

Review Article

The Role of Surgical Treatment in Peyronie's Disease: A Mini Review

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Abstract

Peyronie's Disease (PD) is an acquired fibrotic disorder of penile tunica albuginea. It may cause penile deformity, painful intercourse, erectile dysfunction and psychological stress. PD can be divided into acute and chronic phase, which greatly impacts the choice of treatment plan. Since there is no optimal conservative treatment for PD patients in acute phase, surgical therapy remains the gold standard to be applied in chronic phase with great efficacy. Tunical plication, tunical lengthening, and penile prosthesis implantation are three common surgical strategies that fit for PD patients with different penile conditions. In this review, we evaluated the role of surgical treatment in PD and focused on the benefits, disadvantages, and recent advances of current surgical methods.

Keywords: Peyronie's disease; Surgical treatment**Abbreviations**

PD: Peyronie's Disease; ED: Erectile Dysfunction; PPI: Penile Prosthesis Implantation

Introduction

Peyronie's Disease (PD), an acquired penile disorder, is characterized by tunica albuginea fibrosis with possible appearance of penile deformity, pain, Erectile Dysfunction (ED) and psychological distress. According to the recent epidemiology investigation, the prevalence rate of PD increases to reach around 10% [1]. However, it is likely to be under-reported given a portion of patients may be embarrassed or lack of awareness to see doctors. Although PD has been described and studied for more than 200 years, its etiology and pathophysiology remain unclear. However, most urologists believe that antecedent injury of tunica albuginea and the subsequent activation of transforming growth factor β 1 signaling pathway during the wound-healing process play pivotal roles in the onset and progression of PD [2,3].

According to the natural history of PD, the disease can be divided into two phases: acute and chronic phase. The acute phase is characterized by unstable symptoms of painful intercourse, progressive penile plaque and deformity, which usually last at least for one year. The chronic phase begins at the stabilization of symptoms and the formation of hard penile plaque(s). It is very important to confirm the disease stage because an individualized treatment plan is mainly made based on the clinical phase of a patient. Oral, intralesional, topical, and surgical therapies are currently available treatment options. Although conservative therapies are more appropriate for acute phase of PD, they fail to effectively stop the progression of PD [4]. When disease moves forward to chronic phase, surgery remains the gold standard method to treat men with stable PD [5].

The goal of surgical treatment for PD is to correct the penile deformity, preserve the penile length and girth, and, most importantly,

to restore the erectile function of patients in chronic phase [6,7]. Currently, the major surgical options for PD patients include tunical plication, tunical lengthening, and Penile Prosthesis Implantation (PPI). It is the duty of the clinicians to take a detail history, examine penile conditions (such as penile length and girth, plaque size and calcification, type and degree of deformity, as well as vascular flow), and counsel patients with the possible outcomes of surgery before selecting an appropriate surgical procedure [4,5].

Surgical options for PD

Tunical plication: Tunical plication surgery is recommended for patients who have adequate penile length and are able to complete sexual activity (no matter whether they need the help of medicines and/or vacuum device) to improve their simple penile curvature [8]. Initially, Nesbitt procedure was reported in 1954 with an elliptical excision of a piece of tunica albuginea on the contra lateral side of the curvature to balance the length of the shorter side through shortening the longer side [9]. Since then, modified procedures like Yachia, Giannusso, Lemberger, the 16/24-dot, and the penoscrotal plication surgeries were developed on the basis of Nesbitt procedure [10-14].

The majority of studies reported penile curvature improvement rates of more than 90% with overall satisfaction ranged from 76.2% to 100% [9,15]. Since tunical plication is a simple and minimally invasive surgery to correct certain types of mild-to-moderate penile deformity with satisfied surgical outcome, it is the most widely used procedure that nearly half of all PD patients received this surgery. However, this procedure inevitably results in a loss of penile length, which limits its use in patients with short penile length or severe penile curvature. The other complications of tunical plication are rare except occasional appearance of decreased penile sensation and suture knot irritation.

Tunical lengthening: Urologists may offer tunical lengthening surgery to patients who have severe penile curvature (more than 60 degree) or complicated deformity (such as destabilized hourglass or hinge effect) with adequate rigidity for intercourse [4,6,16]. Generally, surgeons can choose one of the two major methods to perform the

surgery: one is plaque incision and grafting, and the other is partial plaque excision and grafting. An incision is usually performed with double Y or H shape to allow tunic expansion and curvature correction [17]. However, both of these incision methods will produce excess tissue on the wound edges, which results in mismatch of the graft and the defect. In addition, a new band at the opposite side of the penile curvature will occur. To resolve these problems, a geometric model of plaque incision and graft was proposed recently to help design a new incision approach. With accurate geometric calculation of incision length and site on tunica albuginea, the defect area can fit the graft well and the opposite band can be significantly improved [18]. When dense plaque and severe indentation appear, partial plaque excision is a more appropriate choice due to its better correction of the narrowing and relative lower risk to cause postoperative ED [19,20].

Studies from last decade showed satisfaction rate of the surgery ranging from 41% to 93% [21,22]. It is highly related to the graft used. Allografts, autologous grafts, animal grafts, and synthetic grafts are four kinds of currently available graft materials. Allografts like cadaveric pericardium are more likely to be used than other grafts given their similar properties to tunica albuginea and lower risk to induce local infection, rejection, fibrosis, or complications derived from harvest sites of autologous grafts [23]. Although numerous grafts have been developed and new grafts like buccal mucosal, lingual mucosal, amniotic membrane and collagen fleece with beneficial outcomes are coming out continuously [24-27], it is still necessary to find an optimal graft that has similar strength and elastin property to normal tunica albuginea, low risks of implantation-associated complications, and is easy to obtain.

Recently, a group created a new plaque incision and graft technique, named iGrafter, to correct simple or complex penile curvature. With given penile deformity related parameters, this technique could come up with a precise method for incisions and graft insertions with minimum graft area. In addition, this technique was proved to be able to preserve erectile function and avoid geometric and mechanical abnormalities. However, the role of iGrafter in tunical lengthening surgery needs further confirmation given the small patient number, short follow-up period, and lack of control in this study [28].

Penile prosthesis implantation: PPI is suitable for PD patients with severe ED that cannot be corrected by Phosphodiesterase type 5 inhibitors and/or vacuum device treatment [29]. As PPI itself has the ability to correct mild penile curvature, urologists may perform extra intra-operative procedures (including plication or incision/grafting) when residual penile curve is more than 30° after PPI surgery [30].

Malleable and inflatable penile prosthesis are two common devices in the clinic. The latter one is more popular due to its higher functional satisfaction of erection and lower rates of residual penile curvature [6]. Generally, surgeons can choose infra-pubic or penoscrotal incisions to insert penile prosthesis. It is recommended to make a mechanical inspection of prosthesis before insertion. In addition, cautious operation is encouraged to avoid damage of device and reduce the rate of post-operative infection.

Recently, some modified techniques were proposed to improve the surgical procedures. A latest study introduced a new incision

method, the distal circumcision incision near the coronal sulcus of penis, which will be convenient for surgeon to insert prosthesis under direct vision and perform additional reconstructive procedures. This study also tried to design a modified no-touch technique in attempt to reduce postoperative infection [31]. Another “sliding” technique was created to enable penile lengthening and widening without grafting during the penile modeling procedures after PPI [32,33]. This method might save operative time, eliminate grafting-related complications, and reduce costs. However, patients who will receive this kind of surgery should be informed the concurrent high risks of infection and loss of glans sensation owing to the extensive disassembly of the penis and complicated surgical procedure.

Studies regarding the outcomes of PPI surgery revealed that both surgical success rates and patients’ satisfaction rates were more than 84%, and nearly 60% of patients’ sexual partners showed their satisfaction on the treatment outcome [30,34-36]. Although complications of PPI surgery were rarely reported in studies, some adverse events like infection, mechanical failure, urethral injury, or decreased penile sensation occurred occasionally. According to current evidence, post-operative infection rates were reported to be around 3% in most studies [34,37,38]. The revision rates for mechanical failure were reported less than 5% [39-41], with a few studies reported the rates that ranged from 6% to 33% [42,43].

Overall evaluation: In attempt to compare the outcomes of these three surgical procedures, a retrospective study analyzed a total of 390 PD patients who underwent tunical plication, plaque excision and grafting, or PPI according to the surgical algorithm. The results showed no significant difference in post-surgical erectile function and residual bothersome curvature across these three methods. Overall, around 80% of patients was satisfied with their penile rigidity, curvature improvement, and were able to get successful intercourse, which supported the efficacy and rationality of current surgical therapeutic strategy. Interestingly, this study also emphasized the negative impact of psychological distress on postoperative satisfaction. Hence, patients who were unwilling to recognize the limitations of surgery should be suggested to accept psychological counseling in advance [44].

Conclusion

PD has great physical and psychological impacts on male patients. Although its etiology and pathogenesis remain unclear, current surgical methods, including tunical plication, tunical lengthening, and PPI, are served as gold standard treatment plans for PD in chronic phase. Each of these surgeries is appropriate for patients with specific penile conditions, and achieves relative high success rate and satisfaction rate at similar level. Hence, individualized treatment plan with selected surgical approach according to the current surgical algorithm decides the post-operative outcomes. Although modified techniques are coming out continuously to improve surgical procedures and reduce potential adverse effects, more evidence are needed to confirm their roles in PD surgical therapy.

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References

1. Dibenedetti DB, Nguyen D, Zografos L, Ziemiecki R, Zhou X. A Population-Based Study of Peyronie's Disease: Prevalence and Treatment Patterns in the United States. *Adv Urol*. 2011; 282503.
2. Devine CJ, Somers KD, Jordan SG, Schlossberg SM. Proposal: trauma as the cause of the Peyronie's lesion. *J Urol*. 1997; 157: 285-290.
3. Cadavid NFG, Rajfer J. Mechanisms of Disease: new insights into the cellular and molecular pathology of Peyronie's disease. *Nat Clin Pract Urol*. 2005; 2: 291-297.
4. Ralph D, Cadavid NG, Mirone V, Perovic S, Sohn M, Usta M, Levine L. The management of Peyronie's disease: evidence-based 2010 guidelines. *J Sex Med*. 2010; 7: 2359-2374.
5. Levine LA, Larsen SM. Surgery for Peyronie's disease. *Asian J Androl*. 2013; 15: 27-34.
6. Kadioglu A, K uc kduymaz F, Sanli O. Current status of the surgical management of Peyronie's disease. *Nat Rev Urol*. 2011; 8: 95-106.
7. Kadioglu A, Akman T, Sanli O, Gurkan L, Cakan M, Celtik M. Surgical treatment of Peyronie's disease: a critical analysis. *Eur Urol*. 2006; 50: 235-248.
8. Hudak SJ, Morey AF, Adibi M, Bagrodia A. Favorable patient reported outcomes after penile plication for wide array of Peyronie's disease abnormalities. *J Urol*. 2013; 189: 1019-1024.
9. Syed AH, Abbasi Z, Hargreave TB. Nesbit procedure for disabling Peyronie's curvature: a median follow-up of 84 months. *Urology*. 2003; 61: 999-1003.
10. Rehman J, Benet A, Minsky LS, Melman A. Results of surgical treatment for abnormal penile curvature: Peyronie's disease and congenital deviation by modified Nesbit plication (tunica shaving and plication). *J Urol*. 1997; 157: 1288-1291.
11. Giammusso B, Burrello M, Branchina A, Nicolosi F, Motta M. Modified corporoplasty for ventral penile curvature: description of the technique and initial results. *J Urol*. 2004; 171: 1209-1211.
12. Lemberger RJ, Bishop MC, Bates CP. Nesbit's operation for Peyronie's disease. *Br J Urol*. 1984; 56: 721-723.
13. Gholami SS, Lue TF. Correction of penile curvature using the 16-dot plication technique: a review of 132 patients. *J Urol*. 2002; 167: 2066-2069.
14. Dugi DD, Morey AF. Penoscrotal plication as a uniform approach to reconstruction of penile curvature. *BJU Int*. 2010; 105: 1440-1444.
15. Ding S1, Lu J, Zhang H, Wei L, Ding K. A novel modification of tunical plication by plaque thinning: long-term results in treating penile curvature of Peyronie's disease. *Int Urol Nephrol*. 2010; 42: 597-602.
16. Levine LA, Lenting EL. A surgical algorithm for the treatment of Peyronie's disease. *J Urol*. 1997; 158: 2149-2152.
17. Gelbard MK. Relaxing incisions in the correction of penile deformity due to Peyronie's disease. *J Urol*. 1995; 154: 1457-1460.
18. Miranda AF, Sampaio FJ. A geometric model of plaque incision and graft for Peyronie's disease with geometric analyses of different techniques. *J Sex Med*. 2014; 11: 1546-1553.
19. Gelbard MK, Hayden B. Expanding contractures of the tunica albuginea due to Peyronie's disease with temporalis fascia free grafts. *J Urol*. 1991; 145: 772-776.
20. Sherer BA, Warrior K, Levine LA. 2013-2014 updates in Peyronie's disease management. *Curr Urol Rep*. 2014; 15: 459.
21. Simonato A, Gregori A, Varca V, Venzano F, De Rose AF, Ambruosi C, et al. Penile dermal flap in patients with Peyronie's disease: long-term results. *J Urol*. 2010; 183: 1065-1068.
22. Kalsi JS1, Christopher N, Ralph DJ, Minhas S. Plaque incision and fascia lata grafting in the surgical management of Peyronie's disease. See comment in PubMed Commons below *BJU Int*. 2006; 98: 110-114.
23. Carson CC, Levine LA. Outcomes of surgical treatment of Peyronie's disease. *BJU Int*. 2014; 113: 704-713.
24. Salem EA, Elkady EH, Sakr A, Maarouf AM, Bendary L, Khalil S, et al. Lingual mucosal graft in treatment of Peyronie's disease. *Urology*. 2014; 84: 1374-1377.
25. Salehipour M, Izadpanah K, Safaei A, Kamranpoor M, Farsiani MR. Application of human amniotic membrane in canine penile tunica albuginea defect: first step toward an innovating new method for treatment of Peyronie's disease. *Int Braz J Urol*. 2014; 40: 400-407.
26. Zucchi A, Silvani M, Pastore AL, Fioretti F, Fabiani A, Villirillo T, et al. Corporoplasty using buccal mucosa graft in Peyronie's disease: is it a first choice?. *Urology*. 2015; 85: 679-683.
27. Hatzichristodoulou G. Partial Plaque Excision and Grafting with Collagen Fleece in Peyronie's Disease. *J Sex Med*. 2016; 13: 277-281.
28. Miranda AF, Sampaio FJ. Practical Computerized Solution for Incision and Grafting in Peyronie's Disease. *Sex Med*. 2016.
29. Langston JP, Carson CC. Peyronie's disease: plication or grafting. *Urol Clin North Am*. 2011; 38: 207-216.
30. Levine LA, Dimitriou RJ. A surgical algorithm for penile prosthesis placement in men with erectile failure and Peyronie's disease. *Int J Impot Res*. 2000; 12: 147-151.
31. Weinberg AC, Pagano MJ, Deibert CM, Valenzuela RJ. Sub-Coronal Inflatable Penile Prosthesis Placement with Modified No-Touch Technique: A Step-by-Step Approach with Outcomes. *J Sex Med*. 2016; 13: 270-276.
32. Egydio PH, Kuehhas FE. Penile lengthening and widening without grafting according to a modified 'sliding' technique. *BJU Int*. 2015; 116: 965-972.
33. Rolle L, Falcone M, Ceruti C, Timpano M, Sedigh O, Ralph DJ, et al. A prospective multicentric international study on the surgical outcomes and patients' satisfaction rates of the 'sliding' technique for end-stage Peyronie's disease with severe shortening of the penis and erectile dysfunction. *BJU Int*. 2015.
34. Levine LA, Benson J, Hoover C. Inflatable penile prosthesis placement in men with Peyronie's disease and drug-resistant erectile dysfunction: A single-center study. *J Sex Med*. 2010; 7: 3775-3783.
35. Austoni E, Colombo F, Romano AL, Guarneri A, Goumas IK, Cazzaniga A. Soft prosthesis implant and relaxing albuginea incision with saphenous grafting for surgical therapy of Peyronie's disease: a 5-year experience and long-term follow-up on 145 operated patients. *Eur Urol*. 2005; 47: 223-229.
36. Grasso M, Lania C, Fortuna F, Blanco S, Piacentini I. Preservation of cavernosal erectile function after soft penile prosthesis implant in Peyronie's disease: long-term follow up. *Adv Urol*. 2008.
37. Perovic SV, Djinnovic RP. Current surgical management of severe Peyronie's disease. *Arch ESP Urol*. 2010; 63: 755-770.
38. Grasso M, Lania C, Fortuna F, Blanco S. Evaluation of post-operative residual function of corpora cavernosa after soft penile prosthesis implant for Peyronie's disease. *Arch Ital Urol Androl*. 2006; 78: 49-52.
39. Kadioglu A, Sanli O, Akman T, Cakan M, Erol B, Mamadov F. Surgical treatment of Peyronie's disease: a single center experience with 145 patients. See comment in PubMed Commons below *Eur Urol*. 2008; 53: 432-439.
40. Djordjevic ML, Kojovic V. Penile prosthesis implantation and tunica albuginea incision without grafting in the treatment of Peyronie's disease with erectile dysfunction. *Asian J Androl*. 2013; 15: 391-394.
41. Garaffa G, Minervini A, Christopher NA, Minhas S, Ralph DJ. The management of residual curvature after penile prosthesis implantation in men with Peyronie's disease. *BJU Int*. 2011; 108: 1152-1156.
42. Wilson SK, Cleves MA, Delk JR. Long-term follow up of treatment for Peyronie's disease: modeling the penis over an inflatable penile prosthesis. *J Urol*. 2001; 165: 825-829.

43. DiBlasio CJ, Kurta JM, Botta S, Malcolm JB, Wan JY, Derweesh IH, et al. Peyronie's disease compromises the durability and component-malfunction rates in patients implanted with an inflatable penile prosthesis. *BJU Int.* 2010; 106: 691-694.
44. Papagiannopoulos D, Yura E, Levine L. Examining Postoperative Outcomes after Employing a Surgical Algorithm for Management of Peyronie's Disease: A Single-Institution Retrospective Review. *J Sex Med.* 2015; 12: 1474-1480.