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Absorbable versus Non-Absorbable Sutures in Plication Surgery for Penile Curvature: A Comparison of Outcomes

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Keywords
Peyronie's disease · Plication surgery · Absorbable sutures

Abstract

Introduction: Peyronie's disease is a fibrotic disorder of the tunica albuginea that causes penile curvature and sexual dysfunction. Plication surgery is a standard treatment for men with preserved erectile function; however, non-absorbable sutures may lead to palpable and bothersome nodules. ***Objective:*** The aim of the study was to compare surgical and patient-reported outcomes between absorbable and non-absorbable sutures in penile plication surgery. ***Methods:*** This retrospective study included 48 patients who underwent plication surgery between 2013 and 2023 and completed long-term follow-up. Twenty-nine (60.4%) received absorbable sutures and 19 (39.6%) non-absorbable sutures. Mean follow-up was 8.4 ± 2.9 vs. 4.0 ± 1.2 years ($p < 0.001$). Primary outcomes were surgical success (no residual curvature) and bothersome nodularity, both self-reported. Univariate and multivariable logistic regression identified predictors of these outcomes. ***Results:*** Surgical success rates were comparable (62.1% vs. 63.2%; $p = 0.94$). Bothersome nodularity was significantly less frequent with absorbable sutures (6.8% vs. 36.8%; $p = 0.02$). On multivariable analysis, non-absorbable sutures remained the strongest predictor of bothersome nodularity (adjusted OR 18.0; 95% CI 1.36–642; $p = 0.057$), while no independent predictors of surgical success were identified. ***Conclusion:*** Absorbable sutures reduce bothersome nodularity without compromising surgical outcomes, suggesting improved postoperative comfort with comparable efficacy.

Introduction

Peyronie's disease (PD) is a benign condition characterized by acquired penile deformity resulting from fibrosis within the tunica albuginea [1]. Its reported prevalence varies widely, ranging from 0.5% to 20.3%, though it is believed to be underreported [2, 3]. The condition is thought to develop through a pathological cascade initiated by minor penile trauma, leading to plaque formation, resulting in curvature, penile shortening, and sexual dysfunction [1]. Treatment options for PD include oral therapies, though their clinical efficacy remains questionable, intralesional injections such as collagenase *Clostridium histolyticum*, and mechanical approaches like penile traction therapy [4].

Surgical intervention remains the gold standard treatment for patients with stable PD [5]. However,

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despite published recommendations and various society guidelines, there is no clear consensus among clinicians regarding the optimal approach to PD management [4]. Patients with good erectile function can be treated with either plication surgery or penile grafting. Plication is generally preferred for those without an hourglass deformity and with mild to moderate curvature. In contrast, patients with poor erectile function may be offered a penile prosthesis combined with straightening maneuvers [4].

Various plications techniques have been described such as the Nesbitt procedure [6], the Yachia technique [7] and the 16-dot plication technique [8]. The fundamental principle underlying all these surgical techniques is the shortening of the convex aspect of the penile curvature, thereby achieving functional straightening of the organ. The primary advantage of plication procedures lies in their simplicity and low risk of postoperative erectile dysfunction (ED), estimated at less than 5% [5, 9, 10]. Conversely, its principal drawback is the risk of penile length reduction, with an approximate loss of 1 cm for every 30 degrees of curvature correction [5, 9]. However, this claim has been challenged by a recent study, which suggests that perceived length loss often occurs prior to surgery and that the Nesbit procedure does not result in further measurable shortening [11].

Despite successful surgical correction and the achievement of penile straightening, patient dissatisfaction remains a concern, largely due to the palpable presence of sutures, reported in 34%–88% of cases [12, 13]. Moreover, a subset of patients, ranging from 12% to 33%, experience postoperative discomfort or pain associated with suture material [8, 14], with certain sutures known to elicit greater inflammation and fibrosis in penile tissue than others [15].

In an effort to address this issue, various techniques have been explored. Investigations have sought to identify the optimal non-absorbable suture material [13], evaluate the efficacy of inverted sutures in burying the knot [14, 16], and assess the potential benefits of tunical incisions in reducing suture-related discomfort [17]. While a seemingly straightforward solution would be the use of absorbable sutures, concerns regarding recurrence due to suture resorption have precluded their routine application. Nevertheless, absorbable sutures have previously been demonstrated as a viable option for patients with congenital penile curvature [18, 19]. In the context of PD, their use has been documented in a single study, where a modified surgical approach limiting the reliance on permanent sutures yielded favorable functional and durable outcomes, with a low incidence of bothersome nodularity [20]. In this study, we retrospectively analyzed a single center's patient outcomes following plication surgery for penile curvature, comparing the results between those who underwent plication with absorbable sutures and those who received non-absorbable sutures.

Materials and Methods

Patient Population

This retrospective comparative study included patients with penile curvature who underwent tunical plication surgery between 2013 and 2023. All patients treated with either absorbable or non-absorbable sutures were analyzed. Plication was generally offered to men with mild to moderate curvature and preserved erectile function, without applying a strict angular cutoff.

Patients requiring grafting, penile prosthesis, or lacking follow-up data were excluded. Surgery was limited to cases with symptom duration ≥1 year and stable deformity for ≥6 months.

Preoperative Evaluation

Preoperative assessment included a detailed history emphasizing sexual function, risk factors for PD, and presence of ED. Duration of symptoms and changes in curvature were recorded. Physical examination documented curvature degree, direction, and palpable plaques. The final surgical plan was determined through shared decision-making.

Surgical Technique

Under general and local anesthesia, penile degloving was performed through a circumcision incision, followed by induction of artificial erection for curvature assessment. Plication was performed on the convex side using the 16-dot technique. A second artificial erection confirmed correction; adjustments were made as needed. Suture choice (Vicryl® or Ethibond®) was at the surgeon's discretion.

Postoperative Care and Evaluation

Patients were discharged the next day and advised to abstain from intercourse for 1 month. No traction or erection-suppression therapy was prescribed. Follow-up occurred at 1 month and as needed. For this study, patients completed a questionnaire assessing outcomes.

Table 1. Demographic and preoperative clinical characteristics

	Absorbable sutures	Non-absorbable sutures	*p* value
Patients, *n*	29	19	–
Age	55.6±15.1	51.2±15.5	$p = 0.20$
BMI	25.4±3.07	25.5±3.6	$p = 0.92$
Diabetes mellitus	1 (3.4%)	5 (26.3%)	$\mathbf{p = 0.03}$
Time to first follow-up	54.5±10.2 days	47±8.5 days	$p = 0.58$
Time to survey completion	8.4±2.9 years	4.0±1.2 years	$\mathbf{p < 0.001}$
Mean curvature angle	54.7±16.7	56.1±23.6	0.92
Erectile dysfunction	5 (17.2%)	5 (26.3%)	0.49
Curvature direction			0.35
Ventral	10 (34.4%)	9 (47.3%)	
Dorsal	13 (44.8%)	9 (47.3%)	
Lateral	6 (20.6%)	1 (5.2%)	
Etiology			0.70
Congenital	4 (13.7%)	4 (21.0%)	
PD	25 (86.2%)	15 (78.9%)	

BMI, body mass index.

Outcomes

Primary outcomes were surgical success (absence of recurrent curvature) and bothersome nodularity, both patient-reported. Secondary outcomes included ED, painful erections, perceived shortening, satisfaction, and willingness to recommend surgery.

Statistical Analysis

Continuous variables were compared using *t* tests, categorical variables by chi-square or Fisher's exact test. Logistic regression identified predictors of surgical success and bothersome nodularity. Analyses were performed in R (v4.5.0), with significance set at $p < 0.05$.

Results

Demographics and Follow-Up

A total of 58 patients underwent plication surgery for penile curvature at our institution between 2013 and 2023. Of these, 48 patients (82.8%) completed long-term follow-up and responded to the study questionnaires. Twenty-nine patients (60.4%) underwent the procedure using absorbable sutures, while 19 patients (39.6%) received non-absorbable sutures.

The mean age of patients in the absorbable suture group was 55.6 ± 15.1 years, compared to 51.2 ± 15.5 years in the non-absorbable group ($p = 0.20$). Patients were initially assessed at a mean of 54.5 ± 10.2 days in the absorbable suture group and 47 ± 8.5 days in the non-absorbable group ($p = 0.58$). The mean duration of follow-up between surgery and questionnaire completion was significantly longer in the absorbable suture group (8.4 ± 2.9 years) compared to the non-absorbable group (4.0 ± 1.2 years; $p < 0.001$).

Preoperative Parameters

The mean curvature angle was 54.7 ± 16.7° in the absorbable suture group and 56.1 ± 23.6° in the non-absorbable group ($p = 0.92$). Most curvatures were oriented in the ventral or dorsal plane, with no significant difference in distribution between the groups ($p = 0.35$). ED was documented in 5 patients (17.2%) in the absorbable group and 5 patients (26.3%) in the non-absorbable group ($p = 0.49$), based on subjective complaints during follow-up visits. In all cases, erectile function was preserved to a degree sufficient for intercourse. PD was the most common etiology in both groups (25 [86.2%] vs. 15 [78.9%]; $p = 0.70$). Full demographic and preoperative clinical characteristics are summarized in Table 1.

Post-Surgical Follow-Up

At initial follow-up, residual curvature was noted in 24.1% of patients in the absorbable suture group and 15.7% in the non-absorbable group ($p = 0.48$). Two

Table 2. Short- and long-term outcomes after surgery

	Absorbable sutures	Non-absorbable sutures	*p* value
Presence of residual curvature at initial follow-up	7 (24.1%)	3 (15.7%)	0.48
Opted for revision surgery	2 (6.8%)	0	0.52
Presence of residual curvature at long term follow-up	11 (37.9%)	7 (36.8%)	0.94
Mean residual angle	20.5±22.6	16.8±14.3	0.91
Bothersome nodularity	2 (6.8%)	7 (36.8%)	**0.02**
Painful erections	2 (6.8%)	1 (5.2%)	1
Perceived penile shortening	25 (86.2%)	13 (68.4%)	0.16
Satisfaction (1–5)	3.59±1.45	3.53±1.31	0.71
Would recommend surgery to a friend	22 (75.8%)	12 (63.1%)	0.52
IIEF-5 questionnaire	22.9±7.2	24.1±3.05	0.79

IIEF-5, International Index of Erectile Function. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate, and continuous variables were analyzed using independent two-tailed *t* tests. A *p* value <0.05 was considered statistically significant.

patients (6.8%) in the absorbable group underwent revision surgery, compared with none in the non-absorbable group ($p = 0.52$).

Survey Results

At long-term follow-up, residual curvature was reported by 11 patients (37.9%) and 7 patients (36.8%) in the non-absorbable group ($p = 0.94$). The mean residual curvature angle was 20.5 ± 22.6° in the absorbable group and 16.8 ± 14.3° in the non-absorbable group ($p = 0.91$).

Bothersome nodularity was reported by 2 patients (6.8%) in the absorbable group compared to 7 patients (36.8%) in the non-absorbable group, a statistically significant difference ($p = 0.02$). Painful erections were reported by 2 patients (6.8%) in the absorbable group and 1 patient (5.2%) in the non-absorbable group ($p = 1.00$).

The majority of patients reported perceived penile shortening: 25 patients (86.2%) in the absorbable group and 13 patients (68.4%) in the non-absorbable group ($p = 0.16$). Satisfaction, rated on a 5-point scale, was similar between the groups, with a mean score of 3.59 ± 1.45 in the absorbable group and 3.53 ± 1.31 in the non-absorbable group ($p = 0.71$).

Most patients indicated they would recommend the surgery to a friend (75.8% vs. 63.1%; $p = 0.52$). Mean International Index of Erectile Function (IIEF-5) scores were comparable (22.9 ± 7.2 vs. 24.1 ± 3.05; $p = 0.79$). Comprehensive short- and long-term outcomes are summarized in Table 2.

Predictors of Outcomes

On univariate logistic regression, suture type was not significantly associated with surgical success (odds ratio [OR] = 0.95; 95% confidence interval [CI], 0.28–3.15; $p = 0.94$). In contrast, patients who received non-absorbable sutures had markedly higher odds of reporting bothersome nodularity (OR = 7.88; 95% CI, 1.63–58.41; $p = 0.018$).

To further account for potential confounders, a multivariable logistic regression model was constructed including age, follow-up duration, etiology, and presence of erectile dysfunction, based on clinical rationale. In this adjusted model, suture type remained the strongest predictor of bothersome nodularity, with patients receiving non-absorbable sutures demonstrating nearly 18-fold higher odds of nodularity compared with those receiving absorbable sutures (adjusted OR = 18.0; 95% CI, 1.36–642; $p = 0.057$). None of the additional covariates were significantly associated with nodularity.

For surgical success, no independent predictors were identified. After adjustment for the same covariates, suture type was not significantly associated with the absence of residual curvature (adjusted OR = 0.67; 95% CI, 0.11–4.09; $p = 0.67$). Similarly, age, follow-up duration, etiology, and erectile dysfunction did not independently predict surgical success ($p > 0.05$ for all). A detailed summary of both univariate and multivariable regression analyses, including odds ratios, 95% confidence intervals, and *p* values for all tested variables is presented in Table 3.

Table 3. Univariate and multivariable logistic regression analysis for predictors of surgical success and bothersome nodularity

Outcome	Variable	Univariate OR (95% CI)	*p* value	Multivariable aOR (95% CI)	*p* value
Surgical success (no residual curvature)	Suture type (nonabsorbable vs. absorbable)	0.95 (0.28–3.15)	0.94	0.67 (0.11–4.09)	0.67
	Follow-up time, years	1.00 (1.00–1.00)	0.84	0.96 (0.73–1.26)	0.78
	Age, years	0.98 (0.95–1.02)	0.40	1.01 (0.96–1.08)	0.70
	Etiology (peyronie vs. congenital)	0.29 (0.05–1.36)	0.12	0.17 (0.01–1.60)	0.15
	Erectile dysfunction (yes vs. no)	1.92 (0.46–8.14)	0.36	2.49 (0.55–11.9)	0.24
Bothersome nodularity	Suture type (nonabsorbable vs. absorbable)	7.88 (1.63–58.41)	0.018	18.0 (1.36–642)	0.057
	Follow-up time, years	1.00 (1.00–1.00)	0.12	1.11 (0.71–1.79)	0.65
	Age, years	0.99 (0.95–1.05)	0.83	1.03 (0.95–1.13)	0.44
	Etiology (peyronie vs. congenital)	0.64 (0.12–4.95)	0.62	0.33 (0.02–11.9)	0.49
	Erectile dysfunction (yes vs. no)	0.42 (0.02–2.75)	0.44	0.22 (0.01–1.90)	0.23

OR, odds ratio; CI, confidence interval. Variables included in the multivariable model were selected a priori based on clinical relevance. Surgical success and bothersome nodularity were based on patient reports.

Discussion

Corporal plication without incision or excision of the plaque was first described by Essed and Schröder in a series of five patients, in whom the tunica albuginea was plicated using non-absorbable sutures to correct penile curvature [21]. Since then, various plication techniques have been developed such as Baskin and Duckett's tunica albuginea plication [22] and Lue's '16-dot' technique [8]. All of these techniques utilize non-absorbable sutures to prevent early suture absorption or breakage that could result in curvature recurrence.

Reported outcomes of plication surgery vary widely in the literature, likely due to differences in surgical technique, follow-up duration, and definitions of success. Successful penile straightening has been reported in 29–100% of cases, with overall patient satisfaction ranging from 65 to 96% [23]. Despite these encouraging success rates, the use of non-absorbable sutures is not without drawbacks. Studies have shown that 34–88% [12, 13] of patients are able to palpate the sutures postoperatively, and 12–33% [8, 14] describe this sensation as bothersome.

In an attempt to address this issue, the use of absorbable sutures has previously been proposed. Hsieh et al. [24] were the first to describe this approach in patients with congenital penile curvature. In their retrospective analysis of 114 cases, they used two interrupted U-shaped sutures with absorbable Vicryl material. At a 6-month postoperative follow-up, 86% of patients achieved a residual curvature of 15° or less, with no reported cases of bothersome suture palpability. Basiri et al. [18] conducted a randomized study involving 35 patients with congenital penile curvature, comparing absorbable Vicryl® sutures to permanent nylon sutures in plication surgery. At a mean follow-up of 8.1 months, both groups demonstrated comparable rates of postoperative curvature correction (88.2% vs. 88.9%, p = 0.61). However, the incidence of palpable nodules was significantly lower in the Vicryl® group (6% vs. 39%, p = 0.04), suggesting a potential advantage of absorbable sutures in reducing suture-related discomfort.

To the best of our knowledge, this is the first study to compare outcomes between the exclusive use of absorbable versus non-absorbable sutures for the correction of penile curvature in patients with PD, with 83.3% of our cohort diagnosed with PD. Initial follow-up demonstrated comparable success rates in achieving penile straightening without residual curvature between the two groups (70.8% vs. 82.3%; p = 0.48). At long-term follow-up, the success rates were slightly lower (62.1% vs. 63.2%; p = 0.94); however, it should be noted that the initial assessment was performed by the surgeon, whereas the long-term evaluation was based on patient self-report. The degree of residual curvature at long-term follow-up was generally mild in both groups (20.5 ± 22.6° vs. 16.8 ± 14.3°; p = 0.91).

In contrast, bothersome nodularity was significantly more common in the non-absorbable suture group, and remained strongly associated with non-absorbable sutures on multivariable analysis (6.8% vs. 36.8%; p = 0.02; adjusted OR = 18.0, 95% CI 1.36–642, p = 0.057). Iacono et al. [25] similarly reported of their experience using non-absorbable sutures in 47 patients with PD, in which 80% of patients reported experiencing bothersome nodularity. Conversely, Papagiannopoulos et al. [20]

reported their experience using absorbable sutures in the treatment of PD. They employed a modified plication technique in which a non-absorbable suture was placed centrally, reinforced by absorbable sutures, thereby significantly reducing the overall use of permanent suture material. In their retrospective analysis, 81 patients completed a postoperative survey at a median follow-up of 56.3 months. 19.8% experienced nodularity, and 4.9% found the nodularity to be bothersome. Findings that are consistent with those observed in our cohort.

Our study demonstrated high rates of subjectively perceived penile shortening (86.2% vs. 68.4%, $p = 0.16$), consistent with the literature, which reports subjective rates of up to 75% [26]. In contrast, objective length loss assessed by clinicians has been reported in approximately 20–40% of cases [26].

Despite achieving comparable outcomes in penile straightening and a lower incidence of bothersome nodularity in the absorbable suture group, our study did not demonstrate higher overall patient satisfaction (mean score: 3.59 vs. 3.53, $p = 0.71$), increased likelihood of recommending the surgery to others (75.8% vs. 63.1%, $p = 0.52$), or improved sexual function as measured by IIEF-5 scores (22.9 vs. 24.1, $p = 0.51$).

This study is limited by its retrospective design and the fact that 17.2% of patients were lost to long-term follow-up. The data represent outcomes from a single center with multiple operating surgeons, which may have contributed to differences in outcomes. Another limitation is the non-randomized selection of suture material, which was based on individual surgeon preference rather than a standardized algorithm.

Additionally, long-term follow-up was based on patient self-report, limiting the objectivity of key measures such as residual curvature and nodularity. Because follow-up duration differed significantly between the absorbable and non-absorbable suture groups, follow-up duration was included as a covariate in the multivariable regression models for both primary outcomes. This approach allowed adjustment for potential confounding related to varying observation periods. Notably, even after adjusting for follow-up duration, the absorbable suture group achieved comparable rates of surgical success and a significantly lower incidence of bothersome nodularity compared with the non-absorbable group.

Lastly, a post hoc power analysis was performed for the outcome of bothersome nodularity, which revealed a power of approximately 74.5% based on the observed difference between groups (6.8% vs. 36.8%, $p = 0.02$). This suggests that the study was reasonably powered to detect clinically meaningful differences for this specific outcome. However, for the outcome of surgical success, where the rates were nearly identical between groups, the study is likely underpowered to detect subtle or moderate differences. Therefore, while the findings regarding nodularity appear robust, conclusions about other outcomes should be interpreted with caution due to the limited sample size.

Conclusion

Penile plication surgery is feasible using absorbable sutures alone, without compromising the effectiveness of penile straightening and with a significantly lower incidence of bothersome nodularity. However, further prospective studies are needed to support these findings and evaluate long-term outcomes.

Statement of Ethics

This study protocol was reviewed and approved by the Institutional Review Board (Helsinki Committee) of Rambam Health Care Campus (Approval No. 0254-16). The requirement for written informed consent was waived by the same Institutional Review Board in accordance with institutional policy and applicable ethical guidelines.

Conflict of Interest Statement

The authors have no conflict of interest to declare.

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Author Contributions

E.E.: data acquisition and drafting the manuscript. N.F.: drafting and critical revision of the manuscript. A.N.: data collection, patient follow-up, and critical revision of the manuscript. M.A.: data collection, patient follow-up, and critical revision of the manuscript. V.S.: study guidance, critical revision of the manuscript, and intellectual supervision. S.B.: intellectual input, participation in study discussions, and critical revision of the manuscript. A.Z.: conception of the study, study design, and critical revision of the manuscript.

Data Availability Statement

The data that support the findings of this study are not publicly available due to privacy or ethical restrictions involving patient-sensitive information. However, the data are available from the corresponding author, E.E., upon reasonable request.

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