

PEYRONIE'S DISEASE

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ABSTRACT

Peyronie's disease can be considered an exaggeration of the wound repair process and is linked to penile trauma. Although a better understanding of the pathophysiology of the disease was achieved recently, the best alternative to treat the patients remains a dilemma. Pain, shortening, plaque and erectile dysfunction are clinical characteristics of this disease, and solution to patients complaints should steer the therapy. Non-surgical treatment is offered to patients with pain, plaque or deformity of less than one year. Surgical treatment should be delayed until the process become stabilized. Surgery is indicated in patients with stable and severe deformity of more than one year of duration and for patients who have penile shortening, narrowing or indentation, or a combination of the above that preclude normal sexual intercourse. If the patient is also impotent and fails to respond to non-surgical treatment, we recommend a penile prosthesis insertion.

Key words: penis; penile induration; Peyronie's disease; impotence

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INCIDENCE AND BACKGROUND

Peyronie's disease (indurato penis plastica) is characterized by the formation of fibrous plaques within the tunica albuginea. In 1561, Fallopius first reported the disease, which later bore the name of the surgeon to King Louis XV of France, Francois Gigot De la Peyronie, who popularized the disease entity in 1743. Peyronie's disease is estimated to affect 0.4 to 3.5% of adult male patients worldwide (1-4). Autopsy studies have suggested a much higher incidence of subclinical plaques or fibrotic lesions noted in the penis. These plaques impede expansion of the tunica during erection resulting in penile bending. In some extreme cases, these plaques may induce a collar-like or an hourglass-like appearance in the erect penis with dense calcified areas.

Peyronie's disease has been reported to occur in association with Dupuytren's contractures, plantar fascial contractures, tympanosclerosis as well as trauma, urethral instrumentation, diabetes, gout, Pagets' disease, and the use of beta-blockers (5). This condition can occur in a familial pattern (6). There is

a 10 to 40% chance that the descendent of a patient with Dupuytren's contracture will develop that problem, and a 15% chance that a man so afflicted will develop Peyronie's disease.

Contemporary thinking suggests Peyronie's disease represents a localized aberration of the wound healing process. Pathologically, Peyronie's plaques begin with fibrin deposition and end up like scars. Clinical data, anatomical pathology, and bioengineering analysis all implicate trauma as an initiation factor in Peyronie's disease (7,8). Fibrin deposition is recognized as one of the initial consequences of microvascular injury, and it may be the precursor to Peyronie's plaque formation (9).

The search for a genetic link for Peyronie's disease has yet to identify a genetically predisposed population. However, there are reports associating this condition and Paget's disease of the bone, Dupuytren's contracture, and specific HLA subtypes (6,10-12). Studies of Peyronie's patients have implicated an autoimmune component (13,14). It is likely that a certain proportion of men in this age group respond to mechanical tunical stress and microvascular trauma

with an aberrant or hyperactive wound healing response (7,8,15,16). Thus, there may be a subpopulation whose genetic background is such that response to wound healing predisposes development of Peyronie's plaques.

PATHOLOGY AND BASIC SCIENCE

Pathologically, Peyronie's disease is associated with perivascular round cell infiltration, which can be found within the tunica albuginea (17). Fibrin deposition, presumably from microvascular injury, has also been found in relation to Peyronie's plaques, but not in normal or scarred tunica from individuals without Peyronie's disease (9). Plaques consist of dense collagenous connective tissue with reduced and fragmented elastic fibers. In about one third of patients, radiologically or sonographically demonstrable dystrophic calcifications are present (18). The scar tissue of Peyronie's disease contains excessive amounts of type III collagen, which renders it particularly responsive to the wound contraction process (19).

One of the most likely causes of Peyronie's disease may be repeated tunical mechanical stress and microvascular trauma. Excessive bending during erection or blunt trauma to the erect penis may result in bleeding into the subtunical spaces or tunical delamination at the point where the septum integrates into the inner circular layer of the tunica albuginea (7,8,15). Such microvascular trauma may come from sexual intercourse; either with the woman on top or an accident during penetration where the man misses the vagina and injures the penis. Microvascular trauma or subtunical bleeding can result in fluid and fibrinogen in the subtunical layers. The resulting fibrin deposits may be key in the initiation of a wound healing response, which encompasses pain, hematoma, and subsequent inflammatory response with recruitment of macrophages and neutrophils (9,16,20). These cells, in response to clot formation, release a variety of cytokines, autocoids and vasoactive factors, which may precipitate a fibrotic reaction. The unique anatomy of the tunica albuginea with its multiple sublayers of dense fibrous tissue and hypovascularity may «trap» the inflammatory reaction. This may pro-

long the process to months or years and therefore foster the formation of Peyronie's plaque.

There has yet to be a detailed examination of the cell types involved in the pathogenesis of Peyronie's disease. Transforming growth factor- β 1 has a pleiotropic effect on fibroblast function by increasing transcription and synthesis of collagen, proteoglycans and fibronectin while also increasing synthesis of tissue inhibitors of collagenase, which prevents connective tissue breakdown. A role for TGF- β 1 has been proposed in the pathogenesis of Peyronie's disease (21-23). Finally, in the later stages of healing, the connective tissue is remodeled by specific collagenases and proteases. In Peyronie's disease, defects in overproduction of collagen and other tissue remodeling mechanisms may result in an inability to resolve the injury and in plaque formation.

NATURAL HISTORY AND PRESENTATION

In most cases, onset is associated with an active phase, consisting of painful erections, a palpable plaque and bending of the penis. Up to a third of patients with Peyronie's disease present with painless curvature. Whether the onset of deformity associated with the active phase is gradual or sudden, pain usually resolves and the pathologic process itself seems to stabilize after 12 to 18 months. A relatively quiescent secondary phase follows, which is characterized clinically by painless stable deformity, and pathologically by mature scar. Earlier report characterized Peyronie's disease as a process of gradual spontaneous resolution (24). More recent data do not support the above conclusion (25). Painful erection almost always resolves with time; penile deformity usually does not.

The reported incidence of erectile dysfunction in Peyronie's disease is variable. Bystrom & Rubio reported that 52% of 106 patients had coital difficulties and 17% had poor penile rigidity distal to the plaque (26). However, only 8% of patients described coital difficulties at the initial presentation suggesting that this was probably a late feature of the disease. Stecker & Devine found abnormal nocturnal penile tumescence in 29% of patients with Peyronie's disease with suspected organic impotence although

in only 5% of patients could the Peyronie's disease plaque be the sole cause of the dysfunction (27). Other series have reported an incidence of erectile dysfunction of 19% (28). Amin et al. discovered that out of 208 patients investigated routinely by color Doppler ultrasound for erectile dysfunction, 20% had undiagnosed Peyronie's disease (29).

It is clear, therefore, that erectile dysfunction in Peyronie's disease is common and is usually due to 1 or more of 4 factors; psychological or performance anxiety, severe penile deformity, a flail penis, or impaired penile vascular function (30). The deformity of the penis may be so severe that penetration is difficult, painful or impossible. This is more likely to occur if the deformity is in a ventral or lateral direction, where deviation from the normal angle of vaginal entry is maximal. There is a small group of patients with extensive Peyronie's disease who have circumferential plaques and a degree of cavernous fibrosis causing a flail penis. Tumescence is absent from this segment and if extensive it may result in a hinge effect and an unstable penis. Erectile dysfunction may be due to concomitant vascular disease that occurs in 30% of patients with Peyronie's disease (31) or to veno-occlusive dysfunction (32,33). Most studies have used both color Doppler ultrasound and cavernosometry to investigate the impaired erection in Peyronie's disease. Lopez & Jarow showed that out of 76 patients, 36% had arterial disease and 59% had veno-occlusive dysfunction (34). Others have also suggested there is a mixture of arteriogenic and venogenic factors (33,35). It is thought that the venous leakage may occur through the emissary veins that pass near the Peyronie's plaque into the dorsal vein of the penis. The reduced compliance of the tunica albuginea of the plaque prevents the normal compression of these veins during erection and therefore does not compress the venous channels.

Peyronie's disease typically presents with one of the following 4 complaints: painful erection, penile deformity or shortening during erection, presence of a plaque or induration on the shaft of the penis, or erectile dysfunction. Almost all patients have either a well-defined plaque or an area of induration that is palpable on physical examination which 38-62% of the patients are unaware of (26,28,36,37). The plaque is usually

located on the dorsal surface of the penis with a corresponding dorsal penile deformity. Lateral and ventral sited plaques are not as common but result in more coital difficulty, as there is a greater deviation from the natural coital angle. Penile pain may be present with erection or during sexual intercourse. The pain is not severe in nature but may interfere with sexual function. Spontaneous improvement in pain usually occurs as the inflammation settles.

DIAGNOSIS

Peyronie's disease is usually apparent by patient history and physical examination. The medical history should include time and mode of onset (sudden or gradual), course of disease (stable or progressive), history of penile surgery, urethral instrumentation or trauma, medication or drug abuse and family history of Peyronie's disease or Dupuytren's contracture. Risk factors for erectile dysfunction should also be obtained.

A detailed psychosexual history should include penile rigidity during erection, shortening, induration, hourglass constriction, or pain with or without erection. Other important information should also be determined such as ability to have intercourse, adequacy of erection (rigidity and duration), frequency of intercourse, libido, and psychological impact. A photograph of patient's erect penis to identify the extent, direction, and character of erectile distortion is helpful.

Examination of the penis is facilitated by its gentle stretching. This will help identify the size, location and consistence of plaques which may be helpful in determine the stage of the disease and monitoring its progression. The patient should also be examined for the presence of Dupuytren's or plantar fascial contractures. Further diagnostic studies should include photography or drawing of the erect penis after intracavernous injection or vacuum erection device. The stretch length of the penis should also be documented.

Many patients have mild symptoms and reassurance, particularly that the palpable lump is not cancer, is all that is necessary. The majority of patients with Peyronie's disease may be managed with-

out vascular investigation. Penile curvature, especially in young patients, may cause severe psychological distress, which may need to be corrected. Patients usually give an accurate description of their deformity to within 10-20° (38,39). However, when planning a surgical correction of the deformity, documentation of the deformity during erection either by intracavernosal injection of a vasoactive agent or a vacuum device is very helpful.

When the site and size of the Peyronie's plaque needs to be assessed, ultrasound usually will suffice and is particularly helpful in monitoring the progress of medical treatment (2). Patients who also complain of impaired erections, further evaluation is essential. Color duplex sonography performed before and after intracavernous injection of a vasoactive agent allows for assessment of the structure of the corpus cavernosum, tunica albuginea and the cavernous arterial and venous function (40). Color duplex ultrasound is also excellent in detecting collateral arterial connections between dorsal, cavernosal and spongiosal arteries. Dynamic infusion cavernosometry can be used as an adjunct to duplex ultrasound to confirm the diagnosis of veno-occlusive dysfunction (41). Finally, in rare cases MRI can be used for detailed evaluation of penile anatomy prior to surgical intervention.

During the evaluation of patients with Peyronie's disease, other causes of bending and induration of the penis must also be considered. These differential diagnoses include: congenital curvature of the penis, chordee with or without hypospadias, penile dorsal vein thrombosis, cavernosal fibrosis secondary to local trauma, leukemic infiltration of the corpora cavernosa, ventral curvature secondary to urethral instrumentation, benign or malignant primary or secondary tumors, late syphilitic lesion, and penile infiltration with lymphogranuloma venereum.

NON-SURGICAL TREATMENT

The initial approach to treatment should be conservative. Many patients with a minor curvature and normal erectile function can be given reassurance with no invasive diagnostic tests or treatments. Medical management is indicated for patients with a

greater degree of curvature or symptoms. Non-surgical treatments can be divided into systemic, local, or intra-lesional therapies.

Vitamin E is a commonly used oral therapy for Peyronie's disease. In 1948, Scott & Scardino (42) reported a beneficial effect on treatment of 23 patients with vitamin E, a tocopherol with antioxidant properties. The proposed dose was 200 to 300 mg per day. In 1990, Gelbard et al. compared the effects of the vitamin E treatment and natural progression of the Peyronie's disease (25). They noted no significant differences between the 2 groups with respect to pain, bend, ability for intercourse, and over-all perception of disease progression. At this time however, vitamin E continues to be the primary mode of treatment due to its mild side effects and low cost, despite the lack of controlled study showing its benefits.

Potassium aminobenzoate (Potaba) has been studied for the oral treatment of Peyronie's disease (43,44). Its mechanism of action, though not well understood, is decreasing fibrogenesis by decreasing serotonin through increased tissue utilization of oxygen and increased activity of monoamine oxidase. The most extensive review of this therapy of 2653 patients has found it to be successful in 57% of patients (45). The dosage is 20 grams a day for 3 months. Due to Potaba's modest results in literature, relatively high cost, and high side effect, enthusiasm for the use of this medication is cautiously guarded.

Several small, uncontrolled, short-term reports suggest mild to moderate benefit using oral Tamoxifen (46). It has been suggested that Tamoxifen facilitates the release of transforming growth factor-beta (TGF- β) from fibroblasts (47). TGF- β has been shown to play a central role in regulating immune response, inflammation and tissue repair by deactivating macrophages and T lymphocytes. Tamoxifen results in a reduced inflammatory response and, therefore, diminished angiogenesis and fibrogenesis (48). Tamoxifen dosage is 20 mg twice a day with minimal reported side effects of gastrointestinal distress and alopecia.

Colchicine therapy is the most recently reported oral therapy for Peyronie's disease. Akkus et al., in an uncontrolled study, showed a decrease in plaques size and an improvement in penile curvature

in approximately 50% of the 24 patients they treated (49). The main side effect of colchicine is gastrointestinal upset with diarrhea reported in 33% of subjects. Recommended dosing is 0.6 to 1.2 mg daily during the first week of treatment followed by an increase to 1.8 to 2.4 mg for three months. Colchicine is an anti-microtubular agent, which inhibits the proliferation of inflammatory cells and fibroblasts. It can also increase collagenase activity and reduce collagen synthesis (50-52). We currently use colchicine as our first line agent in the treatment of acutely acquired Peyronie's disease.

Based upon anti-inflammatory properties, as well as decreased collagen synthesis by unclear mechanisms, steroids have been used as an intralesional therapy for Peyronie's disease. Several short-term non-controlled subjective studies have reported good responses using various steroids (37,53-55). Nevertheless, we do not recommend intralesional steroids in the treatment of Peyronie's disease. This type of therapy has many local side effects including local tissue atrophy and skin thinning while offering only an inconsistent improvement in well-established curvature. Steroid injections ultimately make surgery more complex due to the difficulty in subsequent separation of tissue planes.

In a randomized placebo controlled study, purified intralesional clostridial collagenase was shown to have some benefit over placebo for mild to moderate degrees of Peyronie's disease. In more severe curvature however, the response to treatment was not statistically significant (56). Its mechanism of action is via altering collagen content of penile plaque. This drug is currently being evaluated for approval for use in the United States of America.

Orgotein, an anti-inflammatory metalloprotein with pronounced superoxide dismutase activity, has been used by several groups in Europe (57-60). Reports of subjective benefits are as high as 80-90%. It is not available in USA and has been taken off the market in several European countries due to its significant toxicity.

The potential use of interferons as an intralesional therapy for Peyronie's disease has been demonstrated (61). In fibroblasts derived from Peyronie's plaques, the addition of interferons decreased the rate of proliferation in a dose-dependent

fashion, decreased the production of extracellular collagen, and increased the production of collagenase. Several clinical trials of intralesional interferon for Peyronie's disease have been published (62-64). Objective improvement in deformity was considered small with mean improvement of 20 degrees. Patients with small plaques (< 4 cm) were more likely to have a better response. All patients experience brief influenza-like side effects.

The calcium channel blocker verapamil was first reported as an intralesional therapy by Levine et al. and Rehman et al. (65-67). Penile shaft narrowing, decreased in 100% of patients, but curvature improved in only 42%. Fifty-eight percent reported that their sexual performance had improved. Overall, 83% noted that the disease had arrested or improved with no recurrence of symptoms or deformity within the eight months follow-up period. Verapamil and other calcium channel blockers affect cytokine expression associated with early phases of wound healing and inflammation and increase the proteolytic activity of collagenase (68). Matrix remodeling is enhanced by human fibroblasts in burn scars and vascular smooth muscle cells in vitro (49,69). Goals of this treatment are to stabilize disease process and reactivate a more normal remodeling process, yielding gradual improvement in deformity. Multiple doses, 10 mg injected every 2-4 weeks for 12 weeks, are given over time. The main side effect is ecchymosis. This is currently the most frequently used intralesional therapy for Peyronie's disease.

Iontophoresis was examined as a means of enhancing topical delivery of verapamil (10 mg) and dexamethasone (4 mg) with a local electric field in 15 patients with Peyronie's disease. At 5 months follow-up, penile pain resolved in 66%, curvature improved in 53% and plaque size reduced or softened in 40% of cases (70). Local penile lithotripsy has also been proposed as topical therapy for Peyronie's disease with limited numbers of patients reporting subjective results (71). The rationale for this approach is not known. Topical verapamil cream has also been advocated for Peyronie's disease. However, we cannot comment on its use because of the lack of analyzable data.

Overall, therapeutic advances in Peyronie's disease have not resulted in a reliable cure. This may

be due to an incomplete understanding of the basic pathophysiology of this disease and the lack of an animal model for study. Recent advances in the understanding of disorders of wound healing have allowed forward strides in the understanding of this disease and offer new therapies, such as the injection of calcium antagonists and interferon. Recent reports of the involvement of TGF- β in human Peyronie's disease and the induction of Peyronie's like condition by injecting TGF- β into the rat's tunica albuginea may help provide a new strategy in combating the disease.

SURGICAL TREATMENT

The indications for surgical correction include: severe curvature, narrowing, or indentation of more than one year's duration, sexual difficulty or partner discomfort because of deformity, or severe penile shortening. Surgical correction of penile curvature is reserved for those who fail conservative measures. There is a considerable variation in the deformity that makes penetration difficult. In young men particularly with congenital deformities the bend causes more psychological distress than physical disability and it may be necessary to correct curvature as little as 20-30 degrees. In contrast, an older man with a stable relationship and partner is better able to cope with a more severe degree of deformity. Of note, a ventral deformity causes more difficulty in vaginal penetration than a dorsal or lateral one.

Prior to surgery, a detailed evaluation of penile vascular and erectile function is highly recommended. Reconstructive surgery is not recommended in the acute phase of the disease. In the past, many penile implants have been performed in patients with normal penile rigidity to treat severe curvature. In the current era, penile implants should be reserved for Peyronie's patients who have severe erectile dysfunction that does not respond to non-surgical erectile dysfunction therapy. The surgical treatments for penile curvature are classified into 3 different categories: tunical shortening procedures, tunical lengthening procedures, and prosthetic procedures.

Shortening procedures are reconstructive techniques performed on the convex surface of the

penis at the site opposite to the penile plaque. These procedures are the easiest to perform and require the least expertise. Patient selection is extremely important. Shortening procedures are most appropriate for patients with useful erections, adequate penile length, and without hourglass deformity. Reed Nesbit first described the correction of congenital erectile deformities by shortening the opposite side of the penis by the excision of an ellipse of tunica albuginea (72). The Nesbit technique was re-introduced for Peyronie's disease in 1979 (73). In a review of 359 men operated upon between 1977 and 1992, 295 (82%) had good results and were able to have intercourse after correction with this technique (74). A literature review has confirmed these favorable results (30). The overall results of the Nesbit procedure have improved in the operations performed after 1985. This is thought to be due to better patient selection (74). With increasing time after the operation, there is a decrease in satisfaction with the results of the Nesbit procedure. The most common complication of this procedure as with all shortening procedures is loss of penile length. This complication, however, does not preclude the great majority of men from having sexual intercourse. Others complications reported include erectile dysfunction, penile hematoma, penile narrowing or indentation, urethral injury, herniation, suture granuloma, numbness and phimosis (74).

A modification of the Nesbit procedure was described by Lemberger et al. (10) and further refined by Yachia (75). The approach is similar to the Nesbit procedure but instead of removing an ellipse of tunica, a long longitudinal or multiple smaller longitudinal incisions are made in the corpora cavernosa. These incisions are then closed horizontally in a Heineke-Mikulicz fashion in order to correct the angle of penile curvature. Many authors claim a high percentage of good results with this technique reporting satisfaction rates between 79-95% (10,75-81). The complications of this procedure are similar to those reported for the Nesbit technique.

Wedge resection or incision of the tunica requires extensive dissection of the neurovascular bundle or the corpus spongiosum. A simplified approach for correcting penile curvature is to perform

plication on an erect penis produced by intracavernous injection of papaverine or alprostadil (82). Plication is a simple, outpatient procedure, which takes approximately 30 minutes under local anesthesia. Tissue incisions or removal or dissection of the neurovascular bundle or urethra is not necessary (Figure-1). Some authors described high recurrence rates and poor results with prolonged follow-up. The literature reports significant variation in results ranging from 38-100% satisfactory results (83-87). Gholami et al. recently reported 98% satisfaction rate with over 90 patients

followed for one to five years (88). Complications of plication surgery include loss of penile length, phimosis, penile narrowing, erectile dysfunction, suture granuloma and palpable suture lumps on penis (85,86,89).

Tunical lengthening procedures use reconstructive techniques to correct penile curvature while restoring the length of the curved, shortened penis. This surgery is performed on the concave, diseased side of the penis and requires plaque excision or incision with grafting. Lengthening of the tunica with graft place-

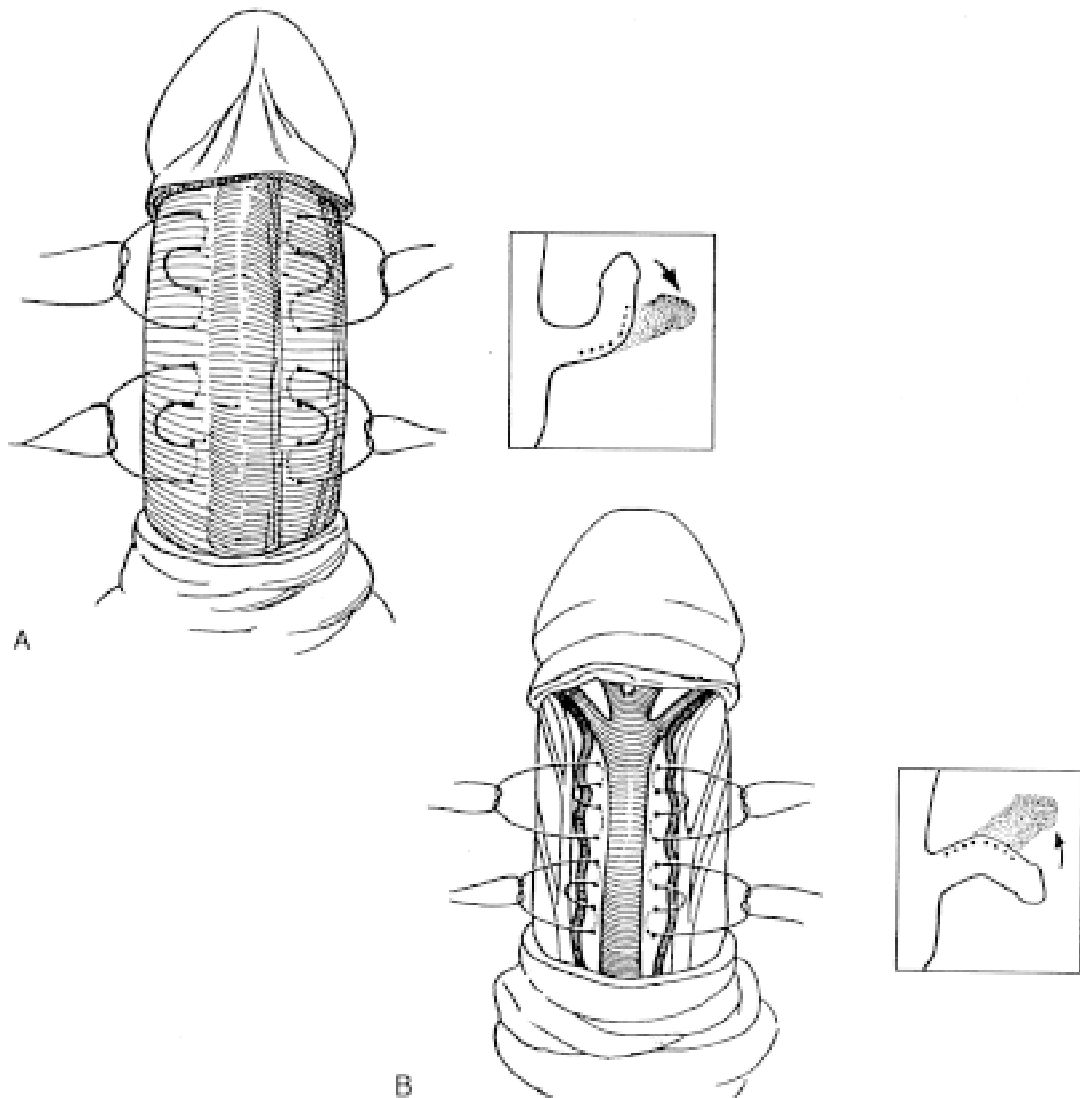


Figure 1 - Plication procedures performed on a papaverine induced erect penis. Dissection of neurovascular bundles is not necessary. The location of paired non-absorbable plication sutures is shown. A)- Perispongiosal for dorsal curvature; B)- Between dorsal vein and dorsal arteries for ventral curvature. The suture entry sites are marked with a marking pen before suture placement. (ref. 82).

ment is indicated in patients with severe curvature resulting in a shortened and deformed penis with penile narrowing or hourglass deformities. Lengthening can also be done on patients that present with recurrent curvature after other surgical procedures. These procedures are the most difficult to perform and require the greatest expertise. Few investigators have experience with more than 50 patients. The replacement of diseased tunica albuginea in Peyronie's disease was largely unsuccessful until the use of dermal graft first described by Bystrom & Rubio (26) in Scandinavia and by Devine & Horton (90) in the United States.

Subsequently, many autologous tissues (temporalis fascia, dura mater, tunica vaginalis and dorsal or saphenous vein), cadaveric tissue (dermis, fascia or pericardium) and synthetic materials (Dacron and Gortex) have been used with different results. Excision of the plaque has been the standard approach. However, it is now known that the pathologic process of Peyronie's disease extends far beyond the plaque and removing a large area of tunica albuginea may impair erectile function (90-92). A review of the literature shows that there is great variability in the outcome of plaque excision with the most common problem being erectile dysfunction.

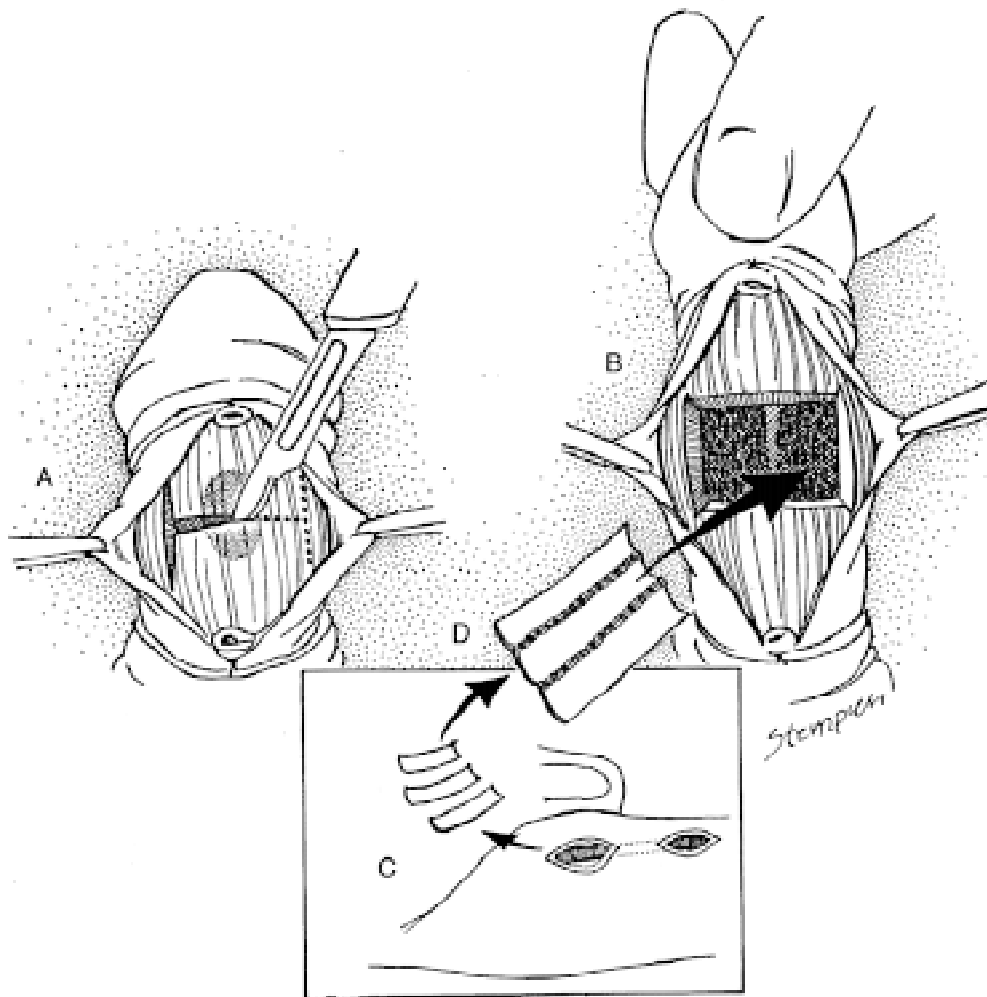


Figure 2 - H-incision and saphenous vein grafting. A)- Dissection of neurovascular bundles (medial to lateral) with tenotomy scissors under 3x or 5x magnification loupes. B)- H-shaped transverse relaxing incision in center of plaque for correction of penile curvature; C)-The tunical defect is measured by stretching the penis longitudinally and transversely; D)- A segment of saphenous vein is resected, opened, cut into several pieces and stapled together with vascular clips. The vein graft is sutured to the tunical defect with the endothelial surface facing the inside of the corpus cavernosum (ref. 96).

tion (26,32,92). Due to the high incidence of erectile dysfunction, contracture of the graft, late recurrence and poor long terms results, the excision of the plaque and grafting is less performed today (93).

In 1991, Gelbard & Hayden (94) proposed plaque incision and grafting rather than excision, decreasing some of the complications of excising the tunica albuginea. The less the tunica and its underlying erectile tissue are altered, the better the postoperative erectile rigidity. No perfect graft material has been described for replacing the diseased tunica albuginea. Lue et al. report on their experience with the use of saphenous vein graft in 112 patients with Peyronie's disease (Figure-2). Successful straightening was accomplished in 95% of the patients with 13% of potent men complaining of decrease in erectile function (95,96).

Patients with Peyronie's disease and impotence, which does not respond to medical management, are usually treated with penile prostheses with or without excision or incision of the plaque. Literature review (91,93,97,98) shows excellent results provided men have realistic expectations. Although there may be some intrusion of the plaque on the corporal bodies, this usually does not cause any difficulty in the implantation. Historically, a penile prosthesis would be performed on any patient who had a penile deformity but without erectile dysfunction. With advances in the medical treatment of erectile dysfunction, prosthesis surgery is now reserved as the final treatment option or in those with severe erectile dysfunction. In most patients with mild to moderate curvature, insertion of a penile prosthesis tends to straighten the penis and no additional procedures are necessary. However, in cases of severe deformity, incision and grafting the diseased tunica albuginea with synthetic material grafts or cadaveric tissue may be necessary during prosthesis placement. The use of operative molding of the penis over the prosthesis is helpful in order to give good correction of the deformity (99).

CONCLUSION

Peyronie's disease remains one of the most perplexing diseases in urology. With continued basic research in wound healing and scarring, our under-

Table 1 - Non-surgical treatment: oral therapy.

	Placebo Control	N Patients	Dose	Mean Follow-up	Pain Improvement	Curvature Improvement	Plaque Size Reduction	Side Effects
Vitamin E	N	23	200-300mg/d	9 mo.	12/12 (100%)	18/23 (18%)	21/23 (91%)	None
Vitamin E	Y	59	NR	NR	NSD	NSD	NR	None
PABA	N	2653	12g/d x3 mo.	NR	NR	NR, 53% subj. improvement	NR	Anorexia, N/V
PABA	N	32	12g/d x3 mo.	8-24 mo.	8/18 (44%)	18/31 subj.(58%)	18/32 subj.(56%)	GI
Tamoxifen	N	36	20mg bid x3 mo.	6 w	16/20 (80%)	11/31 obj.(35%)	12/35 obj.(34%)	Dec. libido, flush., dec. ejac. vol.
Colchicine	N	24	0.6-2.4mg incr. dose qd	2-5 mo.	7/9 (78%)	7/19 subj. (37%)	12/24 obj.(50%)	Diarrhea, liver toxicity, nausea

NR = Not recorded, NSD = No Significant Difference, N/A = Not Available
Modified from Lue et al. (100)

Table 2 - Non-surgical treatment: intralesional therapy, topical, ilontophoresis.

	Placebo Control	No. Patients	Dose	Mean Follow-up	Pain Improvement	Curvature Improvement	Plaque Size Reduction	Side Effects
Dexamethasone	N	21	0.4% qmo x6 months	NR	86%	76% subj.	76% subj.	Ecchymosis
Triamcinolone	N	45	2mg q6 wks x6 injections	4 years	17/45 (38%)	NR	14/45 (31%)	NR
Collagenase	N	31	470-2370 u injection	9.8 mo	13/14 (93%)	16/31 (52%)	20/28 (71%)	Ecchymosis, corporeal rupture
Orgotein	N	22	4mg qmo x6	NA	19/22 (86%)	NR	NR	None
Orgotein	N	18	8mg qmo x8	N/A	15/15	7/18 (39%)	NR	Severe hypotension
Verapamil	N	14	10mg q2 wks x12 weeks	8 mo.	91%	42% subj.	30% obj.	Ecchymosis
Verapamil	N	38	10mg q2 wk x12 inj.	2 weeks	97%	76% subj. 54% obj.	23% obj.	Decreased sensation, hematoma
Verapamil	Y	14	10mg qwk x6 mo.	3 mo.	NR	NSD	NSD	Ecchymosis
Interferon	N	25	1 M IU qwk x5 weeks	6 mo.	24/25 (96%)	1/25 (4%)	7/25 (28%)	Influenza-like symptoms
Interferon	N	10	1.5 M IU qod x3 weeks	6 weeks	60%	60% subj 60% obj.	30% obj.	Influenza-like symptoms
Iontophoresis Verapamil and Dexamethasone	N	15	Verap - 10mg Dexam - 4mg 20 min qod x3 weeks	5 months	66%	53%	40%	NR

NR = Not recorded, NSD = No Significant Difference, N/A = Not Available
 Modified from Lue et al. (100)

standing and management of this frustrating disease will improve. Initial treatment of Peyronie's disease should be conservative with expectant therapy and medical management. Once the penile curvature and plaque have stabilized, patients with severe deformity may be offered surgery depending on their symptoms and complaints. Patient selection is key to proper treatment. Less experienced surgeons should limit themselves to medical management or simple surgical management of the disease including plication or Nesbit procedures. Tunical lengthening procedures or complicated penile prosthesis should be reserved for surgeons with familiarity and expertise in this type of reconstruction. Education of the pathogenesis and natural history of the disease will allow the patient and his partner to make an informed decision in regards to his treatment options and expected outcomes.

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