture urethroplasty and Group B of 130 boys who underwent TIP repair using interrupted subcuticular suture urethroplasty.

Results

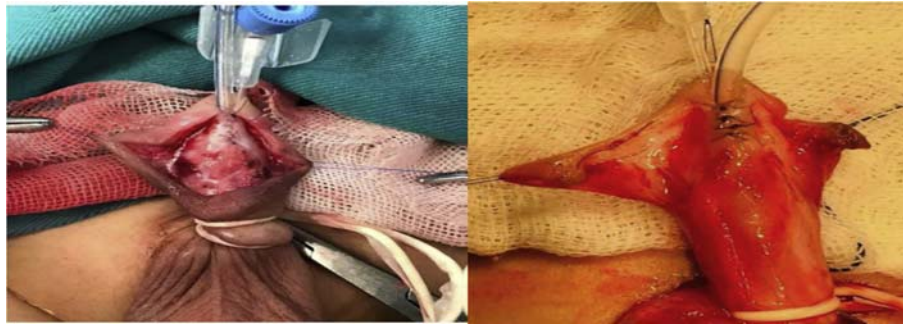
The operative time was of lower statistical significance in group A ($P = 0.006$) while the rate of complications were of higher statistical significance in group A ($P = 0.027$). Urethrocuteaneous fistulae occurred in 20 patients (14 in Group A and six in Group B), which is a statistically significant difference ($P = 0.048$). On the other hand, superficial wound infection, partial glans dehiscence, meatal stenosis, urethral stricture, and aesthetic appearance were statistically insignificant.

Discussion and conclusion

The effect of suturing techniques in bowel anastomosis has been studied and it has been found that the use of an interrupted-suturing technique results in a decreased complication rate compared to continuous suturing. This agrees with our study where the running sutures groups was associated with a higher complication rate compared to interrupted sutures.

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Summary Figure Group A underwent tubularization using continuous sutures and group B underwent tubularization using interrupted sutures.

Introduction

Hypospadias is one of the most common anomalies of male external genitalia. It occurs in 0.4–8.2 of 1000 live male babies. It can be classified, according to urethral meatus site, into anterior or distal (60–65% of cases), middle (20–30% of cases), and posterior or proximal (10–15% of case) [1].

The aim of hypospadias repair is to achieve a normal phallus with a satisfactory functional and cosmetic result and to develop a single and consistent urinary stream while in standing position. To achieve these goals, many techniques of hypospadias repair have been reported and till now newer methods and their modifications continue to emerge [2].

The introduction of tubularized incised plate (TIP) urethroplasty by Snodgrass in 1994 resulted in revolutionizing management of different types of hypospadias. It gained worldwide acceptance for distal hypospadias repair and even for proximal types because of its low complication rate and technical simplicity [3].

While there is consensus on the use of absorbable sutures in hypospadias repair, there are no specific guidelines for the suturing technique and the technique itself remains debatable. Some studies reported that the suturing technique has no influence on the outcome [4,5]. Others concluded that the suturing pattern may affect results and complication rates [6–8].

The aim of this study was to assess and compare the effect of continuous vs interrupted suture urethroplasty on the outcome and complication rates in TIP hypospadias repair with adequate urethral plate.

Patients and methods

A prospective study was conducted during the period from February 2018 to December 2020 in a single tertiary care hospital after getting approval of our institution's ethical committee. A written informed consent was obtained from the parents after explaining the study procedures and the possible complications.

Inclusion criteria were uncircumcised patients with subcoronal, distal and mid-penile hypospadias (according to

Duckett classification 1996) [9], a virgin wide urethral plate (8 ml or more) [5] and adequate glanular tissue (width 14 ml or more) [10]. Patients with proximal hypospadias, glanular hypospadias, inadequate urethral plate, a penile curvature of more than 30°, or recurrent cases were excluded.

Sample size was calculated using STATA version II program, setting the type –1 error (α) at 0.5 and the power at 80%. Results from a previous study by Gafar, 2013 showed that the overall success rate in Group A was 97.5% compared to 82.5% for Group B. Based on this, 70 cases per group would be needed [8].

A total of 347 patients with hypospadias were evaluated for eligibility to be included in the study. Eighty-seven patients were excluded for different reasons: 67 patients were excluded for not meeting inclusion criteria, while 20 refused to participate, Fig. 1.

The remaining 260 patients were randomly divided into 2 equal groups using computer generated method, each group consisted of 130 patients. **Group A:** underwent TIP technique using continuous sutures and **group B** underwent TIP technique using interrupted sutures as shown in Fig. 2.

Technique

The procedures had been done by the same expert surgeon. He was employing the two techniques equally prior to start of the study. All patients received general anesthesia with caudal analgesia and broad-spectrum antibiotic (amoxicillin + clavulanic acid) with induction of anesthesia. After 2 parallel incisions along the edge of the urethral plate and before the midline incision, urethral plate width at the narrowest place after it was stretched flat and glanular width at the widest point were measured using a flexible sterile ruler. In both groups, Snodgrass TIP urethroplasty was performed with subcuticular 6–0 polyglactin (Vicryl®) suture over an 8–10 F catheter (We selected the catheter size depending on urethral plate width before mid-line incision, if it is 8–10 mm, we left 8 F and if it is more than 10, we left 10 F). In all patients, the neourethra was covered by a second layer of vascularized dartos flap harvested from dorsal prepuce. Dressing was performed with nonadhesive dressing covered with petroleum Vaseline gauze and remained in situ for 5 days and the urethral catheter was left in place for 10 days in all

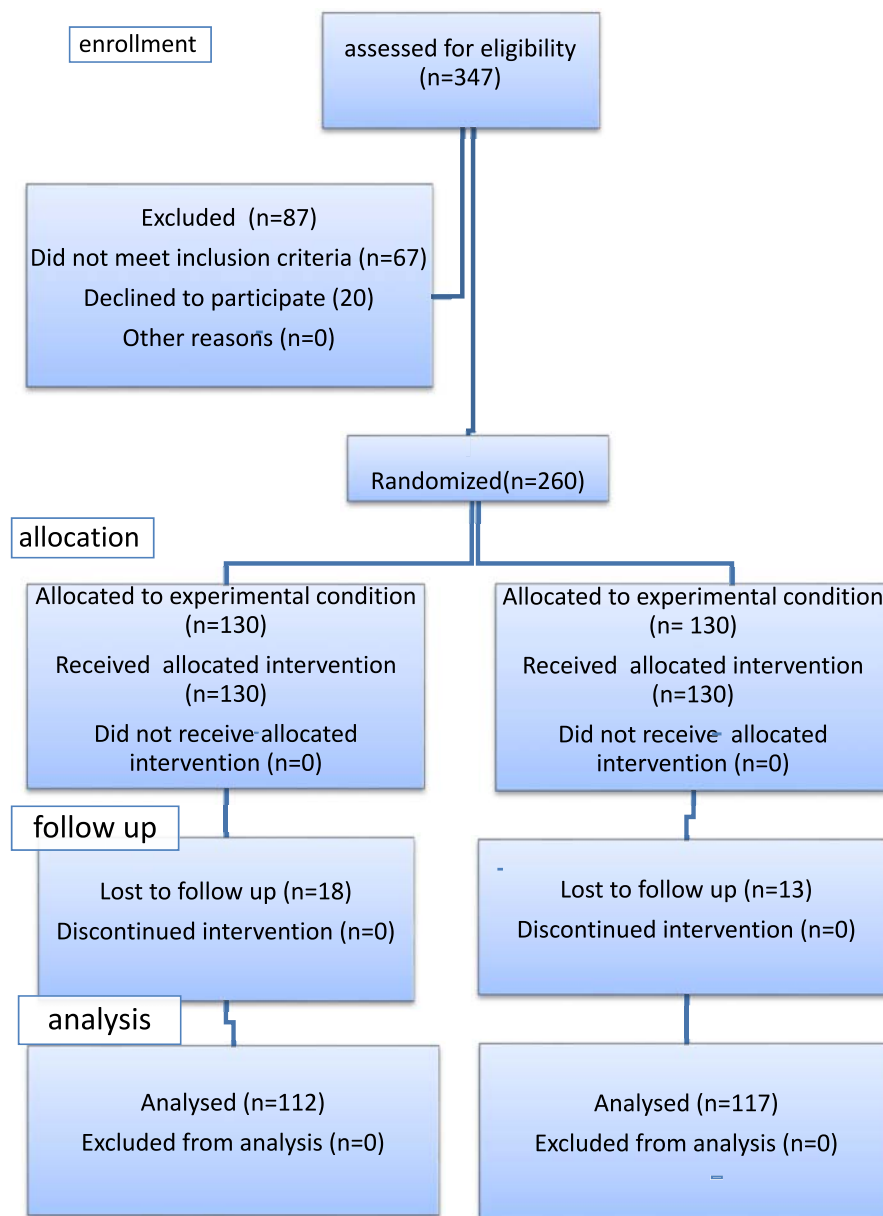


Figure 1 Consort flow chart.

patients. All patients were prescribed postoperative antibiotic prophylaxis (amoxicillin + clavulanic acid) in the appropriate doses for 10 days.

Follow up schedule

After removal of the catheter, urinary stream was observed in all patients of both groups. Under local anesthesia using gel containing lidocaine hydrochloride, urethral calibration was done by passing Nelaton catheter of the same size of the catheter left during repair at the time of catheter removal, then monthly for 6 months then every 3 months for one year to document for the absence of either meatal stenosis or urethral stricture. The parents were instructed to do daily meatal dilatation under local anesthesia, using lubricated catheter of the same size for 3 months. Outcome was assessed by a consultant, who was not aware of the suturing

technique used in TIP repair. Both groups were compared as regards the operative time, occurrence of complications and, aesthetic appearance score using 0–10 scale. A score of zero represented a complete failure of repair, while a score of 10 was considered to have an appearance like that of a normal circumcised phallus with the urethral meatus at the tip of glans. Urethrogram was used to differentiate meatal stenosis from urethral stricture.

Statistical analysis

The collected data organized, and statistically analyzed using statistical package for social sciences (SPSS) version 25 (SPSS Inc, Chicago, USA). Shapiro–Wilk test was used to evaluate normal distribution of continuous data. Quantitative data was presented as mean and SD values or as median and interquartile range according to the distribution of data.

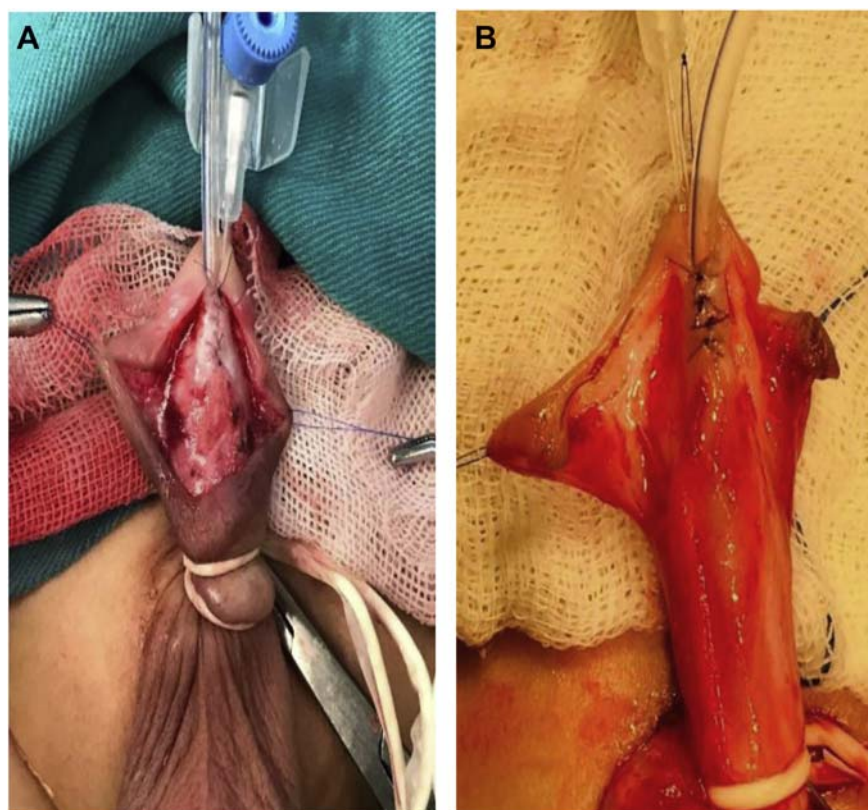


Figure 2 Group A underwent tubularization using continuous sutures and group B underwent tubularization using interrupted sutures.

Table 1 Demographic and other baseline characteristics.

		Group A, (N = 112)	Group B, (N = 117)	P-Value
		Median (IQR) No (%)	Median (IQR) No (%)	
Age(month)		27 (22–31)	26 (22–32)	0.924
Hypospadias type	Subcoronal	79 (70.5)	79 (67.5)	0.799
	Distal penile	20 (17.9)	21 (17.9)	
	Midpenile	13 (11.6)	17 (14.5)	
Urethral plate width (mm)		8.7 (8–10)	9 (8–10)	0.075
Glanular width (mm)		14.7 (14–15.6)	15 (14–16)	0.320

Qualitative data was presented as numbers of cases and percentages. Continuous variables were compared using Student T test or Mann–Whitney U-test, depending on the distribution of data. While Chi square test was used to examine the relationship between qualitative data. P value < 0.05 was considered significant in all tests.

Results

The age of the patients, type of hypospadias, urethral plate width and glanular width showed statistically insignificant difference between the two groups as shown in [Table 1](#).

Table 2 Comparison between both groups according to postoperative complications.

	Group A, (N = 112)	Group B, (N = 117)	p- value
	No (%)	No (%)	
Urethrocutaneous fistula	14 (12.5)	6 (5.1)	0.048
Partial superficial wound infection	3 (2.6)	3 (2.5)	0.957
Partial glans dehiscence	5 (4.4)	2 (1.7)	0.226
Meatal stenosis	4 (3.5)	2 (1.7)	0.378
Urethral stricture	2 (1.7)	1 (0.8)	0.587
Total complications	27 (24.1)	15 (12.82)	0.027

Table 3 The relation between severity of hypospadias and complications.

		Complications		total	P-Value
		Yes No (%)	Yes No (%)		
Hypospadias type	Subcoronal	30 (19)	128 (81)	158	0.322
	Distal penile	4 (9.8)	37 (90.2)	41	
	Midpenile	4 (13.3)	26 (86.7)	30	
Total		38 (16.6)	191 (83.4)	229	

The operative time taken for the repair in Group A was (median = 123 min, IQR = 99.5–135min) and less than that in Group B (median = 130 min, IQR = 101–148 min) and this difference was statistically significant ($p = 0.006$).

Complications occurred in 42 (18.3%) patients, 27 in Group A and 15 in Group B, which was statistically significantly different ($P = 0.027$). Urethrocuteaneous fistula was the most common complication occurred in 20 patients (fourteen in Group A and six in Group B) following removal of the catheter, with statistically significant difference between the groups ($P = 0.048$) as shown in Table 2.

There was no significant difference in aesthetic appearance score in the two groups ($p = 0.343$), Group A (median = 8, IQR = 7–8) and Group B (median = 7, IQR = 7–8). Also, there was no relation between the severity of hypospadias and compilations as shown in Table 3.

Discussion

Hypospadias is one of the most common congenital anomalies which occurs in approximately 1 in 250 newborns or roughly 1 in 125 live male births [11,12].

Snodgrass introduced the TIP technique and published it as a new successful technique in 1994 after using it for 3 years in 16 cases [13]. The introduction of TIP gained worldwide acceptance for distal hypospadias repair because of its low complication rate and technical simplicity as well as its good cosmetic results. Afterwards, its use has been expanded to include proximal types [14–17], subsequently TIP has become the most used technique for hypospadias repair.

Urethral plate width is one of the contributing factors for successful hypospadias repair using TIP technique. Osama et al. concluded that urethral plate width (8 mm or greater) is essential for successful TIP repair [5]. Also, Holland and Smith reported that fistulas occurred in 55% when the plate was less than 8 mm wide, however, no cases were reported when the plate was 8 mm or greater [18].

Complications after hypospadias repair are common, causing the repair of hypospadias to be challenging as the method of the suturing technique may affect the outcome of hypospadias repair as in bowel anastomosis. The effect of suturing techniques in bowel anastomosis has been studied and it has been found that the use of an interrupted-suturing technique results in a decreased complication rate compared to continuous suturing [19]. This agreed with our study where the running sutures groups was associated with a higher complication rate of statistical significance compared to with interrupted sutures were used; this may be due to the ischemic effect of

running sutures. This stood in contrast to what were previously reported by Sarhan et al., Elsherbiny et al. and Gupta et al. where higher complication rates were reported in running groups, but they were statistically insignificant [4,20,21]. On the other hand, Gafar reported that there was a significant difference between the two groups with regards to overall complication rates (one patient in patients who underwent TIP repair using continuous subcuticular sutures and 7 patients in those who underwent TIP repair using interrupted full thickness sutures ($P = 0.028$). The authors explained this higher rate of complication in interrupted sutural arm because subcuticular sutures were used and the edges of the urethral plate in group A come in proximity when compared to group B [8].

Urethrocuteaneous fistula is the most common complication of hypospadias repair [16]. In our study, the post-operative fistula is significantly high in the continuous group; this may be due to ischemia. El-Sherbiny et al. on univariant analysis reported that the use of a running suture was significantly associated with a higher fistula rate (23%) compared to an interrupted suturing technique (9%) [20]. Also, Chung and colleagues reported that in the univariate analysis, fistula formation was statistically related to the type of hypospadias and the type of hypospadias repair. However, it only made up 13.5 and 4.5% for interrupted and continuous methods, respectively [22]. Sarhan et al. found no significant difference in the fistula rate after an interrupted (15%) or continuous suture (12.5%) suturing in hypospadias repair [4]. The same result was reported by Gupta et al., where the fistula rate amongst the interrupted- (12%) and continuous-suturing (14%) techniques in hypospadias repair was comparable ($P > 0.6$) [21]. Moreover, Snodgrass et al. reported that was no difference in urethroplasty complications in patients on the basis of sutures and suturing techniques [23]. On the other hand, Gafar reported a lower fistula rate in the continuous group albeit statistically insignificant. Again, this lower rate may be due to the proximity of the edge of subcuticular sutures in comparison to interrupted full thickness layer [8].

With regards to late complications, in our study meatal stenosis was low and insignificant between the 2 groups. This agreed with Gafar and Gupta et al., where there was an insignificant statistical difference between the two groups [8,21]. Al Saied et al. and Jan I et al. reported that meatal stenosis rates after TIP urethroplasty ranged between 6.2 and 12%, and that most patients with meatal stenosis responded well to regular urethral dilatation [24,25]. Gupta et al. reported that urethral stricture was insignificantly different between the 2 group and this agreed with our study [21].

There is controversy on the value of meatal dilatation, Elbakry et al. (1999) reported a high incidence of meatal stenosis soon after repair that responded to daily dilatation continued for 3 months, recommending routine dilatation for all patients during the period in which re-epithelialization is thought to occur [26]. Furthermore, Elbakry et al. (2002) reported that functional and cosmetic results were excellent in all patients who had regular dilatation; light meatal stenosis developed in 3% of them. In contrast, re-operation was required in eight patients, 31% in the group which did not have regular dilatation [27]. On the other hand, Lorenzo and Snodgrass concluded that calibration and dilatation are unnecessary after TIP urethroplasty to prevent meatal stenosis or urethral stricture, and calibration or uroflowmetry 6 months after surgery may be useful to detect subclinical obstruction [28].

As regards to the operative time, it was statistically significantly lower in the continuous technique group. This went against what reported with Gupta et al. and Gafar et al., who reported that the mean operative time was lower in the continuous technique group but not statistically significant [21,8].

In terms of the aesthetic appearance, there was no statistically significant difference between both groups. Our results were supported by studies of Gupta et al. and Gafar, where the postoperative cosmetic outcome was shown to be satisfactory to all parents of patients in whom there were no complications [21,8].

Limitations of our study included the inability to use uroflowmetry for follow up of urine stream, rather depending only on urine stream observation during follow up sessions. We didn't use ultrasound to assess for post voiding residual urine volume. Postoperative urethral calibration is a point of debate, invasive and may be unnecessary, so further studies are needed to validate its role. Also, there was no standardized method to differentiate between distal types of hypospadias.

Conclusion

TIP repair using continuous sutures took shorter operative time than the same technique using interrupted sutures. The type of suture technique may influence the occurrence of complications after TIP repair.

Funding source

None.

Conflicts of interest

No authors have any conflicts of interest.

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