



Comparative study: TIP vs GTIP (dorsal inlay inner prepuce graft) in distal hypospadias repair with undeveloped urethral plate

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Abstract

Hypospadias is a common congenital anomaly of the male urethra, characterized by the abnormal positioning of the urethral meatus, ventral curvature of the penis (chordee), and a dorsal hooded prepuce. Distal hypospadias, the most prevalent form, often involves a urethral plate of variable quality, posing challenges in surgical reconstruction. This was a randomized controlled investigation that carried out on 20 cases at the plastic surgery department, Beni-suef University hospital. cases have been equally randomized utilizing the closed envelope method into 2 groups Group A utilizing grafted tabularized incised plate urethroplasty technique. Group B utilizing classic Snodgrass tabularized incised plate urethroplasty. Study was conducted from December 2019 to December 2020. This study provide that **Patient Demographics** were Comparable across groups. The range of MCGU scores for both groups was from 5 to 7, with the median score for both groups being 6. This suggests that while the scores for both groups were similar, there was no significant difference in the distribution of scores between the two groups based on the p-value greater than 0.05. the study did not find any statistically significant differences in the occurrence of complications between Group A and Group B. This suggests that, based on the data collected, the complications observed in both groups are comparable, and any observed differences are likely

due to random variation rather than a true effect. the comparison of HOSE scores indicates a small difference between the two groups, with Group A having a slightly higher mean score. However, given the p-value of 0.052, this difference is not statistically significant, and the results could likely be due to chance.

1. Introduction:

Hypospadias is one of the most common congenital anomalies, occurring in approximately 1 in 200 to 300 live male births. It is characterized by an abnormal placement of the urethral meatus, chordee, and incomplete foreskin closure. Distal hypospadias accounts for the majority of cases and is typically repaired during infancy or early childhood to restore normal urinary function and improve cosmetic outcomes.[1]. Hypospadias is classified as distal hypospadias in eighty percent of patient (coronal, glandular, distal penile, and mid penile) or proximal hypospadias in twenty percent of patient (proximal penile, penoscrotal, & perineal). This classification is depended on the position of the urethral orifice. The case's complaints may be wide ranging and may be associated with dysfunction, urinary dysfunction, and/or an insufficient cosmetic appearance. Therefore, the aim of hypospadias repair is to attain a functional penis with sexual normal voiding and improved cosmetic outcomes.[2]. The surgical result of hypospadias repair is impacted by a different

factor, such as age at the time of repair, presence of chordee, meatal location, surgeon experience, surgical technique, & urethral plate characteristics. Numerous series have been conducted to investigate the urethral plate characteristics that influence the surgical findings of tabularized incised plate urethroplasty.[3]. The Tubularized Incised Plate (TIP) repair, introduced by Snodgrass in 1994, is widely recognized as the gold standard for distal hypospadias repair. This technique involves a longitudinal incision of the urethral plate to improve its elasticity and subsequent tubularization to create a functional neourethra. While TIP offers excellent results in patients with well-developed urethral plates, its effectiveness diminishes in cases where the urethral plate is narrow, fibrotic, or otherwise inadequate.

[4] Under such conditions, complications such as enterocutaneous fistula and meatal stenosis are more likely to occur.[5]. To address these challenges, the Graft Tubularized Incised Plate (GTIP) technique has been developed. By incorporating a dorsal inlay graft, typically harvested from the inner prepuce, the GTIP

procedure enhances the pliability and vascularity of the urethral plate, making it suitable for tubularization even in patients with poor-quality plates. This technique has shown promise in improving outcomes for more complex cases, but direct comparisons with standard TIP repair remain limited. [6]. This study aims to evaluate and compare the outcomes of GTIP and standard TIP repair in patients with distal hypospadias and undeveloped urethral plates. By analyzing functional and aesthetic results, as well as complication rates and patient/parental satisfaction, this research seeks to provide evidence for the optimal surgical approach in challenging distal hypospadias repairs.

2. Patients and Methods :

2.1. Study type and sampling:

This is a randomized controlled study that will be conducted on 20 patients at the plastic surgery department, Beni-suef University hospital. Cases have been equally randomized utilizing closed envelope method into 2 groups **Group-A** (10 patients) utilizing grafted tabularized incised plate urethroplasty technique.

Group-B (10 patients) utilizing classic Snodgrass tabularized incised plate urethroplasty. Between January 2024 and July 2024.

The sample size was calculated using G.POWER program. The following criteria were set; t-test design suggests that to detect a

significant difference with a large effect size ($d = 1.35$), an α level of 0.05, and 80% power, you would need 10 participants per group, resulting in a total sample size of 20.

2.2. Data Collection Methods:

The data collection methods for this study involve a thorough and systematic approach to gather relevant preoperative, operative, and postoperative information. Initially, patients are selected based on well-defined inclusion and exclusion criteria, which ensure that the sample population is homogenous and suitable for the study. Data collection begins with a comprehensive preoperative evaluation that includes a detailed history-taking process, covering personal, parental, and family histories, as well as any significant medical factors such as maternal ingestion of drugs or hormones, consanguinity, prior circumcision, and any congenital anomalies. This is followed by a clinical examination of the external genitalia, which includes assessing the penis for length, position, and any associated abnormalities like torsion or buried penis, evaluating the meatus for location and quality, and examining the urethral plate for its dimensions and shape. Additional aspects such as the size and shape of the glans, prepuce, scrotum, and testicles are also meticulously documented.

Routine preoperative investigations, including urine analysis, culture, blood profiles, coagulation tests, and prothrombin activity, are performed to ensure the patient's readiness for

surgery. Karyotyping is carried out if there is suspicion of associated non-genital anomalies. In cases of undescended testis, radiological imaging, such as abdominal-pelvic ultrasonography, is utilized. Data collection also includes the administration of a single dose of broad-spectrum antibiotics prior to surgery and the use of standard anesthesia protocols. During the operative phase, detailed records of the surgical procedure are maintained, including information on the positioning of the patient, anesthesia administration, surgical techniques, instruments used, and the specific suture materials for urethroplasty and skin closure. Hemostasis methods, including the use of bipolar cautery and rubber band tourniquets, are also documented. Throughout the postoperative period, patient recovery, complications, and follow-up assessments are recorded to evaluate the outcomes of the surgery. This comprehensive data collection approach allows for a thorough analysis of the surgical process and its effects on the patient's condition.

2.3. Data Analysis:

The data analysis for this study followed a structured approach to ensure that the results were robust and meaningful. Initially, the collected data were organized into categories based on the different phases of the study: preoperative, operative, and postoperative. Descriptive statistics, including means, standard deviations, and frequencies, were used to summarize the patient demographics, clinical

characteristics, and surgical outcomes. For example, the distribution of patients by age, the type and severity of hypospadias, and the presence of comorbidities were analyzed to provide a clear overview of the sample population.

To evaluate the effectiveness of the surgical intervention, postoperative outcomes were compared to preoperative measures. This involved assessing the success rate of the surgery in terms of functional and aesthetic results, as well as any complications that had occurred during or after the procedure. The primary variables examined included the location of the meatus, the quality of the urethral plate, the degree of chordee correction, and the presence or absence of complications such as infection or wound dehiscence.

The analysis employed inferential statistical methods, such as paired t-tests or non-parametric tests, depending on the distribution of the data, to assess whether there were significant differences in pre- and postoperative measures. For example, the changes in the urethral plate's dimensions or the glans shape before and after surgery were compared to evaluate the impact of the surgical technique. Additionally, logistic regression was used to identify factors that predicted successful outcomes, considering variables such as age, the severity of hypospadias, and the presence of other congenital anomalies.

The overall success of the procedure was measured using pre-established clinical scoring systems such as the Hypospadias Initial Score (HIS) and the McGuire classification (MCGU), which helped quantify the results and provide a standardized comparison across patients. The findings were presented in tables, charts, and graphs for easy interpretation, and statistical significance was set at a p-value of less than 0.05. By analyzing both descriptive and inferential data, the study aimed to provide a comprehensive understanding of the surgical outcomes and the factors influencing success in hypospadias repair.

2.4. Ethical Consideration:

All the individuals included in the study had been informed about the procedures regarding the study and informed of their rights to refuse participation or withdraw from the study

without having to give reasons. Participants were guaranteed anonymity and all information provided would be treated with confidentiality. Before the onset of the study, a written consent and statement of voluntary participation of the participants was obtained after they were informed about the purpose of the research and how it will be conducted. The required administrative regulations were fulfilled. The ethical approval of the faculty of medicine, Beni-Suef University research ethical committee (REC) was obtained prior to the beginning of the work with approval No FMBSUREC/02012024/Ahmed.

3. Results:

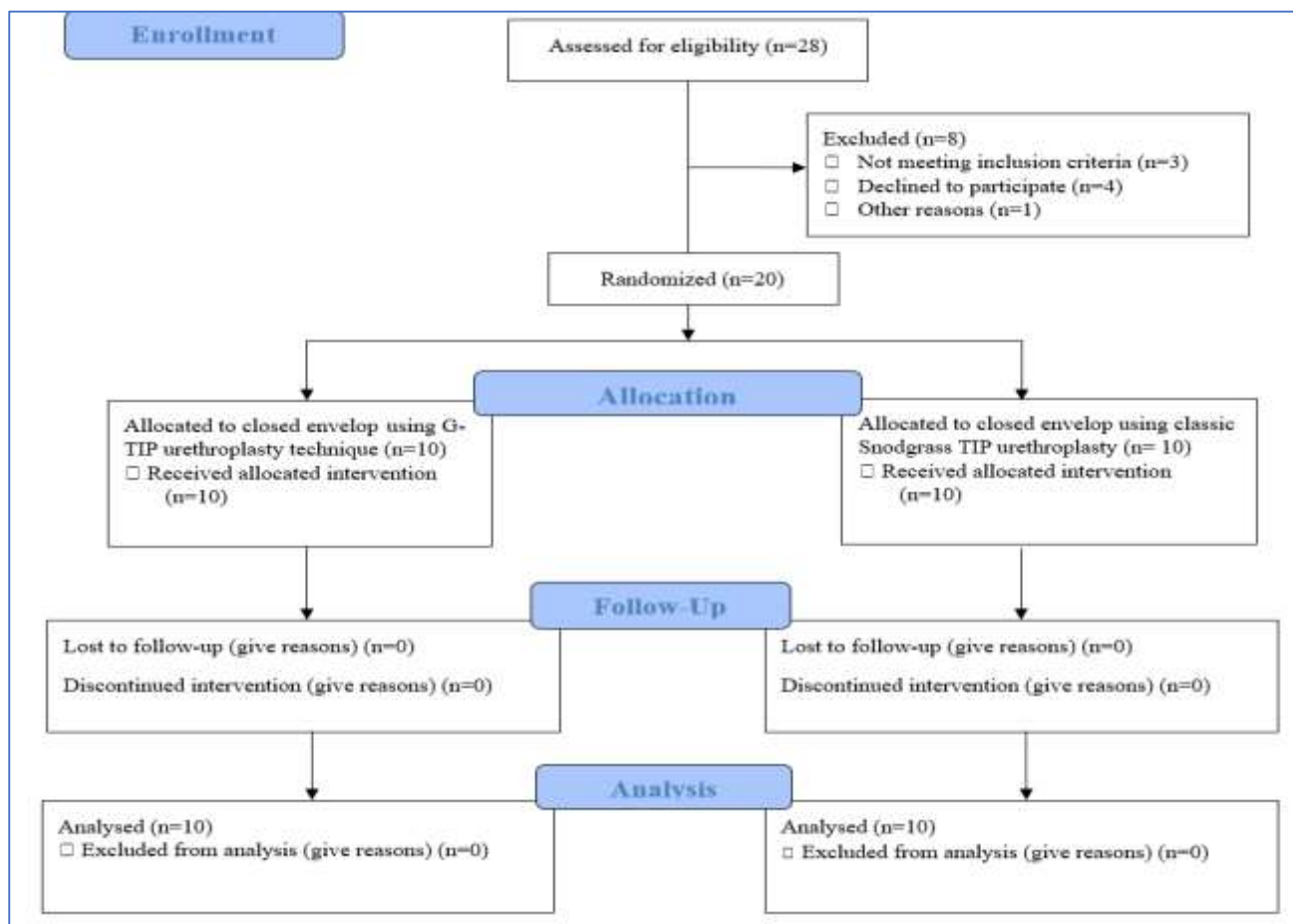


Figure 1 Flow Diagram of Study Strategy and Selection of Patients

As shown in Table 1, there was insignificant variance among both groups in terms of age, which spanned from one year - 40 months, with the median age in group A being 23.5 months &

the median age in group B being 17.5 months. This was the case when comparing the demographic data.

The mean width of the urethral plate in group A was 6.1 ± 0.37 millimeter while in group B the mean urethral plate width was 5.9 ± 0.23 mm. The surgery duration was greater in group A than to group B ($P = 0.00$), There was a statistically significant variance regarding

meatus location as shown in table 1. The characteristics of the studied groups (Group A and Group B) were compared in terms of the MCGU score. The mean $\pm$ standard deviation (SD) for the MCGU score was 5.6 ± 0.87 for Group A and 5.9 ± 0.6 for Group B. The p-value for this comparison was 0.436, indicating that there was no statistically significant difference between the two groups in terms of the MCGU score.

The range of MCGU scores for both groups was from 5 to 7, with the median score for both groups being 6. This suggests that while the

scores for both groups were similar, there was no significant difference in the distribution of

scores between the two groups based on the p-value greater than 0.05.

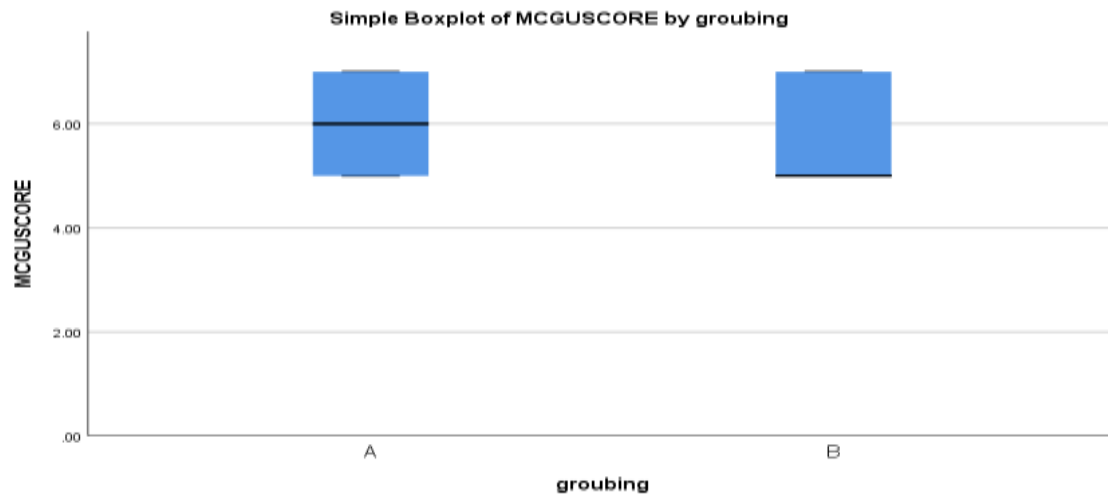


Figure 2 MCGU Score among the studied comparable groups

The comparison of complications between Group A and Group B revealed no statistically significant differences in the types or frequencies of complications observed. The p-values for all complications (oedema, infection, stenosis, and fistula) were above the typical significance threshold of 0.05, indicating that the differences between the groups were likely due to chance rather than any meaningful effect as demonstrated in Table 2. **Oedema:** Both groups experienced similar patterns of oedema, with the majority of participants having mild oedema (50% in each group). There were small differences in the frequency of moderate and severe oedema between the groups, but the p-value of 0.569 suggests these differences were not statistically significant. **Infection:** Although Group B had a slightly higher rate of infection (60% vs. 40%), the p-value of 0.606 indicates that this difference is not significant. Both groups had a

relatively low incidence of infection overall.

Dehiscence: No cases of dehiscence occurred in either group, with a p-value of 1.000 indicating no difference between the groups, as the outcome was the same for both. **Stenosis:** Group B had a higher rate of stenosis (66.7% vs. 33.3%), but the p-value of 0.323 suggests that this difference was not statistically significant. **Fistula:** There was a slight difference in the occurrence of fistulas between the groups (1 case in Group A vs. 2 in Group B), but the p-value of 0.353 shows this difference is also not statistically significant. The **HOSE score** (Hypospadias Objective Scoring Evaluation) was used to assess the outcomes in both studied groups, Group A and Group B, each containing 10 participants. The **mean $\pm$ standard deviation (SD)** of the HOSE score for Group A was **15.10 $\pm$ 0.91**, while for Group B, it was **14.30 $\pm$ 0.85**. The range of scores for Group A was from **14 to 16**, and for

Group B, it was from 13 to 15. The **median score** was 15 for Group A and 14 for Group B. The p-value for the comparison of the HOSE scores between the two groups was **0.052**, which is very close to the typical threshold for statistical significance (0.05). Although the p-value is slightly above 0.05, it suggests that

there may be a marginal difference between the groups, but it is not considered statistically significant. This means that, although Group A had a slightly higher average HOSE score, the difference between the groups is not large enough to be considered statistically meaningful based on the data collected.

Table (1): Comparison of the 2 groups that have been investigated with regard to age, preoperative urethral plate criteria, & granular width, as well as the amount of time that was spent carrying out the procedure among both two methods.

Characteristics		Studied Groups		p-value
		Group A Number =ten	Group B Number =ten	
Age (months)	Mean $\pm$ SD	25.5 $\pm$ 2.9	23.3 $\pm$ 3.7	0.481
	Range (Mini – Max)	15 - 40	12 - 41	
	median	23.5	17.5	
Width of the urethral plate (milometer)	Mean $\pm$ standard deviation	6.1 $\pm$ 0.37	5.9 $\pm$ 0.23	0.631
	Range (Mini – Max)	4 - 8	5 – 7	
	median	6	6	
Operation time	Mean $\pm$ SD	89.4 $\pm$ 4.1	70.6 $\pm$ 2.1	<0.01*
	Range (Mini – Max)	78- 112	61-80	
	median	84.5	70.5	
Meatus location	sub coronal	7 (70)	0	0.003*
	coronal	0	3 (50)	
	distal penile	3 (30)	3 (50)	
	granular	0	4	

Age, Width of UP and Operation Time by Mann-Whitney (U), Meatus site by chi square test.

Table (2): Postoperative complications among the studied comparable groups(N=20).

COMPLICATIONS		Studied Groups		p-value
		Group A Number=ten	Group B Number=ten	
Oedema	Mild	7 (50)	7 (50)	0.569
	Moderate	2 (40)	3 (60)	
	sever	1 (100)	0	
Infection	Yes	2 (40)	3 (60)	0.606
	No	8 (53.3)	7 (46.7)	
dehiscence	Yes			1.000
	No	10	10	
Stenosis	Yes	2 (33.3)	4 (66.7)	0.323
	No	8 (57.1)	6 (42.9)	
Fistula	Yes	1	2	0.353
	No	9	8	

by chi square test, One Case at group B complicated by sub coronal fistula with sever stenosis 40M infant with distal penile hypospadias with MCGG score 7 points.

Table (3): Comparing the HOSE score postoperatively in both group

Characteristics		Studied Groups		p-value
		Group A Number=ten	Group B Number=ten	
HOSE score	Mean $\pm$ SD	15.10 $\pm$.91	14.30 $\pm$ 0.85	0.052
	Range (Mini – Max)	14 - 16	13 - 15	
	median	15	14	

4. Discussion:

Hypospadias is a surgical worry that has inspired a wide range of opinions regarding its therapy, & it is possible that no other surgical concern in history has done just that. Duckett defined hypospadiology as “the comprehensive investigation of the art & science of the surgical correction of hypospadias.” [7]. Our study revealed according the demographic data of there was insignificant variance among both groups in regard to age which varied from one year to 40 months with the median age in group A of 23.5 months & group B 17.5 months in group B. The mean width of the urethral plate in group A was 6.1 $\pm$ 0.37 millimeter while in group B the mean urethral plate width was 5.9 $\pm$ 0.23 mm without significant difference which can be explained by following inclusion and exclusion criteria in choosing patient to our study.

Regarding Operation time comparison between the studied groups our study revealed that mean duration was grater in group B (grafted TIP).

This outcomes is in agreement with investigation conducted by Sultan et al.,2020 to investigate the variance between tabularized

Urethral plate that has been cut into & tabularized plate that has been cut into with preputial graft in hypospadias repair by prospective randomized investigation involve 60 cases suffering from hypospadias who has been recruited into the department of urology of Menoufia & Kafr El-Sheikh University Hospitals from December 2018-June 2020 which have been categorized into 2 groups; group I had the classic TIP repair & group II had tabularized incised plate repair with inlay preputial graft. Details of the surgery, complications after the surgery have been demonstrated also uroflowmetry has been done for all patient at the third & sixth months after the surgery which demonstrated that the surgery duration was longer in group B than to group A as mean operative duration at group B (grafted TIP) was 102.37 $\pm$ 9.27 compared to 89.4 $\pm$ 4.1 at our results. [8].

Regarding post operative complications our results revealed that one case at grafted tabularized incised plate group experienced fistula which closed by frequent dilatation which represent 10%with higher rate of stenosis

as 4 cases complained stenosis at classic tabularized incised plate group. So, our results demonstrated that grafted tabularized incised plate the outcomes very hopeful only 2 cases had experienced meatal narrowing but fistula happened in 1 case comparing by 2 cases at C-TIP which may be explained by this case had narrow urethral plate width 4 mm, and this finding needed to be confirmed by other studies with larger sample size.

This finding was in agreement with study by Leslie and his colleague which aimed to investigate the functional & histological characteristics of the tabularized incised plate versus dorsal inlay graft urethroplasty which reported that no cases had experienced meatal narrowing but fistula occurred in ten patients (9.8percent).[9].

Later on, Mouravas et al. with agreement of our results stated a comparative analysis of classic tabularized incised plate & transplanted tabularized incised plate in forty-seven patient & stated that grafted TIP findings in the lower fistula & urethral stricture levels recommending it as the preferred approach incases having primary hypospadias repair. [10].

However, Abbas had stated that the complications rate rise when urethral plate width is less than eight millimeters (fistula rate fifty-five percent & meatal stenosis eighteen percent). [11].

Keays & Dave stated that 30 patients with urethral plate width less than eight millimeters had classic tabularized incised plate & in 1 case

developed a fistula & no demonstrated patient with meatal narrowing & concluded that the width of the urethral plate didn't impact the findings for a short-term (eight months). [12].

In a retrospective investigation of a single surgeon's experience with tabularized incised plate & transplanted tabularized incised plate, the outcomes of grafted tabularized incised plate were superior to ordinary tabularized incised plate urethroplasty as the transplanted tabularized incised plate has been noted to have significantly lower rates of meatal narrowing & fistula. [13].

5. Conclusion and Recommendations:

This study evaluated complications, MCGU scores, and HOSE scores to compare the results of hypopadias correction between two groups. The incidence of complications, such as oedema, infection, dehiscence, stenosis, or fistula, did not differ statistically significantly between Group A and Group B, according to the data. Although Group A's mean HOSE score was somewhat higher than Group B's (15.10 ± 0.91), the difference was not statistically significant ($p = 0.052$). The conclusion that the surgical methods employed in both groups provide equivalent results is further supported by the similar results that the two groups' MCGU scores demonstrated. These results imply that both methods of repairing hypopadias are successful and provide similar rates of problems and functional results.

Suggestions

Future Research: Multicenter studies and larger sample sizes.

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