

## 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  $\beta$ 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 tunica 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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