

Dorsal Plication Without Degloving Is Safe and Effective for Correcting Ventral Penile Deformities



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OBJECTIVE

To compare the safety and efficacy of patients undergoing dorsal penile plication with patients undergoing ventral and lateral plication.

METHODS

A retrospective review was performed of all patients who underwent penile plication between 2007 and 2013. Plication was performed through a 2-cm longitudinal incision in the proximal or midpenile shaft without degloving. Plication sutures were placed in parallel opposite the angle of greatest curvature. Dorsal plication was performed with minimal displacement of the neurovascular bundle. Patient demographics, perioperative outcomes, and patient-reported outcomes were analyzed.

RESULTS

Of 215 patients who underwent penile plication, complete operative and patient-reported outcomes data were available for 118 (55%). Patients were grouped by location of plication: dorsal ($n = 17$ [14%]), ventral ($n = 65$ [55%]), and lateral ($n = 36$ [31%]). Mean age (52-58 years; $P = .51$) and preoperative curvature (36-51°; $P = .78$) were similar among the 3 groups. Each group required a similar number of sutures (8-9; $P = .18$) to achieve similar correction (37-45°; $P = .33$). Patients completed a satisfaction survey at a mean of 15 months (range, 1-41 months) after surgery. All groups reported equally high rates of satisfaction for penile curvature ($P = .64$), penile rigidity ($P = .64$), strength of erection ($P = .98$), and overall satisfaction ($P = .75$). Although each group reported subjective decrease in penile length ($P = .10$), objective length loss occurred on a small scale (mean length loss for all groups, 0.3-0.8 cm; $P = .24$).

CONCLUSION

Penile plication is a safe and effective technique for correcting all directions of curvature. Dorsal plication without degloving produces favorable objective and subjective results comparable to ventral and lateral plication. UROLOGY 84: 1228–1233, 2014. © 2014 Elsevier Inc.

Penile curvature deformities, such as those due to Peyronie disease, are often amenable to surgical reconstruction by grafting or plication techniques. Nesbit¹ introduced an elliptical wedge resection technique in the 1960s, which was modified by Essed² and Ebbehøj³, and Lue⁴ subsequently introduced a 16-dot plication technique. Although grafting has been recommended for patients with complex penile curvature,⁵ penile plication has also recently been shown to be effective and results in high patient satisfaction in complex biplanar curvatures.^{6,7}

Dorsal penile plication is safe and effective for the correction of hypospadias-associated chordee in pediatric patients.^{8,9} Dorsal plication poses potential risk of injury to the dorsolateral neurovascular bundle (NVB). Outcomes of dorsal plication have not been described in

adults in detail. We report our novel method of dorsal penile plication via a simplified minimally invasive approach involving minimal displacement of the NVB.^{3,10,11} We compare the safety and efficacy of dorsal plication with ventral and lateral plication.

PATIENTS AND METHODS

Patient Selection

An institutional review board–approved retrospective review was conducted of all patients who underwent penile plication at our tertiary care center from 2007 to 2013. All patients who completed a postoperative questionnaire were included in this study. All men had painless persistent penile curvature. Preoperative assessment of the degree of penile curvature was conducted at the time of initial office history and/or documented by patient self-photography. Angle of deformity was documented via intraoperative photographs after alprostadil injection and after plication. Patients with biplanar curvature were defined by the most prominent direction of curvature. Angle of correction, number of sutures, stretched penile length (SPL), and postoperative patient-reported outcomes were assessed. All patient undergoing simultaneous penile plication with inflatable penile prosthesis insertion were excluded. Statistical analyses were

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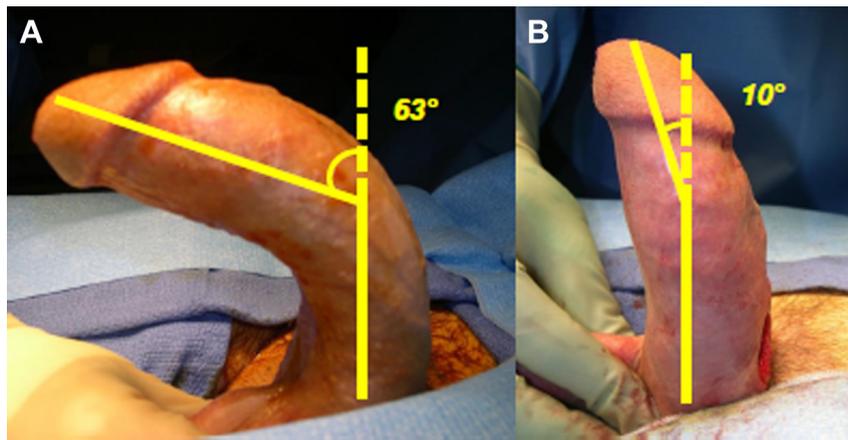


Figure 1. (A) Preoperative photograph of a patient who has significant (63°) ventral curvature. (B) Postoperative photograph of the same patient after 8 dorsal plication sutures were placed. Note the 2-cm longitudinal incision on the dorsal aspect of the shaft. This incision was mobilized along the entire length of the shaft allowing for precise placement of the plicating sutures. (Color version available online.)

conducted using SPSS (IBM, Armonk, NY). One-way analysis of variance test was used to compare means. The Pearson chi square test was used to compare categorical variables.

Surgical Technique

The dorsal plication procedure was a modification of our non-degloving plication technique described previously.^{7,12} Initial SPL was measured as the dorsal distance from the pubic symphysis to the penile tip while on maximum stretch. Patients received an artificial erection induced by intracavernosal injection of alprostadil, and those who did not receive a satisfactory erection received a second injection. Artificial erection was supplemented by intermittent compression of the corpora cavernosa against the pubic symphysis to enable assessment of curvature and guide suture placement. Intraoperative photographs from lateral and inferior views were taken to calculate the degree of curvature of the erect penis (Fig. 1). One investigator, the senior author (A.F.M.), performed all measurements.

Plication was performed through a longitudinal 2-cm incision in the proximal to midpenile shaft. After dissection to and exposure of the tunica albuginea, the incision was mobilized distally and/or laterally using Senn retractors as needed to reveal the distal penile shaft according to the severity and direction of curvature. A series of parallel, 2-0 Ethibond (Ethicon, Somerville, NJ) sutures were placed in the tunica albuginea in an inverting interrupted fashion opposite the angle of greatest curvature (Fig. 2). Each suture spanned a total of 15-20 mm and involved 2 needle passages covering approximately 7-9 mm with a 1-mm gap in between. Each suture was tied at the time of placement.

For dorsal plication, the NVB was clearly identified, and not undermined, dissected, or elevated. Dorsal plication sutures were placed in a thin sulcus created by a sharp dissection lateral to the dorsal penile vein and medial to the dorsal nerves, avoiding any macroscopic horizontal branches. Repeat SPL measurements and intraoperative photographs were obtained after penile plication. Completeness of the procedure was defined as correction of curvature sufficient for sexual encounter as deemed by the senior surgeon. All patients before surgery were counseled on the possibility of residual curvature as well as the potential need for reoperation because of curvature overcorrection.^{6,7} The wound was closed in 3 layers and a compressive Coban (3M,

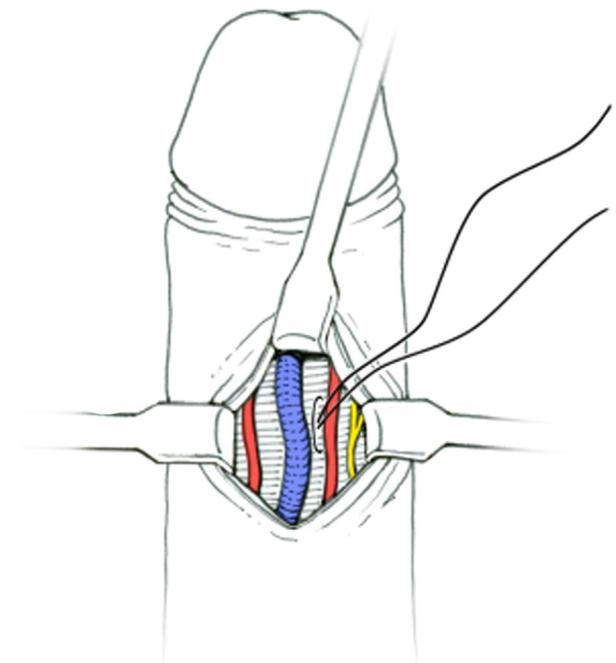


Figure 2. A graphic representation of precise suture placement. A 2-cm incision is made vertically on the dorsal penile shaft over the area of maximal curvature. This incision is mobilized along the shaft using Senn retractors, exposing the neurovascular anatomy. The plicating sutures are then placed in a sulcus between the dorsal vein and the lateral neurovascular bundles, avoiding any macroscopically visible branches. (Color version available online.)

St. Paul, MN) dressing was applied. Postoperatively, patients were instructed to replace the dressing daily for 1 week. All patients were discharged home on the day of surgery.

Outcomes Evaluation

Initial clinic postoperative evaluation was conducted 4-6 weeks after surgery. Further clinic follow-up was conducted according to patient's preference or as medically indicated. A research assistant queried patients with a nonvalidated questionnaire

Table 1. Surgical and patient-reported outcomes

Outcome	Type of Plication			P
	Dorsal	Ventral	Lateral	
Number of patients (%)	17 (14)	65 (55)	36 (31)	
Age, y, median (range)	53 (22-72)	55 (21-72)	58 (33-71)	.51
Preoperative curvature, degrees, mean (range)	51 (20-80)	50 (10-90)	36 (20-90)	.78
Postoperative curvature, degrees, mean (range)	6 (0-15)	14 (0-30)	8 (0-20)	.001
Correction, degrees, mean (range)	45 (20-70)	37 (10-67)	40 (18-80)	.33
Plication sutures, mean (range)	9 (4-20)	8 (3-17)	9 (4-21)	.18
Correction per suture, degrees, mean (range)	6 (3-16)	5 (3-10.0)	5 (2-12)	.82
Loss SPL, cm, mean (range)	0.6 (0.2-1.0)	0.3 (0.2-0.5)	0.8 (0.2-0.5)	.24
Patients with pain after 1 month, n (%)	1 (6)	1 (2)	1 (3)	.76
Patients with repeat procedures, n (%)	1 (6)	1 (2)	0 (0)	.70
Time to survey, mo, mean (range)	17 (5-36)	14 (1-41)	15 (3-41)	.13

modified from the Patient Global Impression of Improvement index (Appendix 1). The survey assessed patients' perception of penile curvature, length, rigidity, adequacy for intercourse, and overall satisfaction.

RESULTS

Between 2007 and 2013, 215 patients underwent penile plication. Complete subjective and objective postoperative data were available for 118 patients (55%; Table 1). Patients were grouped according to plication location: dorsal (n = 17 [14%]), ventral (n = 65 [55%]), and lateral (n = 36 [31%]). Median age was similar among the 3 groups (range: mean age, 53-58 years; $P = .51$). The cohort included complex biplanar curvatures and patients with curvature $>60^\circ$.

Dorsal, ventral, and lateral plication groups presented with similar preoperative curvature (mean, 36° - 51° ; $P = .78$) and received a comparable number of sutures (mean, 8-9 sutures; $P = .18$) to achieve a similar degree of correction (mean, 37° - 45° ; $P = .33$). The mean number of degrees corrected per suture ranged between 5 and 6 ($P = .82$) for the 3 groups. Measured mean penile length loss was not significantly different between the 3 groups: 0.6 cm (range, 0.2-1.0 cm) for dorsal, 0.3 cm (range, 0.2-0.5 cm) for ventral, and 0.8 cm (range, 0.2-0.5 cm) for lateral plication ($P = .24$).

At initial postoperative follow-up, a similar fraction of patients from each group reported penile pain after 1 month (6% of dorsal, 2% of ventral, and 3% of lateral plication patients; $P = .76$). Two patients required reoperation: 1 dorsal plication patient because of bothersome skin fixation at the suture site, and 1 ventral patient required repeat plication for persistent curvature.

Patients completed a telephone questionnaire at a mean of 15 months (range, 1-41 months) after surgery (Fig. 3). A similar proportion of dorsal, ventral, and lateral plication patients reported improvement in their curvature (100%, 94%, and 97%, respectively; $P = .64$), improvement, or no change in their rigidity (82%, 89%, and 84%; $P = .64$), ability to obtain erections (94%, 85%, and 92%; $P = .98$), and improvement in their overall condition (100%, 91%, and 97%; $P = .75$). With regard to penile length, 62%, 75%, and 89% of patients

who underwent dorsal, ventral, and lateral plication reported penile shortening ($P = .10$), indicating a trend toward fewer dorsal plication patients experiencing subjective length loss. Additionally, no patient reported a decrease in sensation of his glans.

COMMENT

Dorsal Plication for Correction of Penile Curvature

Penile plication has traditionally been recommended for patients with simple curvatures $<60^\circ$.⁵ Recently, plication has been shown to be effective with high patient satisfaction for complex curvatures (biplanar and curvatures $>60^\circ$).^{6,7} Dorsal plication for correction of ventral deformities is more technically challenging than dorsal or lateral deformities, often requiring ancillary maneuvers such as resection of the dorsal vein³ or mobilization of the NVBs to perform a modified Yachia corporoplasty.¹³ Our series reveals that dorsal plication can safely be performed without these aggressive maneuvers with excellent cosmetic and functional results.

We initially described plication as a uniform approach to correction of all penile curvatures, performed through a minimally invasive 2-cm penoscrotal incision.¹² The ventral incision was initially displaced dorsally using retractors to expose the tunica albuginea. Our technique has since evolved and we now make our incision dorsally over the area of maximal deformity. We have found that this modification allows for easier exposure and identification of the NVB, and the 2-cm, nondegloving, dorsal incision provides excellent cosmesis.

Patient Outcomes

The "5-degrees of correction per plication suture" rule for our technique has been confirmed in simple and complex curvatures and is used for preoperative planning and patient counseling.^{6,7} Dorsal, ventral, and lateral plication patients required on average 9, 8, and 9 plication sutures ($P = .18$) to correct mean curvatures of 45° , 37° , and 40° ($P = .33$), respectively. Each plication suture corrected approximately 5° of curvature in every direction of curvature ($P = .82$).

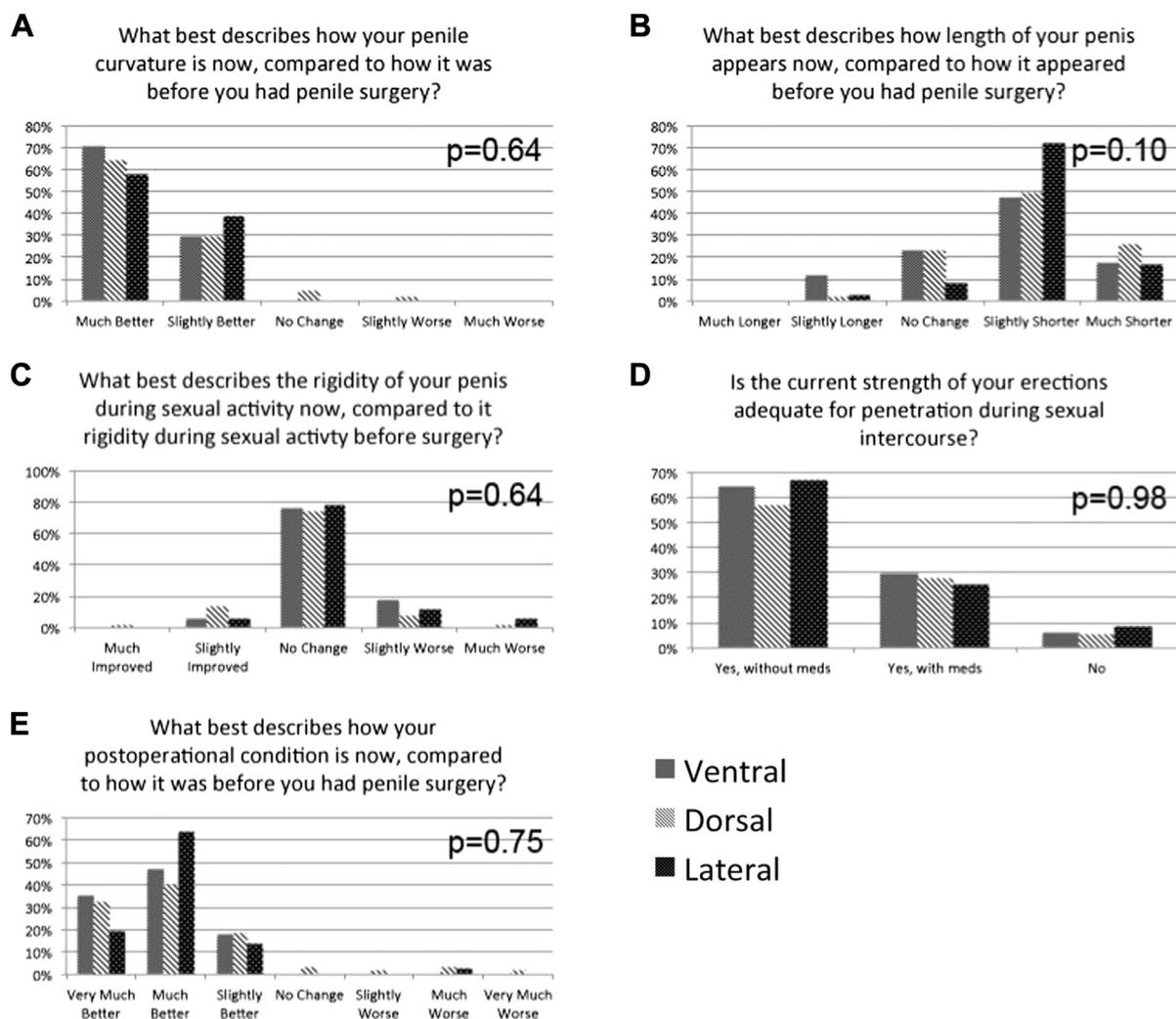


Figure 3. Patient-reported outcomes after plication surgery stratified by the predominant direction of penile curvature.

Patients reported satisfaction for postoperative penile curvature (94%-100%), penile rigidity (82%-89%), ability to obtain erections (85%-94%), and overall satisfaction (91%-100%). Those who underwent dorsal, ventral, and lateral plication experienced minimal change in preoperative and postoperative mean SPL; however, 62%, 75%, and 89% reported subjective shortening. Mean SPL loss occurred on a small scale: 0.6 cm (range, 0.2-1.0 cm) for dorsal, 0.3 cm (range, 0.2-0.5 cm) for ventral, and 0.8 cm (range, 0.2-0.5 cm) for lateral plication. Although patients reported subjective length loss, we do not believe the observed negligible change in SPL to be functionally significant. The discordance between subjective and objective postoperative penile length has been exhibited previously.¹⁴ Furthermore, prior studies suggest that penile plication does not significantly reduce penile length.^{6,7}

Risk to NVBs

Dorsal plication, compared with ventral and lateral plication, does necessitate careful attention to the location of the NVBs. We believe our technique of dorsal

plication is sensation sparing, as the main branches of the NVB were identified and minimally displaced, but not aggressively mobilized or divided during surgery. As suggested in a recent cadaveric study of the penile dorsal nerve, our plication sutures were placed medial to the main trunks of the NVB, limiting involvement of the intermediary anastomosing and lateral branches.¹⁵ No patient in this study reported loss of glans or penile shaft sensation on follow-up evaluation; however, we did not have a validated assessment tool or perform a quantitative measurement of sharp, dull, or vibratory sensation.

Rates of penile (glans) numbness have been historically reported as high as 32% for plication procedures¹⁶; however, larger contemporary series report very low or nonexistent rates of persistent glans hyposensitivity.¹⁷⁻¹⁹ Our series offers confirmation, as no patient has complained of postoperative glans hyposensitivity.

Limitations

Though our large contemporary series is the first to report on comparing dorsal, ventral, and lateral plication, it does represent a retrospective single-institution review with

limited follow-up by some patients. Additionally, as our center is a tertiary care referral center for those with complex penile deformities, various factors have contributed to our loss of follow-up in certain patients. Any study on Peyronie disease relies on patient-reported outcomes, and until recently, there has been no validated satisfaction-based questionnaire available. Consequently, several previous studies have used nonvalidated questionnaires.²⁰⁻²² Our questionnaire is based on the validated Patient Global Impression of Improvement index, which is often used to measure patient satisfaction after anti-incontinence procedures.²³ A new 15-question survey assessing bother and distress in patients with Peyronie disease was recently validated and published.²⁴ This new survey may help the urology community to uniformly assess their patients postoperatively and provide better comparison between studies.

CONCLUSION

Penile plication is a safe and effective technique for correcting all directions of penile deformity. Dorsal penile plication for ventral curvature is equivalent to ventral and lateral plication despite the proximity of the NVB.

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APPENDIX

SUPPLEMENTARY DATA

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.urology.2014.05.064>.

EDITORIAL COMMENT



The authors have reported a large contemporary series of penile plication procedures for treatment of penile curvature. The overall results appear impressive with only 2 patients having revision surgery, and despite significant curvature, minimal objective loss of penile length. Furthermore, the small number of patients who had dorsal "nerve sparing" plication had equally good results.

All patients seen in the unit were offered and agreed to have plication surgery; therefore, with such impressive results should we not all be moving toward plication without circumcision being the standard of care for penile curvature regardless of severity?

Perhaps, instead, we should be asking the question "why after over 50 years of surgical reports of novel methods for correcting penile curvature, we still do not have the answer as to what technique is the best?" If we restrict the question to patients with Peyronie disease, I would like to suggest that the reason is rather more complex than the evidence presented in the authors' article.

Patients with Peyronie disease have a wide range of complaints, and curvature correction surgery of whatever type will not necessarily resolve all of them. Furthermore, the disease process itself is also very heterogeneous. Plaques can be supple or boney hard, the latter resisting bending to induce correction. Erectile function can vary from normal to completely

absent. Stretch length can be so short that further length loss may render the penis functionally inadequate. Recovery from surgery to resumption of satisfactory sexual function also is very variable, and reviewing patient satisfaction as soon as 1 month after surgery is likely to result in erroneous responses in many cases. The degree of potency and frequency of sexual activity will also put varying degrees of strain on plication sutures.

Success should not be measured from the surgeon's perspective. This disease and the surgical measures to treat it should only be measured in 2 ways. Firstly, we lack a preoperative disease severity score to allow comparison of patient groups, and secondly, there is no subjectivity measure in the form of a validated patient-reported outcome tool.

It is not sufficient to use nonvalidated tools to measure success. We should be asking a series of patients what it is that bothers them and test a Peyronie disease-specific tool to use in future studies. Until then, we will still be reading many more large series describing the outcome of Peyronie disease surgery and be none the wiser about what to do.

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REPLY



“Primum non nocere.”

It is helpful to reflect back to our medical school days when we first made that pledge to “first, do no harm.” Urologists have long been pathfinders on the road to discovering innovative ways to reduce surgical trauma, especially in the realm of

endoscopic and laparoscopic procedures. We all know the benefit we bring patients when we achieve the desired outcome while easing recovery.

Penile plication is another transformative procedure in our specialty, which, like transurethral resection of prostate, ureteroscopy, or percutaneous nephrolithotomy, virtually obviates the need to perform more invasive surgical maneuvers. Over the past 7 years, we have performed more than 250 penile plications without degloving; even in complex cases, correction of penile deformity has been reliably achieved such that not a single patient has required corporal grafting during that time at our tertiary care institution. The case in favor of dorsal plication for ventral deformity is especially strong; mobilization of the urethra with ventral grafting is a poor alternative. No nerve mobilization, no circumcision, no deep corporal incisions, and no foreign material to sew deep into the penis. Plication offers precise correction, easily applied from bottom to top and side to side, whereas grafting corrects only segmentally. Objective length loss is negligible, and patients have not complained of new-onset erectile dysfunction or penile sensory loss. The procedure takes less than 1 hour, so no bridges are burned, and patients are discharged the same day. With these excellent results even in patients with complex curvatures, why *would* one offer anything else more invasive?

We agree that lack of validated outcomes tools is problematic in the realm of Peyronie disease penile deformities. However, we must remember that it is good medicine to “first do no harm” in surgery. This report presents additional evidence highlighting the versatility, safety, and efficacy of penile plication.

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