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Comparison of Transverse Mattress Vs Continuous Suture Urethroplasty in Tubularized Incised Plate Hypospadias Repair: A Prospective Study

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ABSTRACT

We studied two improved techniques for tabularized incised plate (TIP) repair in distal hypospadias: continuous vs transverse mattress sutures. We evaluated their effects on complications and surgical success. **Material and Methods:** We performed a prospective randomized trial on 60 boys with primary hypospadias, ages 1 to 13 years (mean age 5.6 years), between June 2024 and November 2024. The participants were randomly divided into two groups based on suturing technique: continuous (30 boys) or transverse mattress(30 boys). This study aimed to compare the complication rates between two groups of patients, all of whom underwent the same preoperative, operative and follow up procedures, allowing for a direct comparison of outcomes. **Results:** Our study revealed no significant difference(p = 0.06) in complication rates between Group A and Group B. A total of 28 (46.7%) complications occurred, with 18 (30%) in Group A and 10 (16.7%) in Group B. The most common complication encountered in both groups was urethrocutaneous fistula (UCF), affecting nearly a quarter of the total patients. Specifically, 15%(9) of patients in Group A and 8.3%(5) of patients in Group B developed this complication, with a total of 14(23.3%) patients out of 60 being affected. Additionally, 6(10%) patients experienced wound dehiscence , 4(6.7%) in Group A and 2(3.3%) in Group B. Total 8(13.3%) patients developed meatal stenosis , 6 (10%) in Group A and 2 (3.3%) in Group B. **Conclusion:** The suture technique used in Snodgrass hypospadias repair doesn't impact complication rates. Surgeon preference, not technique, should guide decision-making. This simplifies surgical planning, enhances patient outcomes and improves safety. Streamlining protocols benefits both patients and surgeons..

INTODUCTION

Hypospadias is a prevalent congenital anomaly , affecting approximately 1 in 200 to 1 in 300 live births[1]. It is characterized by urethral meatus being positioned ectopically on ventral surface of penis, proximal to its normal location and often accompanied by varying degrees of chordee[2]. Numerous classification system have been proposed to categorize hypospadias, primarily according to location of ectopic meatus[3].

The primary objective of hypospadias repair is to create a functional urethra and achieve a penis with good aesthetic look, enabling adequate sexual function[4]. However, hypospadias repair is a complex and challenging procedure, with complication rates exceeding those of reconstructive surgeries. The most frequent and serious complication associated with hypospadias repair is the development of urethrocutaneous fistula which occurs in a substantial portion of cases[5,6].

The ideal technique for repairing hypospadias should be straightforward, uncomplicated and associated with minimal complications[7]. Snodgrass'1994 introduction of tubularized incised plate urethroplasty revolutionized the hypospadias treatment[8-13]. The method's technical simplicity and low risk of complications have led to its widespread popularity for the correction of distal hypospadias. Consequently, a large number of papers about the nuances and variants of this procedure has been published[14]. Although the technique has been successful, complications persist, driving ongoing reseach to further improve outcomes[15].

While there is a consensus on use of absorbable sutures, the suturing method(continuous vs mattress) remains a topic of debate. Furthermore, although some studies found no correlation between suturing pattern and outcome[17], others suggested that suturing technique used can influence results and complications rate[18]. This

study aims to evaluate and compare the outcomes and complications rates associated with continuous versus mattress suture technique in tubularized incised plate urethroplasty for hypospadias repair in cases with an adequate urethral plate.

MATERIAL AND METHODS

This prospective randomized trial was carried out at Paediatric Surgery Department of Mayo Hospital Lahore between June 2024 to November 2024. The study focused on boys with primary hypospadias, with parental consent obtained prior to participation. The mean age of the participants was 5.6 years(range 1 –13 years). The Institutional Ethics Committee granted ethical approval.

Inclusion criteria

It consisted of primary cases with subcoronal, distal or mid-penile hypospadias, minimal chordee and suitability for Snodgrass TIP urethroplasty.

Exclusion Criteria

It included glanular, recurrent or proximal hypospadias as well as moderate to severe chordee.

All patients underwent comprehensive evaluatins, including history and clinical examination along with routine blood investigations.

Patients were randomly divided into two groups based on the suture technique used for Snodgrass hypospadias repair. Randomization was performed using sequential numbering and a computer-generated random table, allocationg patients equally between the two groups.

The study consisted of two groups: Group A, comprising 30 boys who underwent continuous suture Snodgrass TIP urethroplasty and Group B, comprising 30 boys who underwent transverse mattress suture Snodgrass TIP urethroplasty. All patients received prophylactic preoperative antibiotics and underwent surgery. In Group A, the surgical procedure involved Snodgrass TIP urethroplasty with 5-0 polyglactin(Vicryl) suture in continuous manner in single layer over an 8 to 10 F catheter. In Group B, transverse mattress suture technique was employed to reconstruct the neourethra. The technique involved taking sutures from 1 cm on one edge of the urethral plate passing through the soft tissue beneath both urethral edges, and emerging 1cm from the other urethral edge. The suture was then returned to create a transverse mattress suture. Multiple sutures were used to reconstruct the neourethra. In all cases, preputial dartos flap neourethral covering was also employed.The catheter was left in place for 7 days, followed by postoperative antibiotic prophylaxis for 7 days.

Patients underwent regular follow up evaluations occuring weekly for the first four weeks, followed by monthly assessments for at least four months postoperatively. During these evaluations, patients were examined for early and late complications(hematoma, infection, oedema), their urinary stream during voiding, suture line calibration, meatal site and shape were assessed. The incidence and types of complications associated with each type were documented and compared.

Statistical analysis was performed using SPSS software to verify outcomes. A comparison of categorical variables was made using Fisher's exact test. A P-value below 0.05 was regarded as statistically significant.

RESULTS

Out of 60 patients with primary hypospadias, 17 were subcoronal hypospadias, 23 were distal hypospadias and 20 were mid penile hypospadias(Table 1). They were randomly allocated into two groups of thirty patients each.

Acute postoperative complications were found to be minimal in nature. No instances of significant bleeding or hematoma encountered. A total of 10 patients experienced postoperative edema, which subsequently resolved without intervention. The overall success rate, as defined by absence of complications stood at 53.3%, with Group A and Group B reporting success rates of 40% and 66.7% respectively. The complications reported included urethral cutaneous fistula in 14(23.3%) patients; 9(15%) in group A and 5(8.3%) in group B, meatal stenosis in 8 (13.3%)patients; 6(10%) in group A and 2(3.3%) in group B and wound dehiscence in 6(10%) patients; 4(6.7%) in group A and 2(3.3%) in group B (Table 2). All cases of urethrocutaneous fistula presented within the first two months postoperatively. Regular dilatation proved effective in treating meatal stenosis. Local wound care successfully managed wound infections without surgical intervention. The cosmetic results were deemed satisfactory by parents of patients with uncomplicated recoveries. Furthermore, patients who did not develop fistula or stenosis achieved favorable functional outcomes, a normally shaped glans, a slit-like meatus at the tip and voided with a single, straight forward stream.

Group A showed higher incidence of individual complications than Group B, but the difference was not statistically significant($p>0.05$)for each specific complication category.

Table 1

Distribution of Hypospadias Types in Both Groups

Location	Group A N=30	Group B N=30	Total N=60
Sub coronal	8(13.3%)	9(15%)	17(28.3%)
Distal penile	12(20%)	11(18.3%)	23(38.3%)
Mid penile	10(16.7%)	10(16.7%)	20(33.3%)

Table 2
Complications compared between Group A and Group B using x^2-test

	Group A	Group B	Total	p-value
Urethrocutaneous fistula	9(15%)	5(8.3%)	14(23.3%)	0.360
Meatal stenosis	6(10%)	2(3.3%)	8(13.3%)	0.254
Wound dehiscence	4(6.7%)	2(3.3%)	6(10%)	0.671
Total	18(30%)	10(16.7%)	28(46.7%)	0.069

DISCUSSION

Hypospadiology is a continuously evolving specialty, with surgery for hypospadias remaining a complex challenge.[19] Despite the development of various surgical techniques, achieving optimal results remains a goal.[20] The glans penis is a highly resilient and vascularized tissue, characterized by its remarkable ability to heal rapidly with minimal scarring.[21] The primary objectives of surgery are to create a cosmetically normal penis, enable forward directed urination and facilitate coitus. Postoperative complication rate varies widely, ranging from 1% to 50%.[22-24] For distal hypospadias, the tubularized incised plate repair (TIP) has emerged as the preferred method, a modification by Snodgrass. This repair offers the advantage of enhanced cosmetic results, yielding a circumcised penis with a normally positioned, vertically oriented meatus. This approach allows for tubularized urethroplasty to be used in most cases, even when a deeply grooved urethral plate is absent.[25] The optimal age range for hypospadias repair is between 6 and 18 months.[26]

The success of hypospadias repair surgery is contingent upon multiple factors, including surgical techniques.[28] Despite the widespread acceptance of absorbable sutures, there is an ongoing debate about the most effective suturing technique-continuous or transverse mattress. Currently the selection of surgical technique is often dictated by the surgeon's personal preference. Research has shown that the suturing technique can impact the outcome of surgeries such as bowel anastomosis. Similarly, research has explored the effects of suturing techniques on hypospadias repair outcomes, but clear guidelines have yet to be established.[27]

Ulman et al.[29] observed that subcuticular continuous suture urethroplasty with 7-0 polydioxanone resulted in fewer complications compared to full-thickness interrupted suture technique. Similarly, Khan et al.[18] discovered that implementation of an inverting continuous suture technique in hypospadias repair resulted in a lower incidence of urethrocutaneous fistula formation compared to an over and over suture technique.

Chung et al. (2012) found UCF rates of 7% in patients treated with TIP urethroplasty, 13.5% and 4.5% for interrupted and continuous suture urethroplasty respectively. However, they found no significant differences in UCF rates based on suture material or technique. Our study's results align with these findings.[30]

According to findings of El-Sherbiny et al. the technique employed for suturing was identified as a significant risk factor influencing the outcomes of hypospadias repair in the univariate analysis. Specifically, it was observed that use of running sutures was associated with a notably higher incidence of fistula formation occurring in 23% of cases, whereas interrupted sutures were linked to a lower fistula rate of 9%. However, upon conducting a multivariate analysis, it was revealed that the suturing technique did not possess any independent statistical significance. In contrast, Sarhan et al.[16] and Snodgrass et al. found no significant differences in fistula rates or complications based on suturing technique. Our study corroborates this, demonstrating that the transverse mattress and continuous suturing techniques yield comparable fistula rates and overall outcomes in hypospadias repair, with no statistically significant difference($p>0.05$) observed.

This study boasts a prospective randomized design, akin to the methodology employed by Sarhan et al.[16] Nevertheless, a notable limitation arises from the fact that the surgeons were not blinded to the suturing techniques utilized in both groups, which may have inadvertently introduced bias into the outcomes. Furthermore, the study's sample size is relatively small, which consequently resulted in diminished statistical power. As a result, additional investigations with larger participant cohorts are warranted to corroborate the findings of the current study.

CONCLUSION

Our study found that the utilization of different suture technique used in Snodgrass hypospadias repair did not yield a statistically significant difference in terms of complication occurence. As a result, the choice of suturing technique can be left to the surgeon's preference. However, it's essential to note that our study's small sample size limits the conclusiveness of our findings. Additional studies with more substantial sample population are warrented to validate our findings.

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