Research Article

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Does glanular fixation suture affect surgical outcomes in distal hypospadias repair?

Distal hipospadias onarımı yapılan hastalarda penise konulan fiksasyon sütürü ameliyat başarısını etkiler mi?

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Abstract

Purpose: This study aimed to evaluate the impact of glanular fixation suture on surgical outcomes in children undergoing distal hypospadias repair.

Materials and methods: We retrospectively reviewed the data of 322 patients who underwent distal hypospadias repair in our clinic between January 2014 and December 2023. Patients operated on after January 2019, when the glanular fixation technique was adopted, formed the study group; those operated on before this date constituted the control group. All procedures were performed using the TIPU (tubularized incised plate urethroplasty) technique by the same pediatric urology team. Preoperative Glans-Meatus-Shaft (GMS) scores and six-month postoperative HOSE scores were used for comparison.

Results: There was no statistically significant difference between the two groups regarding HOSE scores, fistula formation, or wound dehiscence (p>0.05). However, unintentional early dressing removal was significantly lower in the study group (2.4%) compared to the control group (11.4%) (p=0.02).

Conclusion: While the application of a glanular fixation suture did not significantly affect overall surgical outcomes in distal hypospadias repair, it was associated with improved postoperative dressing adherence. This technique may offer an advantage in clinical protocols where dressing stability is crucial for optimal wound healing. Further prospective, randomized studies are needed to validate these findings.

Keywords: Hypospadias, glanular fixation, dressing stability, HOSE score, postoperative complications.

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Öz

Amaç: Bu çalışmanın amacı, distal hipospadias onarımı yapılan çocuk hastalarda glansa uygulanan fiksasyon sütürünün cerrahi başarı ve komplikasyon oranları üzerindeki etkisini değerlendirmektir.

Gereç ve yöntem: Ocak 2014 ile Aralık 2023 tarihleri arasında kliniğimizde distal hipospadias onarımı yapılan 322 hastanın verileri retrospektif olarak incelendi. Ocak 2019 sonrası opere edilen ve glanüler fiksasyon sütürü uygulanan hastalar çalışma grubunu, öncesinde opere edilen ve fiksasyon yapılmayan hastalar kontrol grubunu oluşturdu. Tüm hastalar aynı cerrahi ekip tarafından TIPU (tubularized incised plate urethroplasty) tekniği ile opere edildi. Glans-meatus-shaft (GMS) skoru ve HOSE değerlendirmesi kullanılarak gruplar karşılaştırıldı.

Bulgular: İki grup arasında HOSE skorları, fistül, dehisens ve diğer cerrahi komplikasyon oranları açısından anlamlı fark saptanmadı (p>0,05). Ancak plansız erken pansuman çıkması çalışma grubunda anlamlı şekilde daha az gözlendi (p=0,02).

Sonuç: Glansa uygulanan fiksasyon sütürü, distal hipospadias cerrahisinde genel başarı oranlarını etkilememekle birlikte, postoperatif dönemde pansumanın stabilitesini artırarak iyileşmeyi dolaylı yoldan destekleyebilir. Bu teknik, pansuman bütünlüğünün önemli olduğu klinik protokollerde yararlı olabilir. Bulguların doğrulanması için ileriye dönük randomize çalışmalara ihtiyaç vardır.

Anahtar kelimeler: Hipospadias, glans fiksasyonu, pansuman stabilitesi, HOSE skoru, postoperatif komplikasyonlar.

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Introduction

Hypospadias is a developmental anomaly affecting the male external genitalia, presenting at different anatomical levels [1]. Hypospadias correction is among the most commonly performed surgeries in pediatric urology [2]. While numerous hypospadias repair techniques are documented, comprehensive evidence on surgical approaches, suture preferences, foreskin reconstruction indications, catheterization strategies, and dressing methods is still lacking [3].

This study was designed to assess the clinical outcomes associated with a glanular fixation suture technique that has been recently integrated into our surgical practice for distal hypospadias repair. We hypothesized that this fixation method would help reduce the rate of postoperative complications without negatively affecting surgical success or functional outcomes.

Materials and methods

Permission was obtained from the Ankara University Human Research Ethics Committee for the study titled “Does glanular fixation suture affect surgical outcomes in distal hypospadias repair?” (approval date: 13.05.2024, approval number: 2024000313-1(2024/313)). Medical records were examined for patients who underwent distal hypospadias surgery between January 2014 and December 2023. In our clinic, a glanular fixation suture technique was introduced in January 2019 as a routine part of distal hypospadias surgery. Patients who were operated on after this date constituted the study group, whereas those who underwent surgery prior to the adoption of this technique (between January 2014 and December 2018) formed the control group. All procedures in both groups were performed by experienced pediatric urologists, ensuring consistency in surgical approach.

Patients under 18 years of age who had undergone distal hypospadias repair utilizing the tubularized incised plate urethroplasty (TIPU) method, had documented preoperative Glans-Meatus-Shaft (GMS) scores, and completed at least 12 months of postoperative follow-up were eligible for inclusion in the study. Individuals with a history of previous hypospadias or circumcision surgery, those who received preoperative androgen therapy, or those with incomplete clinical records or scoring data were excluded.

The severity of hypospadias was evaluated using the GMS scoring system, which incorporates three key anatomical features: glans size, location of the urethral meatus, and degree of penile shaft curvature. Each component is rated on a 1-to-4 scale, where higher values correspond to increased anatomical severity. The total GMS score, ranging from 3 to 12, is subsequently classified into three categories: mild (3-6), moderate (7-9), and severe (10-12). This classification tool has shown strong interobserver agreement and offers a standardized approach for evaluating patients prior to surgery [4, 5].

All patients underwent a preoperative penile nerve block using 0.25% bupivacaine to achieve perioperative analgesia. Hemostasis during surgery was maintained with bipolar cautery. After circumferential degloving of the penile shaft, an artificial erection was induced intraoperatively to assess the presence and degree of chordee. When curvature was present, dorsal plication sutures were applied accordingly. To minimize the risk of fistula development, a dorsal dartos flap, dissected from the inner prepuce, was routinely used as a secondary layer to reinforce the neourethra. A urethral stent, either an 8F or 10F feeding tube, was placed in all cases. Urethroplasty was performed using interrupted double-layer sutures with 7/0 polydioxanone material. All surgical procedures were performed under magnification loupes to ensure precise dissection and suture placement.

Following the procedure, a predefined protocol was used to apply the surgical dressing. The penis was initially wrapped with a chlorhexidine-impregnated gauze, followed by a tension-free elastic compression bandage (Coban™, 3M) to provide mild compression and stabilize the surgical site. Antibiotic therapy was continued until catheter removal. Oral paracetamol was administered three to four times daily after resumption of feeding and subsequently as needed for postoperative pain control.

Patients who underwent surgery after January 2019, when the glanular fixation technique was routinely implemented, were assigned to the study group. Those operated on prior to this date, without the use of fixation sutures, constituted the control group. In the study group, a 5/0 polypropylene suture was used to anchor the glans penis to the lower abdominal skin intraoperatively, with the aim of minimizing postoperative movement and dressing displacement. The application of the glanular fixation suture is demonstrated in Figure 1. No such fixation was applied in the control group.

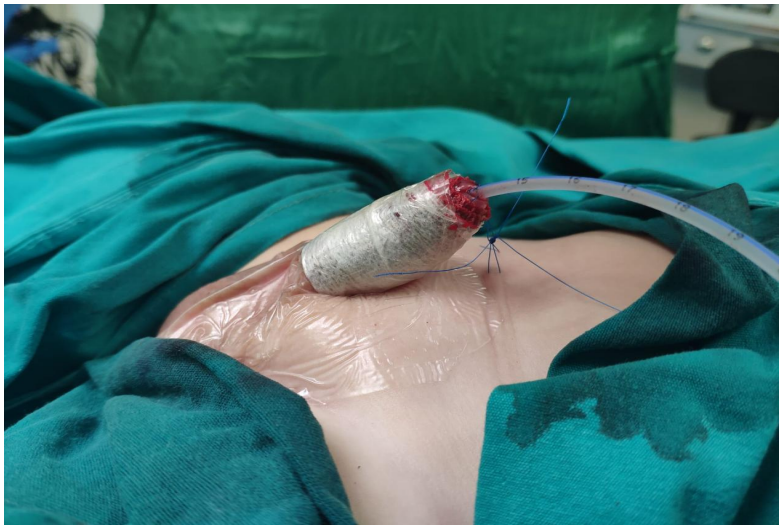

Figure 1. Intraoperative application of glanular fixation suture to stabilize the penis during hypospadias surgery

At six months postoperatively, patients were assessed using the Hypospadias Objective Scoring Evaluation (HOSE) system, a validated tool for measuring surgical success. The HOSE score comprises five components: meatal location and shape, urinary stream quality, penile alignment during erection, and presence of a urethrocutaneous fistula. Each item is scored from 1 to 4, generating a total score between 5 and 20. Outcomes with scores ≥14 are considered satisfactory, as defined by Holland et al. [6], with higher scores reflecting more favorable functional and cosmetic results.

Postoperative outcomes, including demographic characteristics, GMS scores, HOSE scores, time to dressing and catheter removal, duration of hospitalization and complication rates, were compared between the study and control groups during the follow-up period.

Statistical analysis

Statistical evaluations were performed using the IBM SPSS Statistics software (version 25.0; IBM Corp., Armonk, NY, USA). To determine whether continuous variables followed a normal distribution, both the Kolmogorov–Smirnov and Shapiro–Wilk tests were applied. Data conforming to normal distribution were expressed as mean ± standard deviation (SD), whereas those deviating from normality were reported as median with interquartile range (IQR). Comparisons between two independent groups were carried out using the Student's

t-test for normally distributed variables and the Mann–Whitney U test for non-parametric data. Categorical variables were analyzed using Pearson's chi-square test. Fisher's exact test was applied when expected cell counts were less than 5 in 2×2 contingency tables. A *p*-value below 0.05 was considered to indicate statistical significance in all tests.

Results

A total of 322 patients met the inclusion criteria for this study. Of these, 164 individuals who underwent distal hypospadias repair using the glanular fixation suture were assigned to the study group, whereas 158 patients who did not receive this intervention formed the control group. The mean age was 2.68±2.13 years in the study group and 2.77±1.78 years in the control group. The difference in age between groups was not statistically significant (*p*=0.20).

The mean duration of urethral catheterization was 6.51±0.60 days in the study group and 6.55±0.70 days in the control group. The mean length of hospital stay was 1.92±0.94 days in the study group and 2.10±1.33 days in the control group. The average time to dressing removal was 2.48±0.66 days in the study group, compared to 2.57±0.73 days in the control group. No statistically significant differences were observed between the groups regarding catheter duration (*p*=0.34), length of hospital stay (*p*=0.45), or time to dressing removal (*p*=0.30).

Preoperative GMS scores were compared between the two groups. The mean total GMS score was 6.64±1.09 in the study group and 6.51±1.31 in the control group. This difference was not statistically significant (*p*=0.46). A detailed distribution of GMS components for both groups is provided in Table 1.

Table 1. Preoperative Glans-Meatus-Shaft (GMS) score components by group

		Control Group n (%)	Study Group n (%)	Statistical Analysis
Glans	**Glans Good Size**	15 (9.5%)	13 (7.9%)	x^2=1.467 *p*=0.69
	Glans Adequate Size	64 (40.5%)	67 (40.9%)	
	Glans Small In Size	67 (42.4%)	76 (46.3%)	
	Glans Very Small	12 (7.6%)	8 (4.9%)	
Meatal	**Glanular**	21 (13.3%)	15 (9.1%)	x^2=1.392 *p*=0.49
	Coronal Sulcus	68 (43.0%)	74 (45.1%)	
	Mid Or Distal Shaft	69 (43.7%)	75 (45.7%)	
Shaft	**No Chordee**	60 (38.0%)	54 (32.9%)	x^2=0.936 *p*=0.63
	Mild (<30°) Chordee	89 (56.3%)	99 (60.4%)	
	Moderate (30-60°) Chordee	9 (5.7%)	11 (6.7%)	

Pearson's chi-square test was used for comparison of categorical variables

The mean HOSE score was 15.59±0.71 in the study group and 15.53±0.68 in the control group. At six months postoperatively, there was no significant difference in HOSE scores between the two groups (*p*=0.52). Detailed parameter-level comparisons of HOSE score components are presented in Table 2.

Wound dehiscence was observed in 2 patients (1.2%) in the study group and in 3 patients (1.9%) in the control group, with no statistically significant difference between the groups (*p*=0.48). Unintentional early removal of the postoperative dressing occurred in 4 patients (2.4%) in the study group, compared to 18 patients (11.4%) in the control group (*p*=0.02).

Table 2. Postoperative HOSE score components at 6-month follow-up

		Control Group n (%)	Study Group n (%)	Statistical Analysis
Meatal Location	**Coronal**	4 (2.5%)	3 (1.8%)	x^2=0.992 p=0.6
	Proximal Glanular	35 (22.2%)	30 (18.3%)	
	Distal Glanular	119 (75.3%)	131 (79.9%)	
Meatal Shape	**Circular**	2 (1.3%)	3 (1.8%)	p=0.68
	Vertical Slit	156 (98.7%)	161 (98.2%)	
Urinary Stream	**Spray**	2 (1.3%)	2 (1.2%)	p=0.97
	Single Stream	156 (98.7%)	162 (98.8%)	
Erection	**Moderate 10/45**	1 (0.6%)	2 (1.2%)	x^2=0.569 p=0.75
	Mild <10	12 (7.6%)	15 (9.1%)	
	Straight	145 (91.8%)	147 (89.6%)	
Fistula	**Single subcoronal or more distal**	11 (7.0%)	7 (4.3%)	p=0.20
	None	147 (93.0%)	157 (95.7%)	

Pearson's chi-square test was used for comparison of categorical variables

Patients who developed postoperative fistulas were compared with those who did not. There was no significant difference between the two groups in terms of total GMS score (6.27±1.17 vs. 6.59±1.20, p=0.27), duration of urethral catheterization (6.50±0.78 vs. 6.53±0.64 days, p=0.95), or length of hospital stay (2.11±0.83 vs. 2.01±1.16 days, p=0.95). However, unintentional early removal of the dressing was significantly more frequent among patients who developed fistulas (27.8%) compared to those who did not (5.6%) (p=0.01).

Discussion

Postoperative management following hypospadias surgery remains a subject of debate, particularly regarding the optimal type and application of surgical dressings. Although some institutions recommend no dressing at all, others advocate for various dressing techniques with differing levels of complexity and clinical handling requirements [7]. We investigated the clinical relevance of a glanular fixation technique routinely adopted in our surgical protocol in recent years. Our findings revealed that this fixation method did not significantly alter primary surgical outcomes, including HOSE scores, wound dehiscence, or fistula formation. However, the incidence of unintentional early dressing removal was significantly lower in the group receiving glanular fixation, indicating a potential benefit in preserving dressing stability during the early postoperative period. Maintaining dressing integrity during the early postoperative phase is important, as unintended loss may expose the wound to contamination and increase the risk of delayed healing or infection. Although no significant increase in wound-related complications was observed in this cohort, reducing early dressing removal may indirectly support better wound protection. Furthermore, no patient discomfort or parental concerns specifically related to the glanular fixation suture were reported during follow-up visits, indicating that the technique was well tolerated.

Anatomical factors such as a narrow urethral plate and limited glans width are recognized as contributors to greater surgical complexity and elevated postoperative complication risk in hypospadias repair [8]. To objectively assess these anatomical variations, all patients in this study were preoperatively evaluated using the Glans-Meatus-Shaft (GMS) scoring system. This objective and validated tool allowed for a standardized assessment of hypospadias severity between groups. In our analysis, the preoperative GMS scores were comparable between the study and control groups, suggesting that baseline anatomical differences did not influence the observed outcomes.

To objectively assess postoperative functional and cosmetic outcomes, all patients were evaluated using the HOSE. In accordance with the threshold defined by Holland et al. [6], a total score of 14 or above was considered satisfactory. In our study, both the study and control groups achieved similar mean HOSE scores above this threshold, indicating that the addition of a glanular fixation suture did not negatively impact surgical success.

Atan et al. [9] investigated a technique involving glans and catheter fixation to the abdominal skin and observed that this approach was associated with lower rates of postoperative wound separation in hypospadias repair. Unlike our study, theirs did not incorporate a preoperative scoring system such as the GMS, and postoperative outcomes were primarily limited to wound dehiscence. Furthermore, the surgical procedures in their study were performed by multiple surgeons, which may have introduced variability in technique. These differences in study design and methodology could partly explain the variation in findings between the two studies.

Previous studies have reported complication rates ranging from 6% to 8% following TIPU repair in cases of distal hypospadias [10]. Surgical outcomes in hypospadias repair are influenced by numerous variables. Patient-specific factors include age, the anatomical severity of the hypospadias, the presence and extent of chordee, the characteristics of the urethral plate, and whether preoperative hormonal therapy was administered. Additionally, procedural elements such as the choice of suture material and technique, use of surgical magnification, methods of flap coverage, type of postoperative dressing, and specifications of the urethral catheter may also play a significant role in determining success [11]. Among these, the experience of the operating surgeons is considered one of the most critical determinants of success [12]. In our study, all procedures were performed by the same team of experienced pediatric urologists using a standardized technique and suture material, which helped minimize confounding variables and increase the internal validity of our findings.

Postoperative dressing is generally considered beneficial in hypospadias surgery, as it helps maintain penile elevation and reduce the risk of edema and hematoma formation [13]. Most studies evaluating the outcomes of TIPU repair report the use of some form of dressing during the early postoperative period [7, 14]. Nevertheless, several publications have also supported undressed follow-up protocols, suggesting that favorable outcomes may still be achieved without the use of dressings in selected cases [2, 15]. In our study, although the use of a glanular fixation suture did not result in a significant difference in complication rates or HOSE scores, the rate of unintentional early dressing removal was significantly lower in the study group. This finding may be relevant for centers that prefer postoperative dressing protocols, as maintaining dressing adherence could be important for wound stability in the early healing phase.

The present study is subject to certain limitations, primarily stemming from its retrospective design, which may introduce inherent biases related to data collection and documentation. Additionally, due to the study's design, the control and study groups consisted of patients operated on during different time periods, which could potentially introduce temporal confounding. Although the retrospective nature of the study limits active control over time-related changes, all procedures were performed by the same experienced pediatric urology team following a standardized surgical technique and perioperative care protocol throughout the entire study period. Notably, the same postoperative dressing protocol was consistently applied, and no significant modifications were made in perioperative management practices between 2014 and 2023. The absence of randomization further limits the ability to draw causal inferences from the findings. Therefore, future prospective and randomized studies are warranted to validate these results and to further clarify the potential role of glanular fixation sutures in routine clinical practice.

In conclusion, the use of a glanular fixation suture in distal hypospadias repair did not significantly alter surgical success or complication rates. However, it was associated

with a significantly lower rate of unintentional early dressing removal. This finding suggests that the technique may be beneficial in clinical settings where postoperative dressing stability is considered important for optimal wound healing. Further prospective and randomized studies are needed to confirm these results and clarify the role of glanular fixation in routine surgical practice.

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Authors contributions: A.A. and M.C.K. conceptualized the study and formulated the primary hypothesis. M.B. and A.M. played a key role in shaping the theoretical background and were responsible for organizing and editing the materials and methods section. Data analysis and interpretation in the results section were carried out by A.A., M.B., and A.M. The discussion section was drafted by A.A., while B.B. and T.S. critically reviewed the manuscript and provided final approval. All authors contributed to the overall content, discussed the study collectively, and gave their approval for the final version of the manuscript before submission.

Conflict of interest: No conflict of interest was declared by the authors.

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