

Favorable Patient Reported Outcomes After Penile Plication for Wide Array of Peyronie Disease Abnormalities

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Purpose: We present patient reported outcomes from our 5-year experience using penile plication to correct a wide variety of Peyronie disease malformations.

Materials and Methods: We reviewed the records of all men who underwent penile plication for Peyronie disease, as performed by one of us (AFM). All patients were treated with tunical plication without penile degloving via a 2 cm longitudinal penile incision regardless of curvature severity or erectile function. A concomitant inflatable penile prosthesis was placed in men with refractory erectile dysfunction. A questionnaire was administered to assess the patient perception of postoperative penile curvature, length, rigidity and adequacy for intercourse.

Results: Of 154 treated patients 78 (51%) and 65 (42%) had simple (less than 60 degrees) and complex (biplanar curvature, or curvature 60 degrees or greater) malformation, respectively, while 11 (7%) underwent plication plus inflatable penile prosthesis placement. A total of 132 patients responded to the questionnaire a mean 14 months after surgery. Overall, 96% of patients reported curvature improvement after penile plication, 93% reported erection adequate for sexual intercourse and 95% considered that the overall condition improved after surgery. Despite a significant difference in the number of plication sutures (mean 10 vs 7) and curvature angle correction (mean 57 vs 30 degrees, each $p < 0.005$), self-reported outcomes of complex cases were equivalent to those of simple cases. While 84% of patients had no measureable decrease in stretched penile length, 103 of 154 (78%) reported a perceived penile length reduction after surgery.

Conclusions: Penile plication without degloving is effective for correcting a wide variety of Peyronie disease malformations. It can be safely combined with inflatable penile prosthesis placement.

Key Words: penis, penile induration, abnormalities, prostheses and implants, reconstructive surgical procedures

PENILE plication is a widely accepted surgical treatment option for men with mild and moderate degrees of penile malformation due to Peyronie disease.¹⁻³ While many experts recommend more invasive techniques to manage severe or multiplanar curvature, such as plaque incision and grafting, our early experience with plication for complex Peyronie deformity has been promising.^{4,5}

The major concern with applying tunical plication procedures for complex Peyronie curvature is the associated potential for penile length loss.³ A discrepancy between patient reported penile shortening and objectively measured length changes was noted after plication and plaque incision, and grafting surgery.⁶ We evaluated patient reported outcomes of tunical plication with or without IPP

Abbreviations and Acronyms

ED = erectile dysfunction

IPP = inflatable penile prosthesis

SPL = stretched penile length

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for a wide array of Peyronie malformations. We also determined their relationship to measured curvature correction and penile length change.

MATERIALS AND METHODS

We retrospectively reviewed the records of all men who underwent surgery for penile curvature at our tertiary center from August 2007 to April 2012, as performed by one of us (AFM). For analysis patients were grouped by curvature complexity and the need for concomitant IPP, including group 1—simple ED (uniplanar curvature less than 60 degrees), group 2—complex ED (biplanar curvature, and/or curvature 60 degrees or greater) and group 3—refractory ED (any curvature plus IPP). All men had persistent penile curvature that had been painless for at least 6 months and severely compromised or precluded intercourse.

Preoperatively curvature severity and direction were determined at the initial office history and/or documented by patient self-photograph. Patients with mild or moderate ED were liberally prescribed oral phosphodiesterase-5 inhibitors to confirm rigidity sufficient for penetration before tunical plication. Those with refractory ED unresponsive to medical therapy were offered a penile prosthesis at plication surgery.

Surgical Technique

Our technique for penile plication was previously described.^{4,5} Briefly, artificial erection was induced with intracorporal injection of 20 mcg alprostadil (groups 1 and 2) or injectable saline plus a penile tourniquet (group 3). One of us (AFM) recorded the initial SPL measurement and obtained photographs of the erect penis from the lateral and inferior perspectives.

Plication was performed through a 2 cm longitudinal proximal or mid shaft incision, which was easily mobilized along the convex surface of the malformation directly contralateral and proximal to the most concave portion of the curvature regardless of curvature degree or complexity. Penile degloving, dorsal neurovascular mobilization, plaque incision/excision and grafting were not performed. A series of parallel, braided, 2-zero Ethibond nonabsorbable polyester sutures (Ethicon, Somerville, New Jersey) were placed in the tunica albuginea spanning approximately 15 mm with each needle passage covering approximately 7 mm with a 1 mm gap between sutures. This was done in buried, interrupted, vertical mattress fashion until curvature was completely corrected. Group 3 patients then underwent immediate IPP placement by retracting the same skin incision used for plication inferior so that the corporotomies could be placed well proximal to the plication sutures.

Intraoperative photographs and SPL measurements were repeated. The wound was closed in 3 layers to completely cover the plication suture knots and implant components. A compressive Coban™ penile wrap was applied. All men were discharged home immediately (groups 1 and 2) or after overnight observation (group 3). Followup was done at 4 to 6 weeks for wound evaluation and/or IPP teaching, and thereafter as needed according to patient preference and condition.

Curvature direction and severity were assessed before and after plication by measuring the angles recorded on intraoperative photographs, as previously described.⁴ SPL was determined by measuring the dorsal distance between the pubic symphysis and the penile tip while on maximal stretch. This was done by the same surgeon (AFM) using a metal ruler.

A questionnaire modified from the Patient Global Impression of Improvement was administered to all patients in a cross-sectional manner via mail or telephone by a blinded research assistant unfamiliar with the surgery or patient details. The questionnaire assessed the patient perception of postoperative penile curvature, length, rigidity and adequacy for intercourse (supplementary Appendix, jurology.com).

Statistical Methods

Perioperative and survey data on groups 1 to 3 were compared using the Fisher exact, Mann-Whitney and independent sample t tests for categorical, normally distributed continuous and nonnormally distributed continuous variables, respectively. The Pearson correlation was performed to assess the interaction between measured and perceived penile length changes after plication surgery. Logistic regression analysis was used to identify preoperative risk factors for worsened postoperative outcomes. Statistical significance was considered at $p \leq 0.05$ and reported p values are 2 sided. All analyses were performed with SPSS®, version 17.0. This study was approved by the University of Texas Southwestern Medical Center institutional review board.

RESULTS

Surgical Outcomes

Plication surgery was performed in 154 men during the 5-year study period. The average curvature angle in the entire group was 52 degrees (range 10 to 135). Curvature direction was dorsal in 65 of 154 cases (42%), lateral in 35 (23%) and bidirectional in 29 (19%). Ventral malformations were noted in 18 cases (12%) and direction was not recorded in 7.

Of the men 78 had simple penile curvature (51%, group 1), 65 had a complex malformation (42%, group 2) and 11 underwent penile plication at IPP placement (7%, group 3) (table 1). Compared to group 1 patients, men in group 2 required more plication sutures (10 vs 7) to achieve a greater degree of curvature correction (57 vs 30 degrees, each $p < 0.005$), as required by the more complex malformations. However, no difference was noted in the proportion of men in groups 1 and 2 in whom a decrease in measured SPL was noted (23% and 11%, respectively, $p = 0.09$). In the 25 men (16% overall) in whom a measured loss in SPL was observed, the mean length lost was negligible at 0.5 cm (range 0.2 to 1.0).

Table 1. Surgical outcomes of plication surgery by abnormality complexity and need for concomitant IPP

	Group 1	Group 2	Group 3
No. pts	78	65	11
Mean degrees angle (range):			
Preop	39 (10–55)	66 (30–135)	41 (30–55)
Postop	9 (0–20)	13 (0–30)	4 (0–10)
Mean degrees correction (range)	30 (10–55)	57 (10–120)	38 (30–45)
Mean No. sutures (range)	7 (3–15)	10 (4–21)	4 (4–6)
Correction/suture (degrees)	4	6	7
Mean cm SPL (range):			Not measured
Preop	14.6 (12–17.5)	14.6 (10–18)	
Postop	14.5 (12–17)	14.6 (10.5–18)	

Perioperative Outcomes

Immediate complications, ie wound, infectious and anesthesia related, were rare with only 2 partial wound separations noted. Ten patients (6%) had bothersome penile pain at the first postoperative visit. Further surgery was required in 6 patients (4%), including repeat plication for persistent curvature in 2, progressive ED requiring penile prosthesis insertion in 2, circumcision in 1 due to postoperative phimosis and wound closure revision in 1 due to bothersome skin fixation to a plication suture. There was no difference in the need for repeat surgery between groups 1 to 3 (4%, 5% and 0%, respectively, $p = 1.0$). At a mean followup of 13 months (range 8 to 20) none of the 11 patients who underwent concomitant IPP plus plication required device explantation or revision for any cause and most penes appeared almost completely straight after device activation.

Patient Reported Outcomes

Of the 154 patients who underwent penile plication 132 (86%) responded to the questionnaire a mean of 14 months (range 1 to 41 months) after surgery (fig. 1). A similar proportion in groups 1, 2 and 3 responded, including 65 of 78 (83%), 57 of 65 (88%) and 10 of 11 men (91%), respectively ($p = 0.67$). Overall, 96% of patients reported curvature improvement after penile plication, 93% reported erection adequate for sexual intercourse and 95% considered the condition improved after surgery. While 103 of 132 patients (78%) reported a perceived reduction in penile length postoperatively, there was no correlation between measured and perceived length loss (Pearson coefficient 0.12, $p = 0.2$).

On binary logistic regression analysis we could not identify preoperative predictor variables (preoperative SPL or curvature severity) for primary postoperative outcomes. Preoperative SPL did not predict postoperative measured loss of penile length ($p = 0.07$), perceived loss of length ($p = 0.22$) or worsened global condition ($p = 0.97$). Curvature

severity also did not predict postoperative measured loss of penile length ($p = 0.07$), perceived loss of length ($p = 0.43$) or worsened global condition ($p = 0.79$). Additionally, there was no association between measured or perceived loss of penile length and worsened global condition after penile plication (each $p = 0.9$).

DISCUSSION

Subjective and Objective Plication Efficacy

Building on our initial encouraging experience with a plication based strategy to correct Peyronie penile malformation, we explored the relationship between objective measurement of penile deformity before and after surgical correction, and patient reported outcomes postoperatively. We reliably corrected penile curvature of virtually any direction or severity through a small proximal or mid shaft incision without degloving. The majority of patients reported improvements in curvature and global condition postoperatively regardless of primary curvature complexity or the need for IPP with a negligible change in erectile rigidity. While objective measurements of erect penile geometry were not repeated postoperatively, the positive patient reported outcomes suggest that plication is durable well beyond 3 years.

To our knowledge our series is unique, in that it was an expansion of the previously published techniques of Gholami and Lue in which plication sutures are methodically applied until correction is achieved.³ Similar to our previous studies,^{4,5} approximately 5 degrees of correction were achieved for each plication stitch and more sutures could be safely applied for effective penile straightening in severe cases, thus, obviating grafting and its attendant risks.^{7–9} We have found that this 5-degree rule is a valuable tool for patient counseling and preoperative planning.

Previous reports identified a high incidence of palpable knots after plication surgery.⁸ While our questionnaire did not specifically include questions on the perception of or bother from knots, knot palpability did not appear to negatively impact overall satisfaction with plication even in complex cases requiring an average of 10 plication sutures (range up to 21). Individually closing each of the 3 layers of the penis (Buck and dartos fascia, and skin) limits the palpability of the buried soft plication knots in most men.

Perceived vs Measured Penile Length Changes After Plication

Traditional algorithms^{1,2} advocate plaque incision/excision and grafting in potent men with a complex penile malformation to avoid the loss of penile length believed to be associated with plication

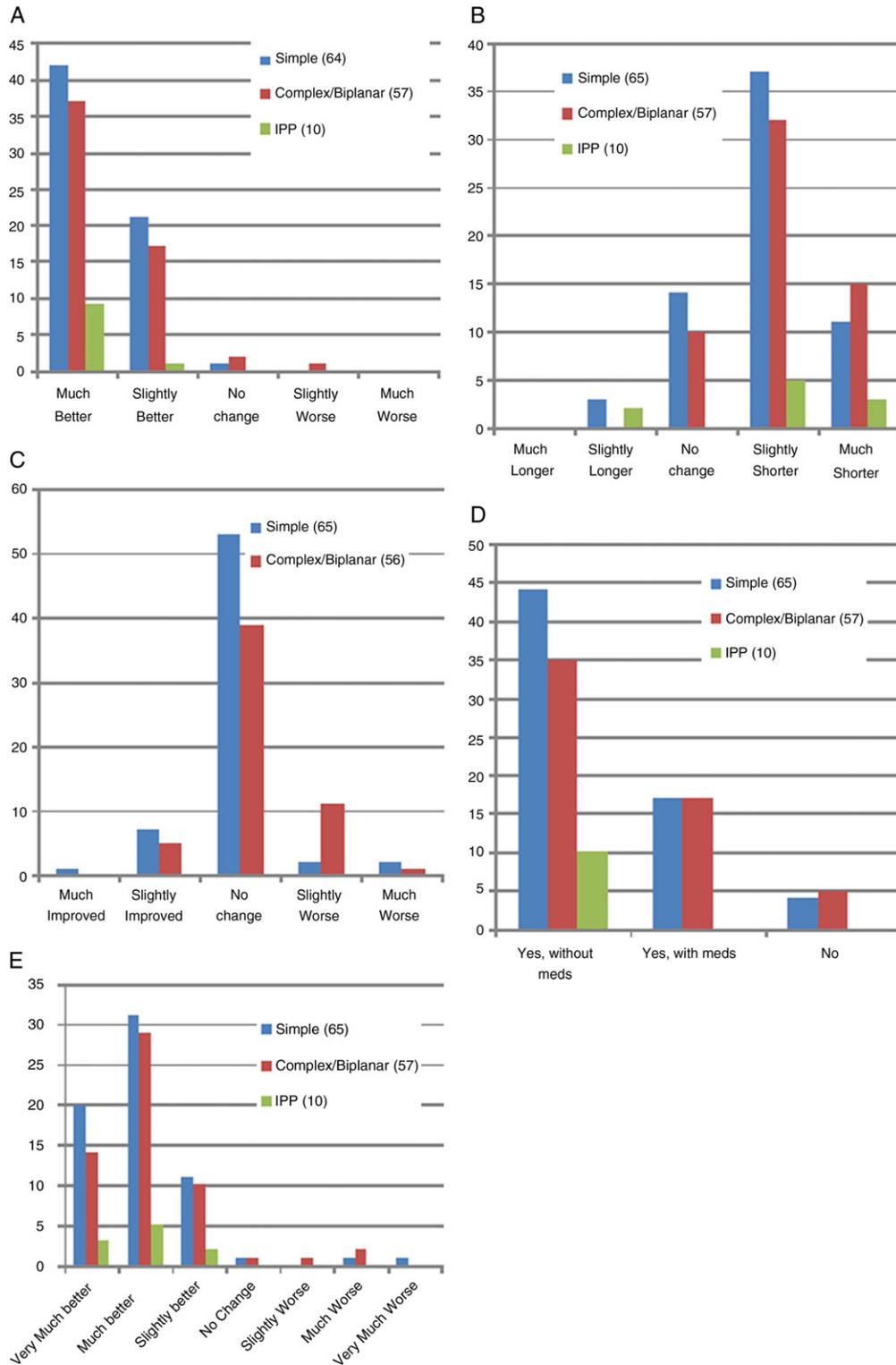


Figure 1. Patient reported outcomes after plication surgery with or without IPP for penile abnormality. A, 1) “What best describes how your penile curvature is now, compared to how it was before you had penile surgery?” Blue bars indicate 64 simple cases, red bars 57 complex/biplanar cases and green bars 10 IPPs. B, 2) “What best describes how length of your penis appears now, compared to how it appeared before you had penile surgery?” Blue bars indicate 65 simple cases, red bars 57 complex/biplanar cases and green bars 10 IPPs. C, 3) “What best describes rigidity of your penis during sexual activity now, compared to its rigidity during sexual activity before you had penile surgery?” Blue bars indicate 65 simple cases and red bars 56 complex/biplanar cases. D, 4) “Is current strength of your erections adequate for penetration during sexual intercourse?” Blue bars indicate 65 simple cases, red bars 57 complex/biplanar cases and green bars 10 IPPs. E, 5) “What best describes how your postoperative condition is now, compared to how it was before you had penile surgery?” Blue bars indicate 65 simple cases, red bars 57 complex/biplanar cases and green bars 10 IPPs.

Table 2. Penile length changes in contemporary Peyronie disease surgical series

Reference	No. Pts	% Length Loss	
		Perceived	Measured
Graft:	175	46	33*
Chung et al ⁷	46	22	Not available
Kim et al ⁸	20	80	Not available
Staerman et al ⁹	28	25	Not available
Taylor and Levine ⁶	81	59	33
Plication:	373	63	17*
Gholami and Lue ³	132	41	Not available
Kim et al ⁸	26	69	Not available
Taylor and Levine ⁶	61	69	18
Present series	154	78	16

* Only in patients with length reported.

procedures.^{3,10} However, reported evidence suggests that the impact of penile straightening operations on penile length is controversial and overstated. Several studies show that only the patient subjective perception of length changes, while studies of objective as well as subjective length changes have routinely demonstrated discordance (table 2).^{3,6-9}

Reporting only patient perceived length loss after Peyronie surgery without objective measurements is fundamentally flawed for 2 reasons. 1) Men report length loss after virtually any surgical intervention involving the penis or urethra even if no length change occurs.¹¹ 2) The contractile effects of Peyronie plaque have already shortened the penis.¹² When straightened by plicating the long side opposite the plaque, curvature is corrected without any further shortening.⁴ Many men seem to compare the recollection of a straight pre-Peyronie disease penis to the newly surgically straightened penis, thus, incorrectly attributing length loss to the surgical procedure.⁶ Finally, most patients are counseled to expect length loss after plication, although the evidence for this is less than robust.

In our study there was no correlation between perceived and measured loss of penile length.

Rather, while objectively measured SPL was unchanged in 84% of our patients, a paradoxical 75% reported a perceived decrease in penile length after plication. Similarly, Taylor and Levine reported subjective length loss in 69% and 59% of plication and plaque excision, and grafting cases despite a measured loss of SPL in only 18% and 33%, respectively.⁶ The lack of an association between measured length loss and the degree of curvature correction substantiates the minimal impact of plication on measured penile length. Most importantly, neither measured nor perceived loss of penile length had any impact on the postoperative global self-assessment of improvement after plication.

Plication Plus IPP for Curvature and Refractory ED

Many groups recommend a stepwise approach to penile straightening in men with coexistent penile curvature and ED requiring IPP. If the implant alone does not straighten the penis, manual modeling is usually recommended, followed by tunical incision with or without grafting.^{13,14} We have preferred plication plus IPP over manual modeling because we have found modeling to be imprecise and morbid with an approximately 5% reported risk of urethral injury.¹⁵ Also, in our hands it has been associated with an unpredictable, incomplete degree of curvature correction.

Similar to the initial description in 2004 of IPP plus plication,¹⁶ we adapted our plication technique for men with penile curvature requiring IPP. A ventral, vertical penoscrotal incision allows excellent access for penoscrotal IPP placement as well as tunical plication since most defects are dorsal and/or lateral. After plication sutures are placed, artificial erection is repeated to confirm adequate correction after subsequent IPP placement, obviating the need for further straightening maneuvers after device insertion (fig. 2).

Our objective assessment of penile straightening achieved by plication plus IPP correlated well with postoperative patient reported outcomes. All men

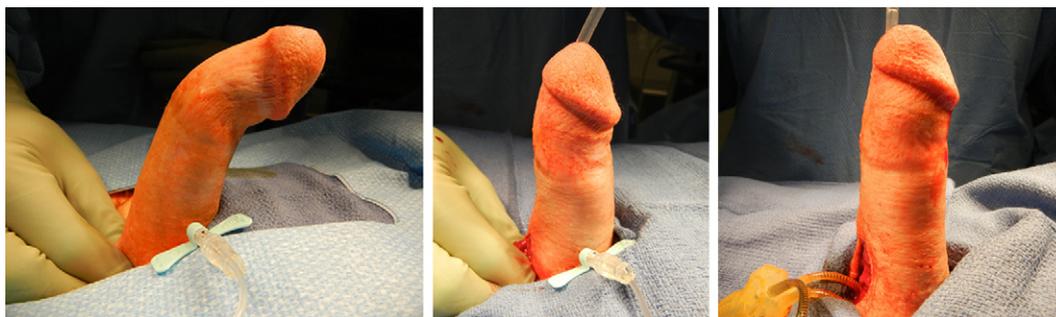


Figure 2. Plication technique with IPP placement

reported improvement in curvature and overall satisfaction after plication plus IPP, similar to that in patients without refractory ED who underwent penile plication alone. While the overall number of IPP plus plication cases was small compared to our other 2 study groups, to our knowledge it is the largest series of IPP plus plication reported to date. Finally, our initial experience suggests that plication has no negative impact on IPP function, safety or durability, given the lack of IPP explantation or revision required in these patients.

Limitations

Despite our high 86% response rate to the administered surveys, our study is limited by the lack of validation for the questionnaire. Other validated surveys have been used for the evaluation and post-treatment followup of patients with ED, ie the International Index of Erectile function, Erectile Dysfunction Inventory of Treatment Satisfaction and Sexual Health in Men. However, none specifically evaluates satisfaction with penile straightening procedures. Thus, we thought that a simplified, direct assessment of straightening, rigidity, penile

length and overall satisfaction would serve as a useful metric to assess patient satisfaction after plication. Questions were based on the Patient Global Impression of Improvement, which has been validated and is frequently used to assess patient satisfaction after anti-incontinence procedures.^{17,18} Nonvalidated questionnaires are often used to evaluate patient reported outcomes after surgery for Peyronie disease.⁷⁻⁹ Our study was strengthened by administering questionnaires by mail or by a non-surgical research assistant blinded to the metrics of the patient original curvature and to subsequent perioperative outcomes.

CONCLUSIONS

Penile plication is a safe, effective method to correct a wide variety of Peyronie disease malformations and it can be safely combined with IPP placement. While almost all patients reported a perceived reduction in penile length, quantitative intraoperative SPL measurement changes were negligible after plication surgery in most patients.

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