Surgical treatment of Peyronie's disease

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Peyronie's disease is a sexually debilitating disease causing significant penile deformity and erectile dysfunction as well as psychological stress for many men. The incidence of Peyronie's disease appears to be increasing and urologists are being called upon more frequently to treat this debilitating condition. Urologists have an opportunity to help men suffering from Peyronie's disease to improve their lives and the lives of their partners. Appropriate treatment should be individualized and tailored to the patient's expectations, disease history, physical exam findings, and coital function. After medical therapy is considered and the Peyronie's disease has stabilized, surgical correction is an excellent option for patients with functional impairment from their Peyronie's disease. Surgical outcomes are excellent with expected return to normal sexual function following Peyronie's disease treatment.

Key Words: Peyronie's disease, penis, erectile dysfunction, penis surgery, sexual dysfunction

Introduction

Peyronie's disease is an incurable chronic condition that affects middle-aged men and often results in penile deformity. Scar-like plaques form between layers of the thick fibrous tunica albuginea, often as a result of coital trauma. These plaques may result in penile curvature, hour-glass deformity, erectile dysfunction (ED) caused by veno-occlusive incompetence or may be asymptomatic. The condition occurs in approximately 3.2% of men over age 40. Caucasians are at highest risk and the mean age is 57.4 years.[1] Presentation includes penile pain with erection, ED, inability to have intercourse secondary to penile deformity, and a palpable plaque. The putative etiology Peyronie's disease is coital trauma to the penis with subtunical bleeding and inflammation ultimately leading to fibrosis of the tunica albuginea usually in the dorsal aspect. This fibrosis produces dense scar or plaque formation.[2]

Non surgical treatment for Peyronie's disease has included: oral medications, topical agents, intralesional injections, extracorporeal shockwave lithotripsy, and ultrasound.[3] Most patients prefer non surgical intervention prior to selecting a surgical procedure despite the small number of successes with medication. Ultimately treatment is designed to improve coital function and result in satisfactory, comfortable erection for both patient and partner.

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Surgery for Peyronie's disease

Peyronie's disease improves and even resolves spontaneously in fewer than 13% of men, progression is seen in 40% and no change in 47% of men.[4] Surgery is recommended for patients with stable Peyronie's disease and poor coital function. Peyronie's disease involves both an active and stable phase. The active phase occurs with the onset of Peyronie's disease and follows closely the traumatic event. Many men, however, do not recall specific trauma. The early, active phase lasts 12 to 24 months and is often characterized by painful erections, a changing plaque, and the development of penile curvature or other deformity during erection. The later quiescent or stable phase is characterized by stable penile deformity, resolution of penile pain, and in some men the onset of ED. Surgery should be avoided during active plaque change, as the penile deformity changes and may resolve enough for some men to resume normal coital function. Montorsi et al recommend waiting at least 12 months from the stabilized Peyronie's disease before considering any surgery. These authors suggest that many men with stable disease for less than 6 months may have curvature recurrence postoperatively.[5]

The choice of a surgical procedure depends upon patient needs and preferences. Counseling patients should be based on the function and type of penile deformity and quality of erection. Three surgical categories are used for Peyronie's disease patients and include: tunica lengthening procedures, tunica shortening procedures, and implantation of penile prosthesis with or without modeling. Penile prosthesis implantation is reserved for men with Peyronie's disease and refractory erectile dysfunction. Men with satisfactory erectile function with or without supportive medications are candidates for straightening procedures using either tunica lengthening or shortening. Tunica shortening procedures include plication techniques such as the Nesbit or Kelami procedures and tunica lengthening procedures include plaque incision/excision and grafting such as the Horton-Devine operation.

Evaluating a patient's erectile status is important in selecting appropriate surgical alternatives. Potency may be determined by sexual history, a PDE-5 inhibitor take home test or intracavernosal injection/Doppler ultrasound examination. Patient photographs may also be helpful in counseling patients before surgery. A strong history of rigid erections is one of the best determinants for choosing to proceed with a straightening procedure. Because many men with Peyronie's disease have avoided coitus for many months, they are uncertain of their potency. In these men, a home trial of PDE-5 inhibitors with sexual stimulation and subsequent follow up history quality of erections is helpful in choosing the best surgical procedure for the individual. When erection quality is still unclear or ED is likely Doppler studies may be helpful in identifying abnormalities in penile hemodynamics, plaque location and size, and degree of curvature. Large calcified plaques are poor prognostic indicators for spontaneous resolution of Peyronie's disease or resolution with non surgical methods. Montorsi et al suggested that Doppler studies show sub clinical penile abnormalities and aberrant communicating vessels that could contribute to post operative ED if damaged during surgery.[5] Severe reduction in blood flow or severe venoocclusive ED should suggest that prosthesis implantation would be the most successful choice. Digital photography at the time of erection with in office injection or at home by patients can be valuable in determining the severity of Peyronie's disease, planning surgery and counseling patients and partners.

Tunica lengthening procedures are best chosen for men with adequate erectile function, penile shortening, curvature >45∞, or hour-glass deformity. Meanwhile, tunica shortening procedures are succeed most often in men with good erectile function, adequate penile length, or curve <45∞. Figure 1 shows the UNC algorithm for selecting treatment for PD.[6] Penile prosthesis implantation is best chosen for men with poor or absent erections or patient choice.

Preoperative counseling should include patients' and partners' expectations, alternatives, risks, complications and potential outcomes of surgery. The most frequent complications of straightening procedures include: penile shortening, glans hypesthesia, ED, recurrent curvature, hematoma and graft contraction.

Tunica shortening

Plication procedures (e.g. Nesbit, Kelami, etc.)

The Nesbit procedure was first described in 1965 for correcting congenital penile curvature caused by corporal disproportion.[7] Pryor and Fitzpatrick first reported its use in the treatment of patients with Peyronie's disease.[8] Plication procedures require that the tunica opposite the Peyronie's plaque and penile curvature is excised and/or plicated in order to straighten the penis. After an artificial erection is obtained using the Gittes technique or with injection of a vasoactive agent into the corpora cavernosum, an initial circumcising incision is created followed by

degloving the penis. A ventral penile incision may be used for ventral exposure in very proximal dorsal curvature. Longitudinal penile shaft incisions should be avoided as post operative scarring may be painful, unsightly or even produce curvature. Buck's fascia is dissected from the tunica albuginea in patients with dorsal curvature or it is dissected off the dorsal neurovascular bundles for ventral curvatures. An artificial erection is induced and the point of maximum curvature is marked on the convex side of the penis. A 5 mm-10 mm transverse ellipse on the tunica albuginea may be excised in the classic Nesbit procedure (~1 mm for every 10∞ of curvature). Rehman et al modified this technique by using a partial thickness shaving of the tunica to avoid possible bleeding and cavernosal injury.[9] Next, the tunica is closed watertight and horizontally using interrupted or running, locking, non- absorbable, braided suture with buried knots. Absorbable suture may fail in the early post operative period with recurrent curvature. A circumcision is recommended in men with redundant foreskin due to the increased risk for Preputial edema or phimosis postoperatively. An artificial erection is again induced and if the penis is straight, Buck's fascia and the skin are closed. If extensive dissection has been required, a small subcutaneous drain such as the TLS drain may be used for 12 to 24 hours to diminish edema. If not adequately straight, subsequent plications or tunica incision/ excision and closure are necessary. A penile block is administered using long lasting bupivicaine and a non pressure dressing and an ice pack are applied. Patients may be discharged home same-day with this surgery and should avoid sexual activity for 6 weeks.

Yachia modified the Nesbit procedure making single or multiple 1 cm-1.5 cm longitudinal incisions along the convex side of the tunica, which are subsequently closed horizontally, applying the Heineke-Mikulicz principle. Yachia felt his modification would reduce injury to the neurovascular bundle and glans hypoesthesia, though this complication is still possible.[10] The authors prefer a longitudinal incision with horizontal closure in the Heineke-Mikulicz technique as tunical deformities and palpable suture lines appear to be fewer. Planning the tunical incision is facilitated by placing an Allis clamp to straighten the penis before performing the incision. Licht and Lewis compared the Nesbit, modified Nesbit and tunical incision with grafting and found the highest satisfaction rates (83%) and lowest ED rates (0%) with the modified Nesbit procedure.[11] Recent studies show patient satisfaction rates for the Nesbit procedure between 75%-88% and rates of complete straightening between 61.9%-82.1%.[9,11-14] Similar rates of satisfaction (78%-83%) and straightening (93%) have been found with Yachia's modification to the Nesbit procedure.[10,15,16]

Despite these high satisfaction and successful straightening outcomes, penile shortening remains difficult with the Nesbit, modified Nesbit and other plication procedures. In a study involving 359 men, Pryor reported shortening <1 cm in 86.6% of men, between 1 cm-2 cm in 8.6% of men, and >2 cm in 4.7% of men.[12] Similarly in another large study of 157 men with Peyronie's disease, Savoca reported shortening <1.5 cm in 86% of men and between 1.5 cm-3 cm in 14% of men.[13] Pryor suggests that the degree of penile shortening rarely precludes sexual activity, only occurring in 1.7% of men in his study.[12] Analyzing other studies, the range for reported sexual dysfunction secondary to shortening is 1.3% to 11.9% for the Nesbit and modified Nesbit procedures.[11-14,16] Complications with the procedures include: curve recurrence (7.7%-10.6%), ED (0%-22.9%), penile indurations or narrowing (0%-16.7%), suture granuloma (0%-1.9%) and glans hypesthesia (0%-21.4%).[9-16] Glans hyoesthesia is common postoperatively though frequently resolves after several months.

Tunica albuginea plication

Plication of the tunica albuginea is the least invasive technique for correction of Peyronie's disease, often performed using only local anesthetic. Gholami and Lue describe a plication method with a high patient satisfaction rate.[17] Following induction of an artificial erection, a dorsal longitudinal or circumcising incision is performed. Longitudinal incisions are reserved for uncircumcised men desiring to keep their foreskin. Buck's fascia is incised medial to the neurovascular bundle and an intravascular space developed bluntly between the dorsal vein and arteries. Nerve fibers travel lateral to these dorsal arteries and plication sutures may be placed in the developed space. For men with a dorsal curvature, a ventral longitudinal incision is made down to Buck's fascia overlying the corpus cavernosum. After marking the center of the curve and entry and exit sites for the plicating sutures, sutures are placed 2 mm lateral to the corpus spongiosum. Two to three pairs of 2-0 braided polyester sutures are placed through the tunica albuginea (four entry and exit points per suture). Van der Horst et al found that polytetrafluoroethylene sutures result in significantly less patient complaints of discomfort than polypropylene sutures (13% versus

52%) using a similar plication technique.[18] The sutures are gradually tied with one surgical knot placed and subsequent clamping. Once all plications are partly tied and clamped, the erect penis is examined. If the penis is straight using another artificial erection, the knots are completed and buried, ideally under minimal tension. The Buck's fascia is then re-approximated with absorbable suture and the skin closed. Patients may be discharged on the same day of surgery.

Gholami and Lue report 85% of patients maintained a straight erection, while 15% suffered curve recurrence in a study of 124 patients at a mean follow up of 2.6 years. Forty one percent of patients in their series reported shortening from 0.5 cm-1.5 cm, causing sexual dysfunction in 7% of patients. Twelve percent reported bothersome knots, 11% erectile pain, 9% penile indentation, 6% glans hypoesthesia, and 6% worsened ED[17]. Results vary for plication procedures, with straightening rates ranging from 57% to 85% and satisfaction rates ranging from 58% to 82%.[17,19-23] Cahall et al reported significantly poorer outcomes than Gholami and Lue, with 57% of patients reporting deterioration in their quality of life, 55% with severe penile shortening, 48% with glans hypesthesia, and 34% with bothersome suture knot nodules.[19]

Tunica lengthening procedures

Plaque incision or excision with placement of grafts has been used successfully for patients with severe penile curvature, complex or hour-glass deformity, or in men with a shortened penis from Peyronie's disease. In 1950, Lowsley and Boyce first reported a series in patients with Peyronie's disease who underwent plaque excision with a fat graft, but no report of success.[24] Various materials have since been used including: dermis,[25] temporalis fasica,[26] vein,[5,27-30] cadaveric or bovine pericardium,[31-33] duramater,[34] synthetic material,[11] and porcine small intestine sub mucosa (SIS).[35] The ideal graft should be: pliable, easy to handle, packaged in various sizes, good tensile strength, low inflammatory response, low patient morbidity, low risk of disease transmission, and low cost. At UNC, we employ porcine SIS (Cook Urological, Inc Spencer Ind). SIS is processed into a reliably packaged, acellular matrix, consistent in thickness and compliance. One drawback for the use of SIS is that some religions may not accept a porcine graft material. Synthetic materials, such as Dacron and Gore-Tex, may cause increased postoperative inflammation leading to fibrosis and post correction curvature. Licht and Lewis reported poor patient satisfaction with synthetic grafts.[11] Sampaio et al report 95% of men achieved a straight penis using cadaveric duramater,[34] however this material has not been widely accepted because of concerns for prion and slow virus transmission. While rare, the media have increased the concern regarding cadaveric human tissues and prion transmission. Use of vein grafts is well documented with good results ranging from 60%-95% straightening and 88%-92% satisfaction,[5,27-30] though these risk harvest site infection, lymphatic leak and require longer operative time. Begun with deep dorsal penile vein, more recent vein grafts have used saphenous vein. Use of vein requires creation of a patchwork graft to fill larger tunical defects. Although we prefer SIS, no material has emerged as the clearly superior graft.

The incision/excision straightening procedure begins with an artificial erection to assess penile curvature. For dorsal plaques, a circumcising incision and degloving of the penis is performed. Ventral plaques may be accessed via a direct ventral incision longitudinally over the plaque. Dorsal penile incisions should be avoided. The neurovascular bundles, located lateral to the deep dorsal vein of the penis should be carefully dissected off the underlying tunica albuginea. The plaque can be approached through the bed of the deep dorsal vein with venous ligation 1 cm proximal and distal to the plaque. The vein is excised between these ligatures. Bucks fascia can also be incised at the 3 and 9 o'clock positions and dissected to retract the neurovascular structures from the plaque. Buck's fascia and the contained dorsal penile nerves are then elevated. A relaxing H-shaped incision is then made in the plaque with subsequent grafting, a technique described by Lue and El-Sakka.[36] Egydio describes a 'tripod-shaped forks of 120∞' incision to produce a geometrically optimal relaxing tunical defect for easy graft suturing.[37] This incision may also be termed a "Mercedes-Benz incision". Larger or calcified plaques may require complete excision. The SIS graft is cut 20% larger than the measured defect and sutured to the tunica albuginea with a running locking 4-0 PDS suture. An artificial erection is induced to check straightening and when necessary, plications are placed on the contralateral side of the penis to correct any residual curvature. Large residual curves may require a second incision and grafting. After straightening is achieved, Buck's fascia and the skin are closed. A penile block is injected, a fine suction drain is kept beneath the skin overnight and the patient is discharged the following morning. Ice is maintained on the operative site for 48-72 hours.

Patients are discharged home on nightly diazepam to prevent nocturnal erections and amyl nitrate may

be used as needed to prevent erections for 2 weeks following surgery. Patients are advised to avoid sexual activity for 6 weeks following surgery for adequate healing. If patients experience mild curvature recurrence in the post operative period, a vacuum erection device may be employed twice daily for 10 minutes without the constriction ring once the patient has recovered from the discomfort of surgery. This post operative VED use is successful for mild to moderate curvature. Many patients will require a PDE-5 inhibitor for 3 to 9 months after surgery to assist with "penile shock" from surgery.

Reported satisfaction and straightening rates vary widely. Complications include worsening erectile dysfunction with most studies reporting 0-15%,[5,11,27-35] though this often takes up to 6 months to improve and may require assistance with a vacuum device or PDE-5 inhibitors. Since this "penile shock" is expected in most patients, the authors use a PDE 5 inhibitor for 6-9 months following surgery. Other complications include penile shortening (0%-40%), glans and penile hypoesthesia (0%-16.7%), curve recurrence (0%-16.7%), and hematoma.[5,11,27-35] Although the risk for increased penile shortening is less with these procedures, patients still need to be warned of this outcome. Peyronie's disease itself will cause shortening and may increase this complaint. Yurkanin reported average penile lengthening of 2.1 cm.[29] Interestingly, over half the patients in this study reported subjective shortening.

Penile prosthesis implantation

Severe ED and Peyronie's disease is best treated with implantation of an inflatable penile prosthesis. The previously discussed tunica lengthening and shortening procedures may provide a straight penis, though a complete loss of adequate erectile function will not benefit if ED is severe.

Montorsi et al found that implantation of a semirigid prosthesis in men with Peyronie's disease had very poor 5-year patient (48%) and partner (40%) satisfaction rates despite a high satisfaction rate (90%) at 3 months.[38] Complaints included poor erection quality and girth with erections, unnatural sensation and partner pain. Meanwhile, these and other authors report good results with inflatable penile prosthesis, with patient satisfaction rates ranging from 75%-93%.[33,39,40]

Following penile prosthesis implantation, patients with continued curvature should be treated with modeling, plaque incision and grafting, or a modified Nesbit. Wilson and Delk first described modeling in a large 138 patient retrospective study.[41] Prior to pump placement in the scrotum, the cylinders are distended maximally and the connector tubing to the pump are clamped to prevent excessive back-pressure. Additionally, pressure is placed over the corporotomy incisions to protect the suture lines. The penis is bent manually directly opposite the curve for 90 seconds. This results in plaque splitting and often an audible crack. Wilson and Delk reported this technique as being successful in 118 of 138 patients, avoiding plaque incision and grafting.[41] They also reported that modeling was associated with greater postoperative pain, swelling and possibly related to urethral perforation in four patients. Carson described the technique in 28 of 30 patients none who suffered no complications from modeling and good penile straightening at a mean follow up of 31.4 months.[42] The remaining two patients in this study required plaque incision and grafting. Chaudhary et al reported the use of modeling in 28 of 46 patients undergoing prosthesis implantation for PD. The remaining 18 patients achieved adequate straightening merely with the prosthetic implantation.[39] Furthermore, a recent study showed slightly higher patient (88% versus 81%) and partner (80% versus 72%) satisfaction rates for modeling vs. corporoplasty with insertion of inflatable penile prosthesis.[33] AMS 700CX and Mentor alpha-1 prostheses are best suited for patients with Peyronie's disease since these higher pressure cylinders provide adequate rigidity to straighten the penis across the Peyronie's plaque.

Complications of inflatable penile prosthesis implantation such as infection and device breakdown are no more common in men with Peyronie's disease than in others undergoing penile prosthesis implantation. As mentioned above, 4 of 138 patients in Wilson and Delk's study suffered urethral perforation possibly linked to modeling, though none of the patients in Carson's or Chaudhary's series experienced urethral injury.[39,41,42] Regardless, all men undergoing prosthetic implantation should be warned of risks for infection, device malfunction urethral injury and recurrent curvature prior to surgery.

Discussion

Peyronie's disease is a sexually debilitating disease resulting in significant psychological stress for many men. Urologists have an opportunity to help men suffering from Peyronie's disease to improve their lives and the lives of their partners. Appropriate treatment should be individualized and tailored to the patient's expectations, disease history, physical exam findings, and erectile function. After medical therapy is considered and the Peyronie's disease has stabilized,

surgical correction is an excellent option for patients with functional impairment from their Peyronie's disease. Outcomes are excellent with expected return to normal sexual function following Peyronie's disease treatment. □

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