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Erkek Cinsel Sağlığı

Is testicular tunica vaginalis autologous graft successful in the surgical treatment of peyronie's disease?

Peyronie hastalığının cerrahi tedavisinde testiküler tunika vajinalis otolog grefti başarılı mı?

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ABSTRACT

OBJEKTIVE: Peyronie's disease (PD) is an acquired benign connective tissue disorder characterized by fibrosis and plaque formation within the tunica albuginea of the penis. Treatment approaches for PD include oral agents, mechanical therapies, intralesional injections, and surgical interventions. In this study, we aimed to evaluate the outcomes of using testicular tunica vaginalis autologous grafts in the surgical treatment of Peyronie's disease.

MATERIALS and METHODS: Nineteen patients who underwent surgery with the use of testicular tunica vaginalis autologous grafts between 2015 and 2022 were evaluated. All patients reported a decreased frequency of sexual intercourse and difficulties with sexual intercourse. Each patient exhibited significant curvature during erection. During the operation, the fibrotic plaque was excised while preserving the neurovascular bundle (NVB). A suitable autologous tunica vaginalis graft was harvested to match the size of the excised plaque and was used to repair the defect. Patients with curvatures exceeding 90°, those who had previously undergone penile surgery, and those with abnormal penile Doppler findings were excluded from the study. Preoperative and postoperative parameters were collected and compared. The patients were assessed using the International Index of Erectile Function (IIEF-5) before surgery and one year postoperatively. Residual curvature was also evaluated in all patients at the one-year follow-up.

RESULT: The mean age of the 19 patients who underwent surgery with testicular tunica vaginalis autologous grafts was 51.95 years (44–61), and the mean operative time was 70.26 minutes (56–80). The mean size of the excised plaque was 2.82 cm^2 (2–4). The overall satisfaction measured by the IIEF-5 score one year postoperatively showed a statistically significant improvement compared to preoperative scores ($p<0.05$). All surgeries were completed successfully without complications, and satisfactory correction of penile appearance was achieved in all patients. No significant difference was observed in the length of the erect penis before and after surgery. In two cases, a 20° residual curvature was observed, and in two other cases, a 15° curvature was noted at the one-year follow-up. No residual curvature was observed in the other patients.

CONCLUSION: Covering the defect following Peyronie's plaque excision with the patient's own tunica vaginalis is a simple, cost-effective, and safe method that produces satisfactory outcomes. These findings should be confirmed in larger series.

Keywords: Peyronie's disease, tunica vaginalis, graft, surgical repair, autologous

ÖZ

AMAÇ: Peyronie hastalığı (PH), tunika albuginea içinde fibrozis ve plak ile karakterize, penisin edinilmiş iyi huylu bir bağ dokusu bozukluğudur. PH'nin tedavisi oral ajanlar, mekanik tedaviler, intralezyonel ve cerrahi tedaviler gibi yaklaşımları içerir. Peyronie hastalığının cerrahi tedavisinde testiküler tunika vajinalis otolog greftinin sonuçlarını değerlendiren bir çalışmayı amaçladık.

GEREÇ ve YÖNTEMLER: 2015 ile 2022 yılları arasında peyronie hastalığı cerrahisinde testiküler tunika vajinalis otolog grefti kullanılan 19 hasta değerlendirildi. Hastaların tamamı cinsel ilişki sayısının azalmasından ve ilişkide zorlanmadan şikâyet etmekteydi. Tüm hastalarda ereksiyon sırasında belirgin kurvatür vardı. Operasyon sırasında fibrotik plak eksize edildi ve nörovasküler demet (NVB) korundu. Eksize edilen plağın boyutuna uygun otolog tunika vajinalis greft olarak çıkartılıp defekt kapatıldı. 90° üzerinde kurvatürü olan, daha önce penisten cerrahi geçiren, penil Doppler tetkiki anormal olan hastalar çalışma dışı bırakıldı. Operasyon öncesi ve sonrası parametreler toplanıp karşılaştırıldı. Hastalar operasyon öncesi ve operasyondan bir yıl sonra Ereksiyon İşlevi Uluslararası Değerlendirme Formu (IIEF-5) ile değerlendirildi. 1. yılda rezidü kurvatür açısından tüm hastalar değerlendirildi.

BULGULAR: 19 testiküler tunika vajinalis otolog grefti kullanılan hastaların ortalama yaşı 51,95 yıl (44–61), ortalama operasyon süresi 70,26 dk (56–80) idi. Eksize edilen plağın ortalama boyutu 2,82 cm2 (2–4) idi. Ameliyat öncesi ve ameliyat sonrası 1. yıl IIEF-5 ile ölçülen genel memnuniyet istatistiksel olarak anlamlıydı ($p<0,05$). Operasyonların tamamı komplikasyon yaşanmadan başarıyla tamamlandı. Tüm hastalarda penis görünümünde tatmin edici bir düzelme sağlandı. Erektil penis uzunluğu operasyon öncesi ve sonrası arasında anlamlı bir fark görülmedi. Ameliyat sonrası 1. yıl takiplerde testiküler tunika vajinalis otolog grefti kullanılan iki olguda 20° kurvatür ve iki olguda 15° kurvatür gözlendi. Diğer hastalarda rezidüel kurvatür izlenmedi.

SONUÇ: Peyronie plak eksizyonunu takiben defektin hastanın kendi tunika vaginalisi ile kapatılması basit, masrafsız ve tatminkar sonuçlar aldığımız güvenli bir yöntemdir. Elde edilen bu sonuçların daha büyük serilerde onaylanması gerekmektedir.

Anahtar Kelimeler: Peyronie, tunika vaginalis grefti, cerrahi onarım, otolog

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INTRODUCTION

Peyronie's disease, which was first described in 1743 by French surgeon Francois Gigot de la Peyronie as a penile anomaly characterized by inflammation and fibrosis of the tunica albuginea, can be accompanied by symptoms such as pain, plaque formation, deformity, and erectile dysfunction.[1,2] Although the exact etiology of PD remains

unclear, the most widely accepted hypothesis is that repetitive microvascular trauma or injury to the penile shaft leads to the condition. It is thought that abnormal healing of the resulting inflammation transforms connective tissue into a fibrous plaque.[3,4] Penile plaques cause penile curvature, which can interfere with penetration when severe. Peyronie's disease progresses through two phases: acute (inflammatory) and chronic (stable). The acute phase is characterized by painful erections or palpable penile plaques, but curvature may not always develop during this stage. The second phase consists of a fibrotic stage with calcified, hard, and palpable plaques. The disease stabilizes during this phase, causing penile deformity, but the curvature does not worsen further.[5]

While medical treatments are considered during the unstable phase of the disease, surgical treatment should only be considered once the disease has stabilized. However, the success of medical treatments during the unstable phase is known to be limited.[6,7] When medical treatment fails to address erectile dysfunction, penile curvature, or plaque, surgery, the gold standard treatment, should be considered. Various surgical techniques with different success rates have been described, including the Nesbit procedure, Yachia procedure, plication techniques, and grafting procedures.[8,9] Grafting procedures are effective approaches that preserve penile length. Grafts can be classified into autologous grafts, xenografts, and synthetic grafts.[10] Studies on the use of autologous grafts, particularly testicular tunica vaginalis autologous grafts, are quite limited.

This study aimed to evaluate the outcomes of patients treated with autologous tunica vaginalis grafts for Peyronie's disease.

MATERIAL and METHODS

Between 2015 and 2022, 19 surgical operations were performed for Peyronie's disease using testicular tunica vaginalis autologous grafts. Patients who underwent different operation techniques due to PD were not included. The records of these surgically treated cases were reviewed retrospectively. In our analyses, only patients who underwent excision + T vaginal grafting surgery were examined. The 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.

The patients with curvatures exceeding 90°, those who had previously undergone penile surgery, and those with abnormal penile Doppler findings were excluded from the study. Data of 19 patients who met these criteria were evaluated. Data on patients were recorded, including age, degree of curvature, operation time, plaque location, plaque number, plaque size, disease onset, duration of conservative medical treatment, comorbidities, preoperative and postoperative IIEF-5 scores, and residual curvature. Plaque size was determined via physical examination. The penile plaque was marked with a marker pen, and its dimensions were measured using a meter. The curvature degree was calculated by reviewing images obtained after intracavernosal injection. All surgical procedures were performed by the same surgeon.

Surgical Technique

General anesthesia was administered in all cases. All cases received prophylactic third-generation cephalosporin (50–100 mg/kg). A preoperative examination was conducted under anesthesia. The penis was circumferentially incised at the circumcision line, and degloving was performed. A tourniquet was applied at the base of the penis, and artificial erection was performed (Figures 1a, 1b). The neurovascular bundle (NVB) was dissected bluntly and sharply, and the fibrotic plaque was excised (Figures 1 c, 1 d). After measuring the size of the excised plaque, a 2–3 cm longitudinal incision was made on the anterior wall of the scrotum to harvest a suitable autologous graft. The tunica vaginalis was excised in a rectangular shape (Figures 1e, 1f). The tunica vaginalis autologous graft was then sutured to the defect with 4-0 absorbable sutures (Figures 1 g, 1h). A second artificial erection was performed to verify satisfactory correction of the curvature (Figures 1i, 1j). The layers were closed anatomically, and the procedure was completed with a pressure dressing and elastic bandage.

In a total of 19 cases, curvature correction in Peyronie's disease was achieved using the testicular tunica vaginalis autologous graft technique. After the surgery, a pressure dressing with an elastic bandage was applied, and patients were discharged with instructions to remove the elastic bandage after 3–4 days. Patients were called for follow-up visits every week starting from the 5th postoperative day. Wound healing was monitored, and sexual activity was restricted for 6–8 weeks. Residual curvature of less than 20° was considered a successful outcome during follow-up examinations.

Statistical Analysis

Statistical analyses were performed with MedCalc (version 20.009; Ostend, Belgium) statistical package program. Descriptive statistics included numbers, mean (with 95% confidence interval), standard deviation (SD), and percentage values. The Shapiro-Wilk test was used to determine whether the data in the groups conformed to a

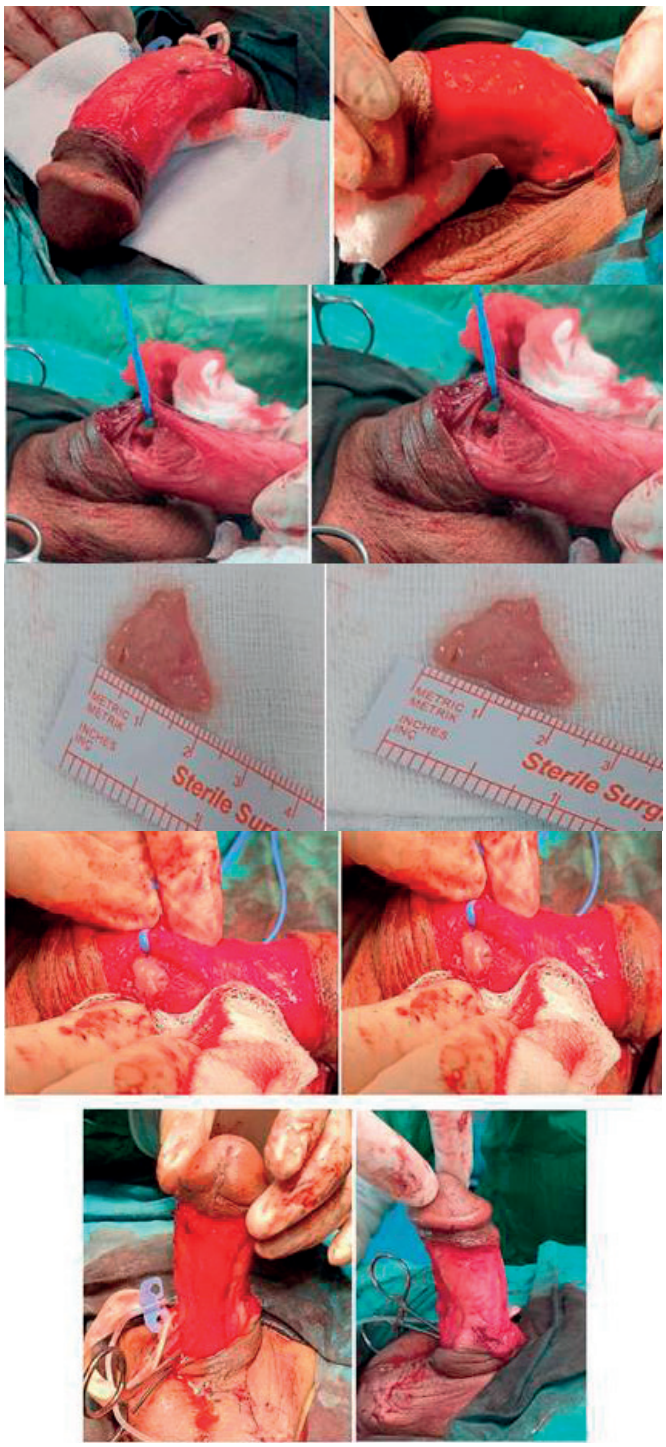

Figure 1 A-J. The steps of the testicular tunica vaginalis autologous graft procedure

normal distribution. Preoperative and postoperative IIEF-5 scores at the one-year follow-up were compared using a paired t-test. The groups were graphically represented as mean ±2 SD. A significance level of $p<0.05$ was taken for the interpretation of the results.

RESULT

The mean age of the 19 patients who underwent surgery with testicular tunica vaginalis autologous grafts was 51.95 years (44–61), and the mean operative time was 70.26 minutes (56–80). The mean size of the excised plaque was 2.82 cm² (2–4). The mean onset time of the symptoms was 17.11 months (10–25). The mean duration of preoperative medical treatment was 14.95 months (8–20) (Table 1). The overall satisfaction, as measured by the IIEF-5 score one year postoperatively, showed a statistically significant improvement compared to the preoperative scores ($p<0, 05$) (Table 2), (Figure 2). Fifteen patients (78.9%) had dorsally located plaques, and 11 patients (57.9%) had two plaques. The most frequently used preoperative medical treatment was a combination of Vitamin E and colchicine (47.4%), and the most common comorbidity was type 2 diabetes (26.3%). In 15 cases (78.9%), no curvature was observed at the one-year follow-up. A 20° curvature was observed in 2 cases (10.5%), and a 15° curvature was noted in 2 cases (10.5%) (Table 3). Penile appearance was satisfactory for physicians and patients.

Table 1. Data from patients undergoing surgery with testicular tunica vaginalis autologous grafts, including age, onset of symptoms, duration of medical treatment, operation time, and plaque size

	N	*Mean*	*95% GA*	*SD*
Age	19	51.95	49.52–54.37	5.03
Onset of symptoms (months)	19	17.11	14.68–19.53	5.03
Duration of medical treatment (months)	19	14.95	13.33–16.57	3.36
Operation time (min)	19	70.26	67.76–72.77	5.19
Plaque size (cm²)	19	2.82	2.61–3.04	0.45

DISCUSSION

Repeated minor traumas to the penis cause extravascular protein deposition, fibrin trapping, macrophage formation, excessive cytokine release, and elastase secretion, leading to alterations in tunical collagen.[11] In the normal wound healing process, the protein structure of collagen found in scar tissue breaks down, leading to scar contraction known as remodeling. However, in Peyronie's disease, these scars fail to undergo proper remodeling. Secondary defects in fibrin degradation, associated with proteins like Transforming Growth Factor Beta 1 and plasminogen activator inhibitor type 1, can result in aberrant healing of the tunica. Additionally, trauma can cause changes in the elastic content of the tunica albuginea, leading to a loss of elasticity and subsequent scarring. Etiological factors contributing to the development of PD include diabetes mellitus, hypertension, dyslipidemia, ischemic cardiopathy, autoimmune diseases, smoking, excessive alcohol

Table 2. Comparison of preoperative and postoperative IIEF-5 scores in patients undergoing surgery with testicular tunica vaginalis autologous grafts at the one-year follow-up

	Pre-op				*Post-op 1st year*				*p-Value*
	N	*Mean*	*95% GA*	*SD*	*N*	*Mean*	*95% GA*	*SD*	
IIEF-5	19	21.21	20.54–21.88	1.40	19	27.21	26.64–27.78	1.18	<0.05*

*Significant difference based on paired t-test (p<0.05)

Table 3. Categorical data from patients undergoing surgery with testicular tunica vaginalis autologous grafts

		N	*%*
Plaque location	Dorsal	15	78.9%
	Lateral	4	21.1%
Degree of curvature	50°	2	10.5%
	55°	6	31.6%
	60°	5	26.3%
	65°	4	21.1%
	70°	2	10.5%
Number of plaques	1 plaque	8	42.1%
	2 plaques	11	57.9%
Postoperative 1-year curvature degree	15° curvature	2	10.5%
	20° curvature	2	10.5%
	None	15	78.9%
Conservative medical treatment	Vitamin E	5	26.3%
	Vitamin E + ESWT	3	15.8%
	Vitamin E + Colchicine	9	47.4%
	ESWT	2	10.5%
Comorbidities	Hypertension	2	10.5%
	Type 2 Diabetes	5	26.3%
	Smoking	2	10.5%
	Alcohol consumption	2	10.5%
	None	8	42.1%

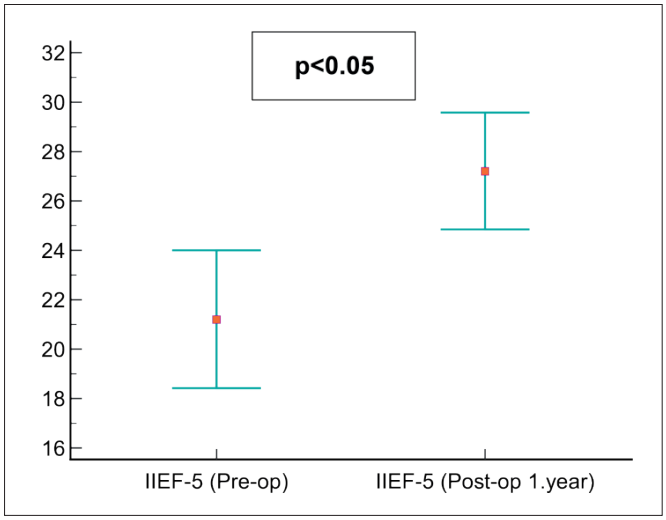

Figure 2. Graphical comparison of preoperative and one-year postoperative data of patients who underwent testicular tunica vaginalis autologous grafting, based on IIEF-5 scores

consumption, low testosterone levels, and pelvic surgeries such as radical prostatectomy.[12,13] The etiological factors observed in our study were consistent with the literature, with type 2 diabetes being the most common comorbidity (26.3%).

Plaque formation in the penis, caused by fibrosis of the tunica albuginea, leads to curvature, pain, and erectile dysfunction, which negatively impacts the quality of life for both the patient and his partner. Surgical intervention is required at the end of the first year, known as the stable phase of Peyronie's disease (PD), to correct penile curvature adequately to allow sexual intercourse.[14] The choice of surgical method is determined by factors such as plaque structure, degree of curvature, baseline erectile function, and the surgeon's preference.[15] Plaque incision and grafting are the preferred surgical methods for PD today. Since 1974, grafts have been used in the treatment of Peyronie's disease, with options including autologous grafts (such as dermis, vein, temporal fascia, rectus fascia, buccal mucosa, tunica albuginea, and tunica vaginalis), allografts (such as cadaveric pericardium, fascia lata, and dura mater), xenografts (such as porcine intestinal mucosa, bovine pericardium, and porcine dermis), and synthetic grafts (such as Gore-Tex and Dacron).[16] An ideal graft material should be readily available, flexible, inexpensive, resistant to infection and traction, and able to preserve erectile function with minimal morbidity. Nevertheless, no existing material fully meets all the characteristics outlined in the definition of an ideal graft. In our study, testicular tunica vaginalis was used as the graft material because it is easy to obtain, flexible, inexpensive, resistant to infection and traction, and preserves erectile function with low morbidity.

The first use of plaque excision with grafting in Peyronie's disease was reported by Lowsley in 1947[16], with a reported success rate of 66%. In 1974, a higher success rate was reported with the use of dermal grafts.[17] However, later studies, including one by Horton in 1974, indicated that dermal grafts could cause morbidity and erectile dysfunction.[18,19] The need to obtain the graft from a secondary incision site prompted a search for alternative graft materials. Synthetic grafts were introduced to improve outcomes,

but complications such as inflammation, perigraft fibrosis, high infection rates, allergic reactions, and issues with flexibility led to a move away from their use.[20] Due to the higher compatibility of autologous grafts with the host tissue, autologous grafts were used in our study.

Autologous grafts are commonly used because of their ease of integration into host tissue and the lower incidence of local inflammatory reactions.[21] The use of tunica vaginalis in Peyronie's disease was first reported by Das in 1980, who used it in six patients.[22] Tunica vaginalis offers several advantages, including ease of procurement, suitable thickness and elasticity, good histocompatibility and blood supply after grafting, minimal surface damage, absence of rejection, and cost-effectiveness. Additionally, it provides tissue of sufficient size to cover the defect.[23] Although it was first reported more than 40 years ago, studies on the effectiveness and safety of tunica vaginalis as a graft material remain limited. In an experimental study by Amin et al., tunica vaginalis was used following the excision of the tunica albuginea in dogs, with acceptable results.[24] In another experimental study by Das et al., postoperative cavernosography and histological analysis revealed no evidence of penile curvature or ballooning, and the graft showed good histological compatibility.[25] One of the largest clinical studies was conducted by Liu et al., who evaluated 19 patients treated with tunica vaginalis grafts for PD between 2007 and 2012. The study reported that all patients were satisfied with the appearance of their penis following surgery, with a mean operation time of 74 minutes.[26] Similarly, Yuanyuan et al. studied five patients with a median age of 37.2 years and reported that penile deformities were corrected in 80% (n=4) of cases at the 12-month follow-up.[27] Soydaş et al. compared the effects of autologous saphenous venous grafts, porcine pericardial extracellular matrix grafts, porcine intestinal submucosal extracellular matrix grafts and bovine pericardial extracellular matrix grafts in their study analyzing grafting procedures in PD. Their study concluded that extracellular matrix grafts should be preferred over autologous venous grafts due to reduced erectile dysfunction, shorter operation time and shorter hospital stay.[28] In another study, Fiorillo et al. documented that corporoplasty with plaque incision and grafting is an effective treatment approach in PD and that the efficacies of porcine dermal and bovine pericardium xenografts are similar.[29] Studies comparing surgical techniques are extremely limited. In this context, a 2024 study by Eslahi et al. involving 33 cases treated with tunica vaginalis grafts and bovine pericardium reported that postoperative penile appearance improved in both groups, with no significant differences between them.[30] Ainayev et al. conducted a comparative study of 20 patients who underwent surgery with either buccal mucosa grafts or tunica vaginalis grafts, reporting that initial penile curvature improved from 48.0±6.6° in the tunica vaginalis group and 50.3±11.6° in the buccal mucosa group, with residual curvature measuring 12.4±4.9° and 7.9±3.7°, respectively, at the 24-month follow-up.[31] The technical success rate was reported to be 90% in both groups. Our results were consistent with those of similar studies. In 15 out of the 19 patients (78.9%) treated with tunica vaginalis autologous grafts, no curvature was observed at the one-year follow-up, and the residual curvature in four cases was not clinically significant. There was no penile shortening, and the patients reported satisfaction with the postoperative appearance of their penis.

Penile length changes can occur following penile surgeries, including those for Peyronie's disease. Liu et al.[26] reported that there was no penile shortening in the follow-up of patients who underwent surgery using tunica vaginalis, whereas Helal et al.[32] found penile shortening in more than 80% of the patients as a result of surgery. In a recent study conducted by Ainayev et al. in 2022, in which they examined cases with a mean age of 47.2±10.8 years and a mean curvature of 48±6.6°, the erect penile length significantly increased in both groups at the 24-month follow-up.[32] Another issue following surgeries for Peyronie's disease is erectile dysfunction. However, in comparative studies by Ainayev et al., it was reported that the IIEF-5 score, which was initially 18.4±2.5, significantly increased to 20.6±2.6 postoperatively. In a study by Yuanyuan et al. involving a total of five cases with a median age of 37.2 years, it was found that at the end of the 12-month follow-up period, all patients maintained erections without pain.[30] In the study by Liu et al., which evaluated 19 patients who underwent tunica vaginalis grafting for Peyronie's disease between 2007 and 2012, it was reported that IIEF scores significantly increased following an average operation time of 74 minutes.[29] In a 2024 study by Eslahi et al., in which 33 cases were treated using tunica vaginalis grafts and bovine pericardium, no significant changes in IIEF scores were observed over a 30-month period.[31] On the other hand, in the study by Helal et al., which included 12 cases, only 7 patients (58.3%) achieved satisfactory erections.[32] In our study, no penile shortening or loss of erection was observed in any patient after a one-year follow-up, and there was a significant improvement in IIEF-5 scores. Additionally, no significant penile curvature was observed in our cases at the one-year follow-up.

Limitation

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. On the other hand, our study only examined PD treated with testicular tunica vaginalis autologous grafts. Data from patients who underwent other surgical techniques or medical treatment were not evaluated. Additionally, complex deformity ratios such as notch, swan neck, and hourglass have not been documented.

RESULT

The tunica vaginalis autologous graft material is used in the surgical treatment of Peyronie's disease (PD) because it is easily obtainable, flexible, inexpensive, resistant to infection and traction, and capable of preserving erectile function with low morbidity. In our study, it was concluded that the testicular tunica vaginalis autologous graft technique was successful in the surgical treatment of Peyronie's disease with curvatures less than 90°. We would like to emphasize that more prospective, randomized, controlled studies are needed to further evaluate the effectiveness of this technique.

Ethics Committee Approval
The study was approved by Tokat Gaziosmanpaşa University Faculty of Medicine Clinical Researches Ethics Committee. (date and number of approval: 12.12.2024/24-mobaek-003).

Peer-review
Externally peer-reviewed.

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

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