

Advancements in the Surgical Treatment of Peyronie's Disease

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Introduction

Peyronie's disease (PD) can be defined as a benign condition that is characterized by the formation of fibrous plaques due to inflammatory response of the tunica albuginea of the penile corpora cavernosa [1]. PD has a complicated pathophysiology which potentially involves several factors like cytokines, fibroblasts, and macrophages [2,3]. Previous trials presented different prevalence rates ranging from 0.4 to 9% [4-7]. Various studies reported a progressive increase in prevalence of the disease with age [2,7,8]. In a retrospective study mean age of the patients with PD was reported as 52 years [8].

Possible penile deformities including varying degrees of penile curvature, shortening, narrowing and erectile dysfunction may be observed due to plaque formation. Those deformities of the penis may prevent an affective vaginal penetration thus a satisfactory sexual intercourse both for the patient and the partner and require surgical correction. The aim of the surgical intervention is mainly correcting the curvature. The procedure should also preserve erectile function and penile length with minimum morbidity [9,10]. Several approaches have been defined for the surgical correction of PD including plication techniques, plaque incision with grafting and penile prosthesis implantation [9].

Timing for the surgery and the type of the procedure still remain controversial and the aim of this review is to summarize the recent advances in surgical correction of PD.

When and how to perform surgical correction?

Surgery should be the preferred treatment option if the disease didn't respond to proper medical management, has been stable for 3-6 months and caused penile shortening and curvature significantly inhibiting the sexual intercourse [11,12]. PD may be accepted as stable if there is no progression of symptoms and pain [1,13]. Previously the use of penile scintigraphy to differentiate the unstable and stable phases of the disease was speculated. This study showed that scintigraphy might be used in men with PD to decide if the patient was convenient for surgical intervention [14].

Recently surgical techniques offer satisfactory success rates with acceptable complication rates [4]. The surgical technique may differ due to differences in clinical presentation and expectations of the patient. In addition combination of different procedures may be used to achieve the ideal surgical outcome. In a recent review it has been advocated that patient preference is the most significant factor for the decision of surgical technique [4].

Patients with satisfactory erectile function can be managed with either shortening the convex side by plication or lengthening the shorter concave side of the penis by plaque incision using a graft [2,7]. Although plication by both the Nesbit and Yachia techniques may potentially include invasive dissection of the neurovascular bundle, it has been previously advocated that those procedures had favorable outcomes in patients with moderate penile curvature [1,15,16]. Previously described two or three pairs of plication procedures are relatively non-invasive techniques which can be performed under local anesthesia with satisfactory outcomes [17]. In patients with more severe curvature, plaque incision with different kinds of graft materials including autologous and allografts should be performed [1,18]. Penile

prosthesis implantation should be the treatment of choice in patients with vasculogenic erectile dysfunction unless the degree of penile curvature is very severe [11,19].

Advancements in surgical techniques

Tunical plication procedures are the least invasive options for the surgical management of PD. In a previous study outcomes of the plication procedure over a 10 year period in 57 patients with PD were reported [20]. 90% of the patients reported satisfactory cosmesis and 71% reported functional satisfaction with a median follow-up of 51 months. 82% of these patients reported satisfactory cosmetic outcome and 71% reported a satisfactory functional outcome in the long term.

There have been a number of modifications of Nesbit plication technique which was firstly described at 1979 for the management of PD [21]. Essed-Schroder technique, a modification of the Nesbit procedure, does not require corporal incision and tunical excision or mobilization of the neurovascular bundle resulting in a decreased possibility of erectile dysfunction [22]. In a recent study, outcomes of a modified Essed-Schroder technique involving mobilization of the urethra in 55 patients with a mean dorsal curvature of 77° was presented [23]. In this trial 80% of the patients reported satisfaction with their sexual function that was assessed by using the international index of erectile function (IIEF) questionnaire. In a different study the effect of Essed-Schroder technique on quality of life for the patients with penile curvature was investigated [24]. This study supported that the Essed-Schroder plication technique is a safe and reliable procedure with minimal manipulation.

Multiple paired plication sutures are placed in low tension plication technique with a minimal risk of erectile dysfunction or possible neurovascular damage [17]. This technique is suitable for patients with simple curvature and can be carried out as an outpatient surgical procedure under local anesthesia. However the procedure can potentially cause penile shortening and palpable nodules as well as prolonged pain due to the sutures [11]. In a previous study it was advocated that the type of the suture material is also crucial for the outcome of the plication procedure [25]. In this study the use of polytetrafluoroethylene sutures were compared with polypropylene sutures in the Esses-Schroder plication procedure and polytetrafluoroethylene sutures was found to be superior to polypropylene sutures in terms of patients' quality of life and complication rates.

Plication procedures may not be applicable for all patients with PD especially in case of complex plaques, hourglass deformities and high possibility of postoperative significant penile shortening. Graft

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interposition is another option for the surgical management of PD. Autologous tissues including vein grafts, fascia lata, buccal mucosa, and tunica vaginalis can be used for grafting procedures. Synthetic tissues, xenografts (porcine small intestinal submucosa) and allografts (cadaveric pericardium) are other potential graft materials for patients with PD [1,4].

In previous studies it has been advocated that venous grafts are more physiologic than other autologous tissue alternatives with better elasticity and less morbidity [10,26,27]. In a recent study 75 men with a mean penile curvature of 61° were treated with plaque incision and vein grafting. 90% of patients had a residual curvature of less than 20° and 75% had no residual curvature [28]. In another study, plication procedure was compared with plaque incision and saphenous vein grafting [29]. There were no significant difference between two groups in terms of overall patient satisfaction, postoperative penile shortening and penile straightness. Patients who underwent grafting procedure reported a higher incidence of loss in sensation. Mean operative time was significantly higher in the grafting group. In a previous study 18 patients with PD were treated with tunica graft from the proximal corpus cavernosum and 14 patients had complete correction of penile curvature [30]. Authors discussed the limitations of the study as the size of the tunica albuginea which could be excised and the narrowing of the corpus cavernosum that could potentially weaken the penile support. In a different study fascia lata grafting was applied to 12 men with severe PD and all patients reported complete correction of the penile curvature with normal erections in a mean follow up of 10 months [31]. In a recent study, authors reported their experience with penile dermal flaps in patients with penile curvature due to PD and only 40.9% were satisfied with cosmetic and functional outcome. Based on the results of this study, authors recommended not using this technique in the surgical management of PD [9]. Synthetic materials may also be used in grafting procedures in patients with PD with higher morbidity rates compared to autologous tissues [10].

Different xenografts/allografts including human cadaveric pericardium and porcine small intestine submucosa are commercially available with a shorter operative time and less morbidity compared to autologous tissue grafting [11]. In a previous study authors reported on 142 patients (61 plication and 81 partial plaque excision with human pericardial grafting) with both objective data and subjective patient reports on their postoperative experience [32]. 93% of plication and 91% of pericardial grafting patients reported curvatures of less than 30°. Rigidity was reportedly as good as or better than preoperative in 81% and 68% of plication and pericardial grafting patients respectively, and was adequate for coitus in 90% and 79% of plication and pericardial grafting patients respectively. 82% plication and 75% pericardial grafting patients were either very satisfied or satisfied. In a recent retrospective study, medium term outcomes and postoperative complications following the surgical treatment of severe PD by porcine small intestinal submucosa grafts were reported [1]. Success was defined as a straight penis or curvature $\leq 20^\circ$ and ability to have intercourse and the success rate of the procedure was 67% with few postoperative complications. After a median follow-up of 9 months 79% of patients had a satisfactory penile curvature correction. In a previous trial pericardial, vein, synthetic, and dermal grafts were compared using a rat model [33]. Synthetic grafts had the highest grade of fibrosis. The vein and dermal grafts demonstrated minimal fibrosis at both 4th and 6th months following the procedure. The pericardial graft showed moderate and minimal fibrosis at the 4th and 6th months respectively.

Patients with erectile dysfunction and severe penile curvature

are potential candidates for penile prosthesis placement [11]. Men with severe penile defects may require penile prosthesis with grafting procedures. The incidence of postoperative complications including urethral injury and wound infection is higher in patients who require additional interventions including penile modeling, incisions with plication, and incisions with grafting [11].

Conclusion

Surgical procedures present significant success rates with minimal complications in the management of PD for the patients resistant to medical treatment and have a stable disease with a penile curvature causing an unsatisfactory sexual intercourse. Unique patient characteristics including the degree of penile curvature, erectile function status, and patient preference are the most important factors affecting the choice for the type of surgical procedure.

Surgical procedures might potentially be outdated through further investigations exhibiting a better understanding of PD.

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