

Comparative Study of Polydioxanone and Polyglactin in Tubularized Incised Plate Urethroplasty for Hypospadias Repair

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ABSTRACT

Objective: To compare the postoperative outcomes of polyglactin (Vicryl) versus polydioxanone (PDS) sutures in tubularized incised plate (TIP) urethroplasty for mid-penile and distal hypospadias in children

Methodology: This prospective comparative observational study conducted in Department of Pediatric Surgery, Pakistan Institute of Medical Sciences (PIMS), Islamabad, from August 2025 to February 2026. A total of 110 male children aged 3–12 years with primary distal to mid-penile hypospadias were enrolled and divided into two equal groups such that one group underwent TIP urethroplasty using polyglactin (Vicryl) sutures whereas other group received TIP treatment using polydioxanone (PDS) sutures. Baseline characteristics were comparable between the groups. Postoperative outcomes including healing time, hospital stay, and complications such as urethrocutaneous fistula, bleeding, flap necrosis, glans dehiscence, hematoma, meatal stenosis, and infection were recorded and analyzed.

Results: PDS group showed significantly shorter healing time as compared to the Vicryl group (5.2 ± 2.0 vs 9.6 ± 3.5 days; $p=0.032$). No significant difference was observed in hospital stay between the two groups ($p=0.512$). Urethrocutaneous fistula was more frequent in the Vicryl group than the PDS group (16.3% vs 5.4%; $p=0.042$). Bleeding (3.6% vs 0%; $p=0.04$) and flap necrosis (7.2% vs 0%; $p=0.003$) were also significantly higher in the Vicryl group. No cases of meatal stenosis or postoperative infection were observed in either group.

Conclusion: Polydioxanone sutures are found to be associated with faster healing and a significantly lower rate of postoperative complications, particularly urethrocutaneous fistula, bleeding, and flap necrosis, compared to polyglactin sutures and should be preferred during TIP urethroplasty performed for mid-penile and distal hypospadias

Keywords: Hypospadias, Polydioxanone, Polyglactin, TIP urethroplasty, Urethrocutaneous fistula

Introduction

Hypospadias is one of the most common congenital anomalies affecting male children and results from incomplete fusion of the urethral folds during penile development.^{1, 2} The condition is characterized by an ectopically placed urethral meatus on the ventral surface of the penis, with locations ranging from the glans to the perineum. Based on the anatomical position of the urethral meatus, hypospadias is classified into anterior (glanular and subcoronal), middle (distal penile, midshaft, and proximal penile), and posterior (penoscrotal, scrotal, and perineal) types³ The reported incidence of hypospadias varies globally, affecting approximately 1 in 150 to 1 in 300 live male births.⁴

Surgical correction remains the only definitive treatment for hypospadias, with the primary objectives being straightening of the penis, correction of associated ventral curvature (chordee), establishment of a functionally adequate urethra, and achievement of an acceptable cosmetic appearance with a vertically oriented meatus.^{5, 6} Despite continuous refinements in surgical techniques, instruments, and magnification, hypospadias repair remains challenging, as evidenced by the existence of more than 250 described surgical procedures, reflecting the lack of a universally accepted optimal technique.⁷ Postoperative complications such as

urethrocutaneous fistula, meatal stenosis, wound infection, and glans dehiscence continue to pose significant concerns, emphasizing the importance of meticulous surgical technique and appropriate selection of surgical materials.^{8, 9}

The suture material type plays a pivotal role in determining the durability and success of hypospadias repair, particularly in urethral reconstruction where tissue healing and tensile support are critical. Absorbable sutures are commonly preferred, with polyglactin (Vicryl) and polydioxanone (PDS) being among the most widely used materials.³ Vicryl is a braided synthetic absorbable suture with a predictable absorption time of approximately 4 to 6 weeks. It is favored for its ease of handling and cost-effectiveness; however, its braided structure may increase tissue drag, capillarity, and inflammatory response. In contrast, PDS is a monofilament synthetic suture with a prolonged absorption period of up to six months, offering reduced tissue reaction, minimal drag, and lower capillarity, which may translate into fewer suture-related complications.^{10, 11}

Several studies have reported differences in postoperative outcomes associated with these suture

materials. In view of the ongoing debate regarding the optimal suture material for hypospadias repair and the limited local data available, our study intended to compare the outcomes of Vicryl and PDS sutures in TIP urethroplasty for distal to mid-penile hypospadias, with particular emphasis on postoperative infection and wound-related complications.

Methodology

This observational prospective comparative study was conducted at the Department of Pediatric Surgery, Pakistan Institute of Medical Sciences (PIMS), Islamabad, over a period of six months from August 2025 to February 2026, after approval of the research synopsis by the institutional ethical committee. A total of 110 male patients were enrolled using non-probability consecutive sampling, with 55 patients allocated to each study group. The sample size was determined through the WHO-recommended sample size calculator, assuming 5% of level of significance, power of 80%, a proportion of urethrocutaneous fistula of 26.67% in the Vicryl group and 6.67% in the PDS group, resulting in a calculated sample size of 54 patients per group, which was rounded to 55.

Male patients aged more than 3 years and up to 12 years presenting with primary distal to mid-penile hypospadias were included in the study. Patients with proximal hypospadias (penoscrotal, scrotal, and perineal types), a history of previous hypospadias surgery, recurrent urethrocutaneous fistula, recurrent hypospadias, those requiring two-stage repair, patients with associated chordee greater than 30 degrees, and those with a phallic length of less than 4 cm were excluded.

After the ethical committee approval, written informed consent was obtained from the parents or legal guardians of all the study participants. Demographic details including age were recorded, and confidentiality of patient information was ensured throughout the study. Participants of the study were allocated into two groups based on the suture material type used for hypospadias repair. Group A TIP urethroplasty using Vicryl sutures, while Group B underwent TIP urethroplasty using PDS sutures. All procedures were performed by the same surgical team following standardized operative steps.

Postoperatively, patients remained admitted for five days. Surgical dressings were removed on day 5 postoperatively, and the urinary catheter was taken off on postoperative day ten during an outpatient visit. Follow-up assessments were conducted at three weeks, two months, and six months postoperatively. Apart from the suture material used, all perioperative and postoperative management protocols were identical in

both groups. Data regarding the type of hypospadias, suture material, and postoperative complications including urethrocutaneous fistula, meatal stenosis, glans dehiscence, and flap necrosis were recorded using a predesigned structured proforma based on predefined operational definitions.

Data were analyzed using SPSS version 23.0. Quantitative variables, including age, were summarized as mean $\pm$ standard deviation. Data normality was assessed using the Shapiro-Wilk test. Thereafter, normally distributed data was analyzed via independent t-test while the Mann-Whitney U test was used for non-normally distributed data. Qualitative variables were presented as frequencies and percentages. Effect modifiers including age, type of hypospadias, and suture material were controlled through stratification, and post-stratification analysis was performed using chi-square test or Fisher's exact test, according to data type. A p-value <0.05 was taken as statistically significant, and all analyses were performed at a 95% confidence level.

Results

A total of 110 participants were included in the study. No significant difference was found among the two study groups in terms of age, hypospadias type, phallic length, and presence of chordee ($p < 0.05$) (Table I)

The healing time in the PDS group is significantly less than that of Vicryl group, with a mean of days $9.6 \pm$

Variables	Vicryl Group (N=55)	PDS Group (N=55)	p-value
Age (years), Mean $\pm$ SD	6.9 $\pm$ 2.0	6.7 $\pm$ 2.1	0.58
Type of hypospadias, n (%)			
• Distal penile	35 (63.6%)	37 (67.3%)	0.68
• Mid-penile	20 (36.4%)	18 (32.7%)	
Mean phallic length (cm)	5.0 $\pm$ 0.5	5.1 $\pm$ 0.6	0.44
Presence of chordee, n(%)	11 (20%)	10(18.2%)	0.81

3.5 days in comparison with 5.2 ± 2.0 days, respectively ($p = 0.032$). However, duration of hospital stay remained statistically insignificant between the two analyzed groups (Table II).

Among the postoperative complications, patients in PDS group demonstrated significantly lesser frequency of Urethrocutaneous fistula (5.4% vs 16.3%, $p=0.002$), bleeding (0% vs 3.6%, $p= 0.003$), and flap

necrosis (0% vs 7.2%, $p = 0.001$) as compared to vicryl group. Neither of the groups experienced meatal stenosis or post-operative infection. Whereas the incidence of Glans dehiscence and hematoma formation remained insignificantly low in both groups (Table III).

Table II: Comparison Between Operative Characteristics of Two Study Groups (n=110)

Variables	Vicryl Group (N=55)	PDS Group (N=55)	P-value
Healing Time (Days)	9.6 ± 3.5	5.2 ± 2.0	0.032
Hospital Stay (Days)	7.5 ± 0.5	6.0 ± 1.2	0.512

Discussion

Table III: Comparison of Post-Operative Complications (n=110)

Outcomes	Vicryl Group (N=55)	PDS Group (N=55)	P-value
Urethrocuteaneous fistula	9 (16.3%)	3 (5.4%)	0.042
Meatal stenosis	0 (0%)	0 (0%)	
Glans dehiscence	3 (5.4%)	1 (1.8%)	0.71
Flap necrosis	4 (7.2%)	0 (0%)	0.003
Bleeding	2 (3.6%)	0 (0%)	0.04
Hematoma	2 (3.6%)	1 (1.8%)	0.61
Infection	0 (0%)	0 (0%)	

In our study, the lack of a statistically significant age difference between the Vicryl and PDS groups goes hands in hands with the study of Alaraby et al., who also reported comparable mean ages between patients repaired using polyglactin and polydioxanone sutures, with no significant intergroup variation.⁴ Similar observations were made by Shirazi et al., who evaluated a large cohort of hypospadias patients and demonstrated non-significant age differences between Vicryl and PDS groups.¹² These findings collectively suggest that age is unlikely to confound the relationship between suture material and postoperative outcomes in primary hypospadias repair.

Moreover, as already discussed, healing time was significantly shorter in the PDS group compared to the Vicryl group, whereas hospital stay duration did not differ significantly. The shorter healing duration observed with PDS may be explained by its monofilament structure, which is associated with reduced tissue drag, lower capillarity, and a diminished inflammatory response compared to braided sutures such as Vicryl. Our findings regarding hospital stay are in agreement with Alaraby et al., who similarly reported no significant difference in hospitalization duration between polyglactin and polydioxanone groups.⁴

Regarding the most important aspect of the study-postoperative complications, urethrocuteaneous fistula formation was significantly more frequent in the Vicryl group than in the PDS group. This observation supports the hypothesis that the prolonged tensile strength and lower tissue reactivity of PDS sutures contribute to improved urethral healing. These findings are in concordance with Shirazi et al., who reported a higher incidence of urethrocuteaneous fistula, glans dehiscence, and meatal stenosis in patients repaired with Vicryl compared to those repaired with PDS.¹² Likewise, Singh et al. demonstrated a markedly higher rate of urethrocuteaneous fistula among patients undergoing tubularized incised plate urethroplasty with Vicryl utures compared to PDS sutures.¹³

In contrast, Guarino et al., who compared polyglytone and polydioxanone sutures in distal hypospadias repair, reported no statistically significant differences in major complication rates between the two groups, although a slightly higher fistula rate was observed with polydioxanone on long-term follow-up.¹⁴ Similarly, a systematic review by Borkar et al. failed to demonstrate significant differences between polyglactin and polydioxanone sutures in terms of meatal stenosis, wound infection, urethral stricture, and overall complication rates.¹⁰ These discrepancies may be attributable to study design differences, patient selection criteria, surgical techniques, surgeon experience, and follow-up duration.

Additional evidence supporting the superior tissue response associated with PDS sutures was provided by Fakhr, who observed higher rates of postoperative redness, edema, bleeding, and infection in patients repaired with Vicryl compared to those repaired with PDS, although no urethrocuteaneous fistula was reported in either group.¹⁵ These findings are consistent with the known higher inflammatory potential of braided sutures.

While some studies have reported non-significant differences between suture materials, our findings differ from those of Alaraby et al., who demonstrated a statistically significant increase in fistula formation in the polyglactin group compared to the polydioxanone group.⁴ This divergence may reflect variations in patient populations, inclusion criteria, or perioperative protocols.

Overall, the findings of the present study, supported by a substantial body of existing literature, suggest that polydioxanone sutures offer clinically meaningful advantages over polyglactin sutures in hypospadias repair. These advantages include faster healing and a lower incidence of key postoperative complications, particularly urethrocuteaneous fistula, bleeding, and

flap necrosis. While both materials remain acceptable, PDS appears to provide more favorable outcomes in primary distal to mid-penile hypospadias repair.

Conclusion

Use of PDS sutures in TIP urethroplasty for mid-penile

and distal Hypospadias is associated with faster healing and significantly fewer postoperative complications compared to Polyglactin sutures. Therefore, PDS sutures should be preferred to optimize surgical outcomes.

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