Original Article

Urethroplasty in Paediatric Patients

Comparison of Urethrocutaneous Fistula Formation in Continuous Versus Interrupted Suture Techniques in Tubularized Incised Plate Urethroplasty in Paediatric Patients: A Randomized Controlled Trial

Ikramullah, Samreen Jamil, Haseeb Masood, Muhammad Shahzaib Akmal and Muhammad Saleem

ABSTRACT

Objective: To compare the incidence of urethrocutaneous fistula following tubularized incised plate urethroplasty (TIPU) using continuous versus interrupted sub-epithelial suture techniques in pediatric patients.
Study Design: Randomized Controlled Trial study
Place and Duration of Study: This study was conducted at the Department of Paediatric Surgery, Allied Hospital, Faisalabad, from December 28, 2022 to June 27, 2023.
Methods: Eighty male children (ages 3–10) with distal hypospadias were enrolled through consecutive sampling and randomly assigned to continuous (Group A) or interrupted (Group B) subepithelial PDS 7/0 suturing. All surgeries were performed by a single consultant. Patients were hospitalized for 7 days with catheter removal on the final day. Follow-up was done at one week and one month post-discharge. Urethrocutaneous fistula formation was the primary outcome. Data were analyzed using SPSS v25 with Chi-square test and stratification; $p \leq 0.05$ was considered significant.
Results: The frequency of urethrocutaneous fistula was 80% in Group A and 20% in Group B ($p = 0.002$).
Conclusion: Interrupted sub-epithelial suture technique in TIP urethroplasty showed a statistically significant trend toward fewer urethrocutaneous fistulas compared to the continuous method. These findings support further investigation in larger, multicenter trials to confirm clinical benefit.
Key Words: Hypospadias, TIPU, Urethrocutaneous fistula, Continuous sutures, Interrupted sutures.

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INTRODUCTION

The management of hypospadias, a common congenital anomaly affecting males characterized by a ventral urethral opening, often involves surgical correction through various urethroplasty techniques. Among the different approaches, tubularized incised plate urethroplasty (TIPU) has gained prominence due to its favorable outcomes. However, complications such as urethrocutaneous fistula formation remain significant concerns postoperatively. Suture technique—continuous vs. interrupted—plays a key role in outcome impacting both operative time and fistula risk.

Continuous sutures involve a single thread running along the tissue, creating an uninterrupted line of support. This technique is often appreciated for its efficiency in terms of time and material usage, potentially reducing the total suture length needed for closure[1,2]. Some studies suggest that continuous suturing can yield enhanced tensile strength at the incision site, which is especially critical for maintaining the integrity of the urethra during the immediate postoperative phase. For instance, certain biomechanical studies indicate that continuous sutures may provide superior strength compared to interrupted sutures, particularly when stitch length is optimized relative to wound length, potentially leading to improved healing outcomes[3,4]. Additionally, the intraoperative simplicity of continuous sutures may contribute to reduced surgical time, which is beneficial in pediatric patients, as minimizing anesthesia time is often a priority.

In contrast, the interrupted suture technique involves distinct, separate stitches anchored at specific points along the incision. This traditional method is favored by

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many surgeons due to its perceived ability to provide independent support to each segment of the tissue, potentially allowing for greater tissue resilience[5,6]. Some studies suggest that the modular nature of interrupted sutures facilitates adjustments during surgery, enabling the surgeon to manage tension and alignment incrementally. It has been hypothesized that the individual knots of interrupted sutures can contribute to more secure tissue adhesion, potentially reducing the risk of postoperative complications such as fistula formation[7].

Pediatric urethroplasty requires context-specific evaluation, as delicate tissues may respond differently. Some studies suggest continuous sutures reduce fistula rates in children, while interrupted sutures may be preferred when precise tension control is needed[8].

A systematic review by Borkar et al. found a lower incidence of UCF with interrupted sutures in Snodgrass urethroplasty, likely due to better suture line stability. In contrast, continuous sutures may increase tension and the risk of complications[9,10].

Clinical experience suggests that interrupted sutures offer better wound edge control, reducing strain and improving closure precision, which may lower the risk of ischemia and necrosis. Studies also show that using PDS in interrupted techniques results in fewer urethrocutaneous fistulas than continuous sutures[11,12].

Recent literature emphasizes the significance of suture technique on functional outcomes following urethroplasties. Research by Ullah et al. indicates that using interrupted sutures not only leads to fewer postoperative complications, including UCF, but also improves cosmetic outcomes and overall patient satisfaction[13]. The dynamics of wound healing associated with interrupted suturing may be attributed to intermittent tissue apposition, allowing for adequate blood flow and reducing the risk of ischemic complications that can arise with continuous sutures[10,14].

Moreover, varying suture techniques, including running versus interrupted sutures, can significantly affect postoperative continence and stricture rates following urethroplasty procedures[15]. Their meta-analysis reveals a strong correlation between interrupted suturing and decreased complications, affirming that this technique not only reduces UCF formation but also enhances functional outcomes related to urinary continence and stricture rates.

UCFs significantly impact patient morbidity and often require secondary interventions, many of which may be preventable with careful suture selection. Interrupted suturing is preferred, particularly in high-risk cases, due to its association with fewer complications[16,17].

Despite advancements in hypospadias surgery, a practical gap remains in comparing suture techniques. This study aims to address this by evaluating continuous versus interrupted sutures in Snodgrass urethroplasty, focusing on UCF formation to help guide best practices.

Hypothesis: There is a significant difference in urethrocutaneous fistula (UCF) formation rates between continuous and interrupted suturing techniques in tubularized incised plate urethroplasty (TIPU).

METHODS

This randomized controlled trial was conducted in the Department of Paediatric Surgery, Allied Hospital Faisalabad, from December 28, 2022, to June 27, 2023, after obtaining approval from the hospital's ethics committee. Informed consent was taken from the parents of all participants. A total of 80 male patients aged 3–10 years with distal hypospadias were enrolled through non-probability consecutive sampling and randomly assigned to two groups. Group A underwent tubularized incised plate urethroplasty using continuous subepithelial PDS 7/0 sutures, while Group B received the same procedure using interrupted sutures.

Exclusion criteria included prior hypospadias repair, moderate to severe chordee, ambiguous genitalia, and associated anomalies. All surgeries were performed by the same consultant surgeon. Patients were admitted for seven days postoperatively, with catheter removal on day seven. Follow-up assessments for urethrocutaneous fistula were done at one week and one month after discharge. Demographic and clinical data were recorded in a structured proforma. Statistical analysis was performed using SPSS version 25. Chi-square test was applied to compare fistula rates between groups, with $p \leq 0.05$ considered significant. Stratification by age and BMI was also performed to control for effect modifiers.

RESULTS

Table No.1: Descriptive statistics of age of patients

		Groups	
		Group A	**Group B**
Age (years)	N	**40**	**40**
	Mean	6.43	6.68

Table No.2: Descriptive statistics of BMI of the patients

		Groups	
		Group A	**Group B**
BMI	N	**40**	**40**
	Mean	24.25	24.30
	Standard Deviation	1.26	1.22
	Minimum	22.00	22.00
	Maximum	26.00	26.00

A total of 80 cases (40 in two equal groups) fulfilling the inclusion/exclusion criteria were enrolled to compare the frequency of urethrocutaneous fistula formation in continuous and interrupted suture tubularized incised plate urethroplasty presenting to Paediatric Surgery department Allied Hospital Faisalabad.

Descriptive statistics of age of patients shows that mean age in Group A was 6.43±1.99 and in Group B 6.68±1.91 in Group B, minimum value as 3.00 years and maximum age was 10.00 in both groups. (Table 1).

Descriptive statistics of BMI of the patients shows that mean BMI in Group A was 24.25±1.26 and in Group B 24.30±1.22 in Group B, minimum value as 22.00 and maximum BMI was 26.00 in both groups. (Table 2)

Comparison the frequency of urethrocutaneous fistula formation in continuous and interrupted suture tubularized incised plate urethroplasty shows 16(80%) in Group A and 4(20%) in Group-B, p-value was 0.002 showing a significant difference. (Table 3)

Table No.3: Comparison the frequency of urethrocutaneous fistula formation in continuous and interrupted suture tubularized incised plate urethroplasty

		Groups	
		Group A	**Group B**
Urethrocutaneous Fistula	No	**40**	**40**
	Yes	16	4
	%	80%	20%
	No	24	36
	%	40%	60%

P value: 0.002

Table No.4: Comparison of frequency of urethrocutaneous fistula formation in continuous and interrupted suture tubularized incised plate urethroplasty by age

Age		**Group**		**Total**	**P value**
		Group A	**Group B**		
2-5	Yes	4	0	4	0.098
		100.0%	0.0%	100.0%	
	No	9	9	18	
		50.0%	50.0%	100.0%	
6-10	Yes	12	4	16	0.008
		75.0%	25.0%	100.0%	
	No	15	27	42	
		35.7%	64.3%	100.0%	

Table No.5: Comparison the frequency of urethrocutaneous fistula formation in continuous and interrupted suture tubularized incised plate urethroplasty by BMI

BMI		**Group**		**Total**	**P value**
		Group A	**Group B**		
22-25	Yes	13	2	15	0.001
		86.7%	13.3%	100.0%	
	No	20	31	51	
		39.2%	60.8%	100.0%	
>25	Yes	3	2	5	0.500
		60%	40%	100.0%	
	No	4	5	9	
		44.4%	55.6%	100.0%	

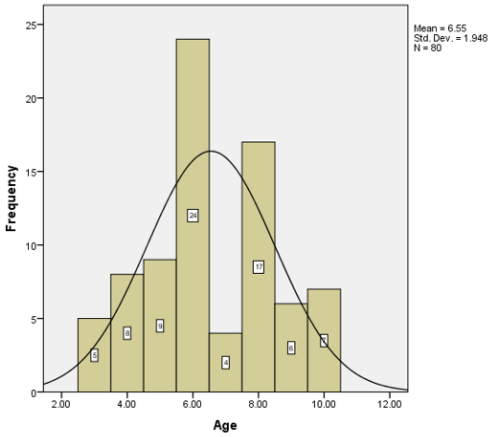

Figure No.1: Descriptive statistics of the patients

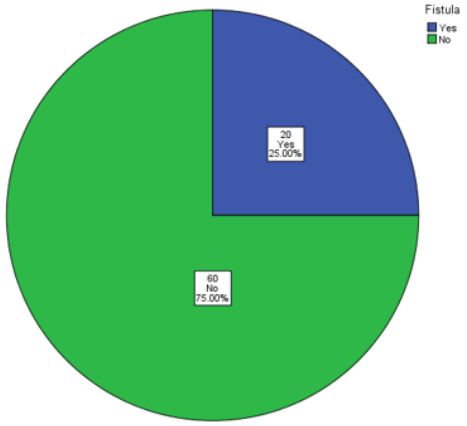

Figure No.2: Comparison the frequency of urethrocutaneous fistula formation in continuous and interrupted suture tubularized incised plate urethroplasty

Stratification was done for effect modifiers like age and BMI. Post stratification Chi-square test was applied. p-value ≤ 0.05 was taken as significant. (Table 4-5)

DISCUSSION

Hypospadias is a prevalent congenital condition affecting males. Snodgrass urethroplasty is widely regarded as one of the most effective methods for addressing distal and mid hypospadias. While pediatric surgeons generally agree on the use of absorbable sutures for urethroplasty, there remains a lack of standardized guidelines regarding the specific suturing techniques—interrupted suturing (IS) versus continuous suturing (CS)—for the construction of the neourethra during Snodgrass urethroplasty[18].

The mean age of patients in Group A was 6.43+1.99, while the mean age of Group B was 6.68+1.91. The frequency of urethrocutaneous fistula formation in continuous and interrupted suture tubularized incised plate urethroplasty was compared to 16 (80%) in Group A and 4 (20%) in Group-B, with a p-value of 0.002 indicating a significant contrast.

An earlier investigation comparing the results of interrupted versus continuous suture techniques in tubularized incised plate urethroplasty was carried out at Bangabandhu Sheikh Mujib Medical University (BSMMU). Six out of sixteen (37.5%) patients experienced urethrocutaneous fistulas following continuous technique tubularized incised plate urethroplasty, whereas two out of sixteen (12.5%) patients experienced urethrocutaneous fistulas following interrupted technique urethroplasty. The findings align with our research.

According to El-Sherbiny et al[19], suturing technique was a substantial risk factor that could have an impact on how well hypospadias healing went. In contrast to an interrupted suturing technique (9%), they discovered that the use of a flowing suture was substantially linked to a greater fistula rate (23%).

Interrupted suture technique is considered superior in tubularized incised plate urethroplasty (TIPU) due to its potential to minimize urethrocutaneous fistulae formation, a common complication after hypospadias repair.

Urethrocutaneous fistula is a key complication in TIPU, and several studies suggest that suture technique plays a significant role. Mahmud et al. reported lower fistula rates with interrupted sutures due to improved tissue approximation and vascularity[20]. Another researcher noted that this technique enables better edge adjustment, enhancing outcomes. Similarly, Gupta et al. found a lower incidence of fistulae with interrupted sutures in a prospective study.[10]

Interrupted sutures distribute tension independently, which is particularly beneficial in delicate tissue of urethra, while continuous sutures may compromise blood flow, increasing ischemia risk and fistula formation.

In addition to the direct impact on fistula rates, the interrupted suture technique is often associated with a more meticulous approach to tissue handling. As highlighted by Subihardi, the choice of suture technique can significantly affect the overall outcomes of urethroplasty, with interrupted sutures allowing for more precise control during the closure process[18]. This precision is critical in the context of TIPU, where the integrity of the neourethra is paramount to prevent complications.

Furthermore, while continuous sutures may reduce operative time, the potential increase in complications such as urethrocutaneous fistulae may outweigh the benefits of speed[10]. The interrupted technique, although potentially more time-consuming, may ultimately lead to better long-term outcomes, including lower rates of reoperation due to complications.

One limitation of our study is the potential loss to follow-up, as urethrocutaneous fistulas can develop even after the designated follow-up period. Additionally, the small sample size in both groups reduces the study's statistical power, indicating a need for further research with larger cohorts to validate these findings. Our study's findings indicate a difference in the rate of urethrocutaneous fistulas between tubularized incised plate urethroplasty performed with continuous versus interrupted suturing techniques

CONCLUSION

Interrupted suturing technique has significantly lower chances of urethrocutaneous fistula in tubularized incised plate urethroplasty when compared with continuous suturing technique.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Ikramullah, Samreen Jamil, Haseeb Masood
Drafting or Revising Critically:	Muhammad Shahzaib Akmal, Muhammad Saleem
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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