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A Comparative Analysis of Heineke-Mikulicz and V-Y Scrotoplasty Techniques in the Surgical Correction of Congenital Penoscrotal Webbing

Konjenital Penoskrotal Web Onarımında Heineke-Mikulicz ve V-Y Skrotoplasti Tekniklerinin Karşılaştırılması

Short Title: Surgical Techniques in Penoscrotal Web (Penoskrotal Web'de Cerrahi Teknikler)

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Abstract

Objective: The penoscrotal web is a congenital cutaneous anomaly in which scrotal skin extends onto the ventral surface of the penis, potentially leading to deformity and, in adulthood, sexual dysfunction. This study aimed to compare the clinical outcomes of two commonly used techniques—Heineke-Mikulicz and V-Y scrotoplasty—in the surgical management of penoscrotal webbing.

Materials and Methods: A retrospective analysis was conducted on 87 pediatric patients (aged 6 months to 6 years) diagnosed with penoscrotal webbing during circumcision consultations between 2018 and 2022. The patients underwent web correction simultaneously with circumcision. Group 1 included 49 patients treated with Heineke-Mikulicz scrotoplasty, and Group 2 consisted of 38 patients treated with V-Y scrotoplasty. Postoperatively, the cases were evaluated for scrotal and penile edema, hematoma, recurrent web, wound contracture and cosmetic results.

Results: There was no statistically significant difference between the two groups in terms of age or body weight ($p>0.05$). When the two groups were compared in terms of mean operation time, statistical significance was observed ($p<0.05$). A statistically significant association was also found between the severity of the penoscrotal web and the choice of surgical technique ($p<0.05$). No significant differences were observed between the two groups regarding penile or scrotal edema and postoperative wound contracture ($p>0.05$). However, the comparison revealed a statistically significant difference in web recurrence between the two techniques ($p<0.05$).

Conclusion: The findings suggest that Heineke-Mikulicz scrotoplasty is more effective in patients with grade 1 and 2 webbing, whereas V-Y scrotoplasty yields better results in grade 2 and 3 cases.

Keywords: penoscrotal web, pediatrics, Heineke-Mikulicz, V-Y, scrotoplasty

Özet

Amaç: Penoskrotal web peniste şekil bozukluğuna neden olan ve erişkinlikte cinsel ilişki sırasında sorunlara yol açabilen skrotum cildinden penis ventral derisine uzanan deri uzantısıdır. Bu çalışmada, Heineke-Mikulicz ve V-Y skrotoplasti tekniği ile penoskrotal web onarımı yapılan hastaların sonuçlarının karşılaştırılması amaçlanmıştır.

Gereçler ve Yöntemler: 2018-2022 yılları arasında kliniğimizde 6 ay ile 6 yaş arası olmak üzere 1423 sünnet muayenesi değerlendirmesi sırasında penoskrotal web saptanan ve sünnet ile beraber web onarımı yapılan 87 hastanın verileri retrospektif olarak incelendi. Grup 1; Heineke-Mikulicz skrotoplasti uygulanan 49 hasta, Grup 2; V-Y skrotoplasti uygulanan 38 hasta olmak üzere iki grup oluşturuldu. Operasyondan sonra olgular skrotal veya penil ödem, hematom, tekrarlayan web, yara yeri kontraktürü ve kozmetik sonuçlar açısından değerlendirildi.

Bulgular: Her iki grupta yaş ortalaması ve vücut ağırlıkları açısından karşılaştırıldığında istatistiksel olarak anlamlılık görülmedi ($p>0,05$). Her iki grupta ortalama operasyon süresi açısından karşılaştırıldığında istatistiksel olarak anlamlılık görüldü ($p<0,05$). Penoskrotal web derecesine göre operasyon tekniğinin seçiminde ise her iki grup arasında istatistiksel olarak anlamlılık görüldü ($p<0,05$). Her iki teknikte komplikasyon olarak penil veya skrotal ödemde ve postoperatif yara kontraktüründe istatistiksel olarak anlamlılık görülmedi ($p>0,05$). Tekrarlayan web açısından ise her iki teknik karşılaştırıldığında istatistiksel olarak anlamlılık görüldü ($p<0,05$).

Sonuç: Penoskrotal web onarımında grade 1 ve grade 2 dereceli olgularda Heineke-Mikulicz skrotoplasti tekniğin daha etkin olduğu, grade 2 ve grade 3 dereceli olgularda ise V-Y skrotoplasti tekniğinin daha etkin olduğu çalışmamızda bulunmuştur.

Anahtar kelimeler: penoskrotal web, çocuk, Heineke-Mikulicz, V-Y, skrotoplasti

Introduction

Webbed penis is a congenital anomaly in which a fold of skin extends from the scrotum to the ventral surface of the penile shaft, obscuring the penoscrotal angle [1]. It is most commonly identified during infancy or at the time of circumcision. This condition may result in a visually shortened penis and is recognized as a frequent cause for delayed circumcision [2]. Performing circumcision without correcting the web can lead to downward urine flow during childhood and may impair sexual function in adulthood. Therefore, surgical correction of the

web is generally considered mandatory prior to circumcision [3]. However, correcting the web post-circumcision is often more challenging due to the loss of preputial tissue.

In Turkey, circumcision is a nearly universal practice performed for cultural and religious reasons. In some cases, it is carried out by non-specialist practitioners, which may lead to underdiagnosis of such anomalies [4,5]. Numerous studies have investigated the surgical correction of primary webbed penis [2,6-8]. The main goal of treating penoscrotal webbing is to elongate the ventral penile skin by transecting the web. This is traditionally achieved using a transverse incision followed by vertical closure—commonly referred to as the Heineke-Mikulicz technique [9]. Other surgical methods have also been introduced, including V-Y plasty, Z-plasty, lateral parapenile incisions, and preputial flap rotation [8].

The present study aims to compare the clinical outcomes of Heineke-Mikulicz and V-Y scrotoplasty techniques in the surgical correction of penoscrotal webbing in pediatric patients with varying grades of severity.

Materials and Methods

Between 2018 and 2022, 87 pediatric patients aged between 6 months and 6 years were diagnosed with penoscrotal webbing during circumcision evaluations at our clinic and underwent simultaneous surgical correction. The medical records of these cases were reviewed. This study was retrospective and conducted in accordance with the Declaration of Helsinki. Patients were informed that their data would be used for scientific purposes, and written consent was obtained from all participants.

Ethics Committee Approval: The study was approved by the Non-Interventional Clinical Research Ethics Committee of Tokat Gaziosmanpaşa University Faculty of Medicine (Approval Date and Number: 13.05.2025/ 25-MOBAEK-169)

Web severity was graded using the classification system proposed by El Koutby and El Gohary [10]:

Grade 1: Web extends up to the proximal third of the penis

Grade 2: Web extends to the middle or distal third

Grade 3: Broad web extending to the distal third

Patients were divided into two groups: Group 1 included 49 patients treated with Heineke-Mikulicz scrotoplasty, mostly comprising Grade 1 and 2 cases; Group 2 consisted of

38 patients treated with V-Y scrotoplasty, primarily comprising Grade 2 and 3 cases. Patients with hypospadias, previous circumcision, micropenis and/or torsion, buried penis, or history of prior surgical correction for penoscrotal webbing were excluded from the study. Web correction was carried out using either Heineke-Mikulicz or V-Y scrotoplasty, followed by circumcision via the dorsal slit technique. The following data were recorded: patient age, operative duration, body weight, length of hospital stay, presence of penile or scrotal edema, hematoma, recurrence, wound contracture, and cosmetic outcomes as subjectively evaluated. All surgical procedures were performed by the same surgeon.

Surgical Technique

All procedures were performed under general anesthesia. As prophylaxis, all patients received a third-generation cephalosporin antibiotic (50–100 mg/kg) prior to surgery. A preoperative assessment was conducted under anesthesia.

Heineke-Mikulicz Scrotoplasty Technique

A transverse incision was made along the web at the penoscrotal junction. The skin flaps were carefully dissected proximally and distally to preserve vascularity and allow for a tension-free vertical closure. After achieving adequate hemostasis, a simple longitudinal closure was performed at the midline using absorbable synthetic polyglactin sutures (**Figure 1a-e**).

V-Y Scrotoplasty Technique

An inverted V-shaped incision was made at the penoscrotal junction at an angle of approximately 60°, with the limb lengths adjusted according to the penile length. The skin flaps were carefully dissected proximally and distally to preserve vascularity and allow for a tension-free vertical closure. Following hemostasis, the incision along the median raphe was vertically sutured using absorbable polyglactin sutures. The lateral arms of the V were then closed in a straight line using the same suture material (**Figure 2a-e**).

In both groups, a light compressive dressing with elastic bandage was applied postoperatively. Patients were discharged the following day. Follow-up visits were scheduled at 1 week, 1 month, 3 months, and 6 months postoperatively. During follow-up, clinical evaluation and patient history were used to assess the surgical outcome. Successful repair was defined as the absence of recurrence and satisfactory cosmetic results as reported by the parents.

Statistical Analysis

All data were analyzed using MedCalc software package, version 20.009 (Ostend, Belgium). Qualitative variables were expressed as frequencies and percentages, while quantitative variables were presented as mean ± standard deviation (SD), median, and interquartile range (IQR). The Kolmogorov-Smirnov test was used to assess the normality of data distribution. For comparisons between the two groups: The Mann-Whitney U test was applied to non-normally distributed continuous variables. The Chi-square test was used to evaluate differences in categorical variables. A p-value of less than 0.05 was considered statistically significant.

Results

The mean age of patients in Group 1 was 31.9±16.4 months while that of Group 2 was 29.8±17.3 months. The corresponding average body weights were 14.4±4.3 kg and 13.6±4.3 kg respectively. There were no statistically significant differences between the two groups in terms of age or weight ($p>0.05$). The mean operative duration was significantly shorter in Group 1 (42.7±7.2 minutes) than in Group 2 (68.1±13.3 minutes), and this difference was statistically significant ($p<0.05$). The difference in operative duration between the two groups was statistically significant ($p<0.05$) **(Table 1).** A statistically significant association was also found between the severity of the penoscrotal web and the selection of surgical technique ($p<0.05$). No statistically significant differences were observed between the two techniques in terms of penile or scrotal edema and postoperative wound contracture ($p>0.05$). However, a statistically significant difference was observed between the two techniques regarding web recurrence, with a higher rate noted in Group 1 ($p<0.05$) **(Table 2).**

Complications thought to be related to circumcision were separated from both groups and were not included in the study. In the early postoperative period, penile or scrotal edema was observed in 4 patients (8.2%) in Group 1 and in 7 patients (18.4%) in Group 2. The edema resolved with conservative measures such as warm baths and oral anti-inflammatory medications. Tension at the dorsal penoscrotal junction following ventral skin closure was noted in 2 patients (4.1%) in Group 1 and 5 patients (13.2%) in Group 2. This was managed with a 3–4 mm longitudinal midline relaxing incision on the dorsal side. All Grade 3 cases in Group 1 (9 patients, 18.4%) experienced recurrence of the web. In contrast, no recurrence was observed in any of the patients in Group 2. The recurrent cases in Group 1 were subsequently corrected using the V-Y scrotoplasty technique in separate sessions. At the 6-month

postoperative follow-up, cosmetic outcomes were evaluated. The web had resolved in all patients. No postoperative wound contracture or recurrent web was observed in any patient. The circumcision incision and the penoscrotal surgical sites had healed without complications.

Discussion

Congenital penoscrotal webbing is considered part of the broader spectrum of male genital anatomical anomalies, often described as an inconspicuous or concealed penis. Although its exact etiology remains unclear, one prevailing theory suggests that a congenital deficiency in the development of the ventral penile skin may lead to a compensatory extension of scrotal tissue, resulting in web formation [11]. Previous studies have reported a prevalence of approximately 4% for this condition. While it may not cause significant problems during childhood aside from abnormal urinary flow, untreated penoscrotal webbing can lead to painful erections and sexual dysfunction in adulthood, necessitating surgical correction [10].

Maizels et al. [1] initially proposed a classification system distinguishing between buried, trapped, webbed, and micropenis. More recently, El-Koutby et al. [10] further subclassified webbed penis into simple, compound, and secondary forms. Although some authors argue that the severity of the web influences the complexity of surgical correction [1], others maintain that the classification proposed by El-Koutby and El-Gohary does not necessarily correlate with the complexity or choice of surgical approach [6]. These authors do not apply these classification criteria in the preoperative setting, and the choice of surgical approach is typically made regardless of the complexity of the diagnos. In our study, the choice of surgical technique was not strictly determined by the severity of the web, and treatment decisions did not always align with the classification.

Various surgical methods have been described for the correction of webbed penis. R.P. Bonitz et al. [2] compared three surgical techniques used for web correction—Heineke-Mikulicz scrotoplasty, V-Y scrotoplasty, and Z-plasty—and reported no significant differences in follow-up outcomes. They concluded that all three techniques are safe and effective, with the choice among them largely depending on the surgeon's individual preference. Similarly, Negm MA and Nagla SA reported that the Heineke-Mikulicz technique was effective for grade 1 cases, while multiple Z-plasty was more suitable for grades 2 and 3 [9]. Elrouby A. compared the Heineke-Mikulicz and Z-plasty methods and found no significant differences in outcomes, although operative duration was longer with Z-plasty [12]. Alkış O et al. [13] also reported favorable results with the double V technique. In our study, Heineke-Mikulicz and V-Y scrotoplasty techniques were compared. The operative time was found to be significantly longer

in the V-Y scrotoplasty group. Heineke-Mikulicz scrotoplasty was more effective in Grade 1 and Grade 2 cases, whereas V-Y scrotoplasty showed superior outcomes in Grade 2 and Grade 3 cases—findings that were statistically significant. All Grade 3 web cases that were initially repaired using the Heineke-Mikulicz technique experienced recurrence and required revision surgery with the V-Y scrotoplasty method. These findings highlight the importance and utility of V-Y scrotoplasty in managing recurrent web cases.

R.P. Bonitz et al. [2] reported a complication rate of 5.3% in the Heineke-Mikulicz group in a study comparing three different techniques for repairing different grades of the uncircumcised webbed penis. In our study, the complication rates were comparable, with 4.1% of patients experiencing postoperative wound contracture and 8.2% presenting with penile or scrotal edema. However, the recurrence rate of penoscrotal web was relatively high at 18.4%. This elevated recurrence may be attributed to the limited suitability of the Heineke-Mikulicz technique for Grade 3 cases. Additionally, Bonitz et al. reported complication rates of 7.8% in the V-Y group and 2.9% in the Z-plasty group. In our V-Y group, postoperative wound contracture occurred in 13.2% and penile/scrotal edema in 18.4% of patients. These complications were effectively managed with conservative treatments or minor surgical revisions.

R.P. Bonitz et al. [2] also found that the mean operative duration was significantly shorter in the Heineke-Mikulicz group (22.90 ± 4.58 minutes) compared to the Z-plasty group (45.50 ± 6.67 minutes), recommending the former technique to reduce anesthesia time. Elrouby A. conducted a comparative study evaluating two surgical techniques for web correction and reported that the Heineke-Mikulicz method was associated with a shorter operative duration [12]. Our findings are consistent with those in the literature, as cases treated with the Heineke-Mikulicz technique demonstrated a significantly shorter operative time. Notably, the method also proved effective in Grade 2 cases, making it a favorable option due to its efficiency and simplicity. Although the V-Y scrotoplasty technique is effective even in Grade 1 cases, its relatively longer operative time suggests that it may not be the most suitable choice for less severe presentations.

The limitations of the study include the small number of patients, the single-center and retrospective nature of the study, the need to compare more surgical techniques, and the short follow-up period.

Conclusion

This study demonstrated that Heineke-Mikulicz scrotoplasty is more effective and requires a shorter operative time in cases of Grade 1 and 2 penoscrotal webbing, while the V-Y scrotoplasty technique yields better outcomes in Grade 2 and 3 cases, despite a longer surgical duration. Although effective in Grade 1 cases, the use of V-Y scrotoplasty is not recommended in such patients due to its extended operative time. Further prospective, randomized, and controlled studies are necessary to more comprehensively assess the efficacy of these surgical techniques.

Ethics Committee Approval: The study was approved by the Non-Interventional Clinical Research Ethics Committee of Tokat Gaziosmanpaşa University Faculty of Medicine (Approval Date and Number: 13.05.2025/ 25-MOBAEK-169)
Informed Consent: Patients were informed that their data would be used for scientific purposes, and written consent was obtained from all participants.
Publication: The results of the study were not published in full or in part in form of abstracts.
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Authorship Contributions: Any contribution was not made by any individual not listed as an author. Concept – K.Y., E.K.; Design – K.Y., E.K.; Supervision – K.Y.; Resources – K.Y., E.K.; Materials – K.Y.; Data Collection and/or Processing – K.Y., E.K.; Analysis and/or Interpretation – K.Y., E.K.; Literature Search – K.Y., E.K.; Writing Manuscript – K.Y.; Critical Review – K.Y., E.K.
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Table 1. Difference between the two studied groups according to demographic data and operative duration

		Heineke-Mikulicz scrotoplasty N = 49	V-Y scrotoplasty N = 38	Test of significance	P
Age at operation (month)	**Mean ± SD**	31.9±16.4	29.8±17.3	U= 854.00	0.507
	Median (IQR)	30 (18.0 - 42.0)	30 (12.0 - 42.0)		
Weight at operation (Kg)	**Mean ± SD**	14.4±4.3	13.6±4.3	U= 808.00	0.290
	Median (IQR)	14 (12.0 - 17.0)	13.5 (11.0 - 16.0)		
Operative duration (min)	**Mean ± SD**	42.7±7.2	68.1±13.3	U= 118.50	**<0.0001***
	Median (IQR)	43 (36.0 - 46.3)	70 (60.0 - 80.0)		

***** Mann-Whitney U test results indicate a significant difference at the <0.05 level

Table 2. Comparison of the two groups according to the postoperative follow-up parameters

		Heineke-Mikulicz scrotoplasty		V-Y scrotoplasty		Test of significance	P
		n	%	n	%		
Degree of web	**Grade 1**	27	55.1	7	18.4	X^2= 14.952	**0.001***
	Grade 2	13	26.5	11	28.9		
	Grade 3	9	18.4	20	52.6		
Penile or scrotal edema	**Not present**	45	91.8	31	81.6	X^2= 2.015	0.156
	Present	4	8.2	7	18.4		
Postoperative wound contracture	**Not present**	47	95.9	33	86.8	X^2= 2.356	0.125
	Present	2	4.1	5	13.2		
Recurrence of the web	**Not present**	40	81.6	38	100	X^2= 7.695	**0.006***
	Present	9	18.4	0	0		

* Chi-square test results indicate a significant difference at the <0.05 level

Figure 1. Intraoperative stages of Heineke-Mikulicz scrotoplasty technique

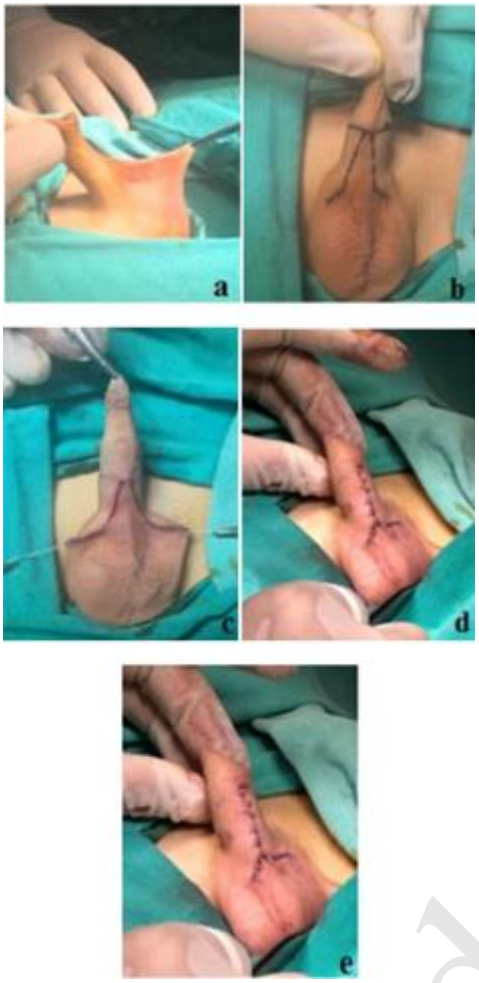

Figure 2. Intraoperative stages of V-Y scrotoplasty technique