

# Peyronie's Disease: a Review

## *Malattia di La Peyronie: revisione della letteratura*

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**Key words:** Peyronie's disease, Induratio Penis Plastica, erectile dysfunction, oral treatment, surgery

**Parole chiave:** *Malattia di La Peyronie, Induratio Penis Plastica, disfunzione erettile, terapia orale, chirurgia*

### Summary

**Aim.** Peyronie's Disease is characterized by the formation of a fibrous plaque within the tunica albuginea of the corpora cavernosa. This plaque results in symptoms ranging from pain and penile curvature to erectile dysfunction. The etiology of Peyronie's disease remains uncertain, and there is no cure at this time. Many articles have been written about Peyronie's, including speculation about its etiology and the "best" methods for its treatment. The aim of this review article is to establish the state of the art in Peyronie's disease management.

**Methods.** We have done a bibliographic review of the history, pathophysiology, medical, and surgical treatments for Peyronie's disease.

**Results.** The standard of care is to treat Peyronie's in a conservative way, with expectant medical management, until the process has stabilized for 12-18 months. Besides pain relief, few patients will experience any significant disease regression as a result of medical management. During the chronic phase of Peyronie's disease, those with disabling curvature may require surgical intervention.

**Conclusion.** This review clearly illustrates that there is not a well defined unique best treatment option(s) for men with Peyronie's.

### Riassunto

**Obiettivo.** *La malattia di La Peyronie è caratterizzata dalla formazione di una placca fibrosa nel contesto della tunica albuginea dei corpi cavernosi. Questa placca produce un corredo clinico che spazia da dolore e curvatura peniena a deficit erettile. L'eziologia della malattia di La Peyronie rimane oscura, e non è attualmente disponibile una sua cura. È presente una ricca letteratura sulla malattia di La Peyronie, comprensiva di speculazioni sulla sua eziologia, e dei metodi "migliori" di trattamento. Lo scopo di questa review è di fornire lo stato dell'arte sul trattamento della malattia di La Peyronie.*

**Metodi.** *Revisione della letteratura esistente in merito a storia clinica, fisiopatologia, terapie mediche e chirurgiche per la malattia di La Peyronie.*

**Risultati.** *L'approccio standard è il trattamento conservativo della malattia di La Peyronie, mediante vigile gestione medica, fino a stabilizzazione del processo (12-18 mesi). A parte un miglioramento della sintomatologia algica, pochi pazienti assistono ad una remissione significativa quale risultato del trattamento medico. Nel corso della fase cronica della malattia di La Peyronie i pazienti con curvatura invalidante possono necessitare di correzione chirurgica.*

**Conclusioni.** *La rassegna illustra chiaramente che non c'è un'unica ben definita miglior opzione di trattamento per l'uomo con malattia di La Peyronie.*

### Introduction

Peyronie's Disease was "popularized" by 1743 by Francois Gigot de la Peyronie – a surgeon of King Louis XV of France. De la Peyronie initially recommended that treatment for this condition should include Barege spa water and mercurial ointments. We know today that Peyronie's Disease (or Induratio Penis Plastica) is characterized by the formation of a fibrous plaque within the tunica albuginea of the penile corpora cavernosa.

This plaque results in a painful, curved erection that makes intercourse difficult or impossible. For those with a minimal plaque and only mild curvature, reassurance from a physician that this is a benign condition may be all that the patient needs. Most patients, however, will opt for some form of medical management, the goals being disease stabilization and functional improvement. A subset of patients who are afflicted with a disabling deformity may find that the best treatment option would be surgery<sup>1</sup>. Although multiple treatment

options exist, the desired outcome goals remain relieving pain, minimizing deformity, and maximizing coital effectiveness.

## Epidemiology

This disease process is uncommon, occurring in 0.3 to 7% of Caucasian men<sup>2</sup>, while rarely affecting African-American men. Since corporal elasticity diminishes with age, it is understandable that most men who seek medical attention do so later in life – typically in their fifth decade. However, not all men seek attention for, or feel bothered by, their disease. An autopsy study of 100 men without known Peyronie's disease demonstrated that 22% had asymptomatic fibrotic lesions of the albuginea indicating that these asymptomatic lesions may develop "naturally" when increasing age and sexual activity are combined<sup>3</sup>. Additional correlates to Peyronie's have included Dupuytren's contractures, plantar fascial contractures (Lederhose's disease), tympanosclerosis, trauma, urethral instrumentation, diabetes, gout, Paget's disease, and even the use of beta-blockers (Tab. I)<sup>4</sup>. A familial pattern of inheritance has been associated with HLA-B7 antigens and Dupuytren's contractures<sup>4,6</sup>. There is a 10-40% chance that a descendent of a patient with Dupuytren's will also inherit that autosomal dominant disorder<sup>5</sup>. 15% of Dupuytren's patients will also eventually develop Peyronie's<sup>1</sup>. This possibility of a genetic predisposition can be supported by two observations: 1) dog studies have not demonstrated post-traumatic Peyronie's-like le-

sions, and 2) if direct penile trauma was the only factor/element required for plaque formation, the expected incidence would be much higher<sup>7,8</sup>. Other studies have shown associations with tissue types HLA-B27, HLA-A1, HLA-DQw2, and HLA-DQ5<sup>5,9-11</sup>.

Although these HLA associations initially spurred an interest in the possibility of autoimmune or infections etiologies, no compelling evidence for either of these processes has been demonstrated.

Even though there is no evidence to suggest that the epidemiology of this disease is changing, some experts believe that the clinical incidence of Peyronie's is increasing<sup>11</sup>. A possible explanation for this observation could be related to the recent increased awareness of sexual dysfunction, and the effective and more common treatment of this condition.

## Etiology

Peyronie's is a disease process that primarily affects the tunica albuginea. The origins of the inflammatory response that eventually result in the offending plaque are not fully understood. The most plausible theory to explain this process is that the stretch- and bend-trauma, which may occur during sexual intercourse, can result in tunical delamination – predominately along the dorsal cavernosal surface, where the mid-line septum inserts<sup>12</sup>. Delamination not only incites inflammation, induration, and fibrin deposition, but also activates fibroblasts and leukocyte reactions<sup>13</sup>. The process starts along the dorsal tunica, which is comprised by an outer longitudinal and inner circular layers. With buckling penile trauma and associated shear forces, these two layers delaminate, resulting in microvascular injury and hematoma formation<sup>14,15</sup>. The resulting inflammatory reaction causes an influx of macrophages, neutrophils, and mast cells that secrete cytokines, autocooids, and vasoactive factors, many of which then become involved in the creation of fibrosis<sup>14</sup>.

Recent studies have implicated platelets, arising from a tunical hematoma, as the ringleader for plaque formation. Not only do platelets release fibrin – which become incorporated into the scar – but they also release serotonin, platelet-derived growth factors, and transforming growth factors. It has been proposed that the avascular nature of the tunica albuginea impedes clearance of growth factor products. Particularly detrimental is transforming growth factor (TGF) that in large doses has the unique abili-

**Tab. I.** Correlates with Peyronie's Disease. *Correlati della Malattia di La Peyronie.*

- 
1. Hereditary
    - i. Dupuytren's contractures
    - ii. Plantar fascial contractures (Lederhose's disease)
    - iii. HLA-B7
  2. Injury
    - i. Trauma
    - ii. Urethral instrumentation
  3. Medical conditions
    - i. Diabetes
    - ii. Gout
    - iii. Paget's disease
    - iv. Tympanosclerosis
  4. Medications
    - i. Beta-blockers

ty to auto-induce inflammatory responses<sup>16</sup>. This means that TGF can lead to an ongoing, smoldering, inflammatory process, that results in disordered healing<sup>11</sup>. TGF binds to cell surface receptors, and activates connective tissue synthesis while slowing scar reabsorption by inhibiting collagenases<sup>17</sup>. This newly synthesized connective tissue contains excessive amounts of type III collagen, rendering the Peyronie's scar particularly prone to wound contraction. The replacement of normally elastic tunica with rigid and contraction-prone type III collagen often leads to another problem associated with Peyronie's – erectile dysfunction.

### Peyronie's Disease and Erectile Dysfunction

The reported incidence of erectile dysfunction (ED) with Peyronie's disease varies in part, due to the plethora of ED-related co-morbidities found with this age group. Although some see ED as a late-developing feature<sup>11</sup>, the overall risk for Peyronie's specific ED at any age is 30%<sup>18</sup>. The most popular explanation describes venous leakage as a result of reduced tunical compliance. This loss of compliance is the result of type III collagen replacing the normal complement of elastic fibers. This rigid segment of tunica (plaque) is unable to occlude venous cavernosal blood efflux, which results in a segmental venous leak and detumescence. This process has been appropriately labelled “veno-occlusive dysfunction”. However, not all of Peyronie's-related ED can be explained by venous dysfunction. Lopez and Jarow studied 76 patients and found venoocclusive dysfunction 59% of the time. The remaining 41% of this sample had arterial disease<sup>19</sup>. Three additional factors were found to be commonplace with Peyronie's-related ED. The occurrences that show this problem is much more than a simple hydraulic defect are that: 1) the penile deformity can make sexual activity difficult, if not impossible, 2) a flail penis can cause a segmentally-absent tumescence, and 3) performance anxiety is related to the presence of the physical abnormality<sup>20</sup>.

### Psychological Impact

Many men find their penile deformity so anxiety provoking that it interferes with their ability to maintain or even obtain erections. In a small study (n = 20) us-

ing duplex ultrasonography to evaluate men complaining of dysfunction, 90% had a “functional” rather than organic cause for their ED<sup>21</sup>. In fact, the psychological impact may be so extensive that residual psychological aspects can continue to impede even the best surgical results<sup>14</sup>. To minimize the emotional toll of this disease process and the treatment thereof, Jones suggests that patients and their partners hear their physicians reinforce the need to “keep sexual expression alive, and, be active to whatever degree possible at each state of the progression or regression of their Peyronie's disease course”<sup>22</sup>.

In Peyronie's disease, the line between psychological and organic ED is often blurred. Unlike other causes for ED, where 90% are primarily organic, those with Peyronie's often have mixed etiologies that respond best to multi-modal therapy.

### Clinical Presentation

The relative ease in diagnosing Peyronie's is offset by the plethora of treatment protocols found in literature. Most patients present with concerns about a penile lump, curvature, or painful erections (Fig. 1). A short list of differential diagnoses, such as congenital chordee, dorsal vein thrombosis, infiltrative cancer, or a sexually transmitted disease need to be excluded. When that is accomplished the diagnosis of Peyronie's becomes rather straightforward. As part of the initial workup, it is important to record plaque dimensions (consider ultrasonographic determina-

**Fig. 1.** Dorsal angulation in a patient with Peyronie's disease. *Curvatura dorsale in un paziente con malattia di La Peyronie.*



tion), degree of penile curvature/angulation, presence of ED, disease time interval, and sensation of pain. Other more involved evaluations, such as color Duplex sonography, cavernosometry, or even photographs, are not routinely necessary unless the patient is contemplating surgical correction. If surgical treatment becomes necessary, these studies help with informed consent by establishing a preoperative baseline of erectile function and degree of deformity, and have also been used to predict postoperative results. For instance, Jordan demonstrated a positive linear association between preoperative sexual function and postoperative results<sup>23</sup>.

## Medical Management

Treating Peyronie's should begin with education for the patient and his partner concerning the typical disease timeline and its varied degrees of progression. In general, they should be told that the disease process begins with an acute inflammatory phase, which lasts 6-18 months and is associated with gradual resolution of pain and, plaque remodeling. Subsequently, during the chronic phase, plaque size and penile curvature stabilize. For some men with minimal symptoms reassurance may be all that is required. Most patients, however, opt for some form of treatment. That treatment should be both goal-directed and individualized to best meet each patient's needs. Although rates of complete plaque resolution have been reported in up to 13% of the patients studied<sup>24</sup>, most authorities suggest that physicians inform their patients that Peyronie symptoms will not likely resolve spontaneously. For this reason, patients should be encouraged to start medical therapy as soon as possible. It is important to note that the most dramatic results in improving the negative aspects of Peyronie's have been seen in those patients who were treated in the early-stage of their disease<sup>13</sup>. Unfortunately, there is no definitive medical therapy for Peyronie's disease. Witness to this fact is the long list of historical treatment options, none of which have been proven completely effective. Gelbard believes that the perfect candidates for medical therapy, however, would include those men who are able to engage in intercourse even though they have severe or disabling curvature, and who also have either had the disease process for less than a year, or, who have not yet reached a stable state. Patients with evolving or changing plaque should continue medical therapy until their disease has stabilized, or for at least 12 months, whichever is longer.

More and more evidence has espoused the importance of counselling and emotional support as important adjuncts to medical therapy<sup>1</sup>. This helps to not only keep patients informed of their disease process, but also enables them to maintain realistic goals regarding therapeutic outcomes.

### ORAL

1) *Vitamin E*: 800-1000 I.U. QD in divided doses. Scardino and Scott first reported the antioxidant effects of Vitamin E in 1948. In uncontrolled trials they observed 78% decrease in curvature and 91% reduction in plaque size when patients were given Vitamin E<sup>25</sup>. More recently, at a 1993 NIH Conference on Peyronie's Disease, Devine and Snow reported a 99% reduction in pain and a subjective 13% reduction in curvature in 105 men taking vitamin E. This occurred despite the fact that 70% had no objective change in their condition<sup>26</sup>! Low cost and excellent tolerability continue to make this agent a popular treatment modality – especially for the reduction of pain.

2) *Colchicine*: 0.6 mg PO BID-TID for 3 months. Gelbard originally proposed the use of colchicine in 1995 (personal communication). Colchicine is an antimicrotubular agent that binds tubulin, and thereby inhibits leukocyte adhesion and motility. In addition, colchicine inhibits cellular mitosis, and inhibits the proliferation of both fibroblasts and inflammatory cells. A third way colchicine acts to inhibit inflammation is to block the lipoxygenase pathway of arachidonic acid metabolism<sup>14</sup>. Its ability to reduce collagen synthesis, by interfering with transcellular movement of procollagen and increasing collagenase activity, (see "future treatment" section) makes colchicine an exciting adjunct for treating Peyronie's<sup>14 27 28</sup>.

In an uncontrolled study Akkus followed 24 patients for 3 to 5 months and reported 11% had a slight and 26% a marked decrease in curvature. 50% noted a decrease in plaque size. Although colchicine is generally well tolerated, up to one-third of men can experience diarrhea<sup>29</sup>.

3) *Potassium aminobenzoate (Potaba)*: 12-20 gm PO QD for 3 months. In 1959, ten years after the start of vitamin E therapy, Zarafonitis and Horrax reported Potaba as a successful way to treat Peyronie's<sup>30</sup>. In their original study of 21 patients, 100% reported less pain, 82% experienced a reduction in curvature, and 76% had "resolution" of their plaque. A more realistic response may relate to the 57% (n = 2,653) of patients who described plaque reduction in a study

reported by Hasche-Klunder<sup>31</sup>. More recently, Carson demonstrated that 26% (8/21) of patients had complete resolution of penile angulation, while 58% (18/31) had decreased plaque size<sup>32</sup>. Although Potaba's mechanism of action is poorly understood, it is thought that a reduction in fibrogenesis occurs as a result of local reduction of serotonin levels. The reduction in fibrogenesis is accomplished by increased oxygenation of tissues and increased monoamine oxidase activity. Excitement about Potaba's above-average efficacy, however, is tempered by its relative high cost and negative gastrointestinal side effects.

4) *Tamoxifen*: 20 mg PO BID for three months Tamoxifen is a non-steroidal anti-estrogen that affects the inflammatory response by facilitating release of TGF- $\beta$  from fibroblasts. Interestingly, in large amounts, TGF- $\beta$  causes an auto-increase in the local inflammatory response – which would worsen Peyronie's (see etiology section). On the contrary, in small doses – such as those seen after tamoxifen – reductions in the inflammatory response, fibroblast production, and angiogenesis could be demonstrated<sup>33</sup>. Once again, however, a lack of controlled, longterm studies limits the reliability of this form of treatment. In 1992, Ralph studied 36 patients and reported 80% (16/20) had improvement in their level of penile pain, 35% (11/31) less curvature, and 34% (12/35) reduced plaque size<sup>34</sup>. On the other hand, Teloken could not demonstrate a therapeutic advantage in his small, but controlled study using Tamoxifen<sup>35</sup>. The best results have been seen in patients with early stages of this disease and in those with biopsy-confirmed inflammation.

Fig. 2. Intralesional injection. *Iniezione intralesionale*.



## INJECTION THERAPY (FIG. 2)

1. *Verapamil*: Intralesional injection, 10 mg every other week, 12 injections. In 1994, Levine was the first to suggest intra-lesional injections of a calcium channel blocker to treat Peyronie's<sup>36</sup>. Conceptually, this was an extension of bench research, which demonstrated that verapamil could retard scar formation by both the induction of collagenase activity and by blocking calcium – which is required by fibroblasts to effectively extrude collagen<sup>37</sup>. Once again, early studies using verapamil injections were not controlled and had small numbers (12 patients completed the study), but did demonstrate that 100% of the men with an hourglass deformity had improvement, 91% had reduced pain, and 42% and 58% had subjective reports of reduced curvature and improved sexual function respectively<sup>33</sup>. Follow-up studies suggested that the best results have been seen in men with small (< 4 cm) non-calcified plaques and an angulation of less than 30 degrees<sup>11 38</sup>. Other than ecchymosis, no other adverse events from verapamil injections (such as hypotension) have been reported.

2. *Steroids*: Dexamethasone and long-acting triamcinolone have been reported. The best results have been seen in men with small, firm, discrete plaques. Serious side effects such as local tissue atrophy and tissue fibrosis limit widespread use<sup>39</sup>. In fact, performing surgery after steroid injections puts the neurovascular bundle at increased risk of injury – tissue planes blur as a result of steroid use.

3. *Collagenase*: The concept of intra-lesional injections to treat Peyronie's actually started a decade prior to verapamil injections. Gelbard investigated *in-vitro* and *in-vivo* collagenase in 1982 and 1985 respectively. Also, Walsh stated that clostridial collagenase could dissolve surgically excised plaque tissue<sup>40</sup>. He subsequently injected collagenase directly into the plaque of 31 men. 65% reported reduced curvatures, with the best results seen in those with small plaque deposits<sup>41</sup>. Due to recent successes in treating orthopedic contracture disorders, such as Dupuytren's disease, a resurging interest in the use of collagenase has occurred.

4. *Interferon*: 1-3 million units, from 3-times a week to once every other week. The concept of injecting interferon into Peyronie's plaque grew from bench research on fibroblasts in 1991. In that study, Duncan used fibroblasts from actual penile plaque to demonstrate that interferon alpha-2b: 1) decreased the rate of fibroblast proliferation (in a dose-dependent fashion), 2) decreased the production of extracellular collagen, and 3) increased the production of collagen-

sases<sup>42</sup>. Four years later, Wegner was the first to report results of intralesional interferon alpha-2b<sup>43</sup>. Since then, several clinical studies have been published with varied outcomes<sup>44 45</sup>. Overall, the mean objective improvement in plaque size has been 20-degrees: the best result realized in plaques less than 4 centimeters<sup>11</sup>. Unfortunately, most, if not all patients suffered flu-like side effects, sinusitis, and arthralgia. Whether or not standardized dosing schedules can effectively reduce side effects, while maintaining efficacy, needs to be determined.

5. *Parathyroid Hormone*: 50 units every week for 8 weeks.

This historical approach to treating Peyronie's was reported by Morales in 1975. Excess parathyroid hormone has been known to depress collagen synthesis and promote collagen degradation. As seen with many other therapies, pain reduction occurred in all patients. Subjectively, 67% (8/12) of men reported decreased curvature. No alterations in serum calcium or phosphorus were reported in any patient<sup>46</sup>.

### ENERGY TRANSFER

This treatment modality includes shock wave lithotripsy, laser and ultrasound therapy, and orthovoltage radiation. Although research continues to improve these modalities, energy transfer options have yet to become mainstream in the United States.

### TOPICAL TREATMENT

1. *Topical Verapamil Cream*: as mentioned previously, calcium channel blockers inhibit the synthesis and secretion of extra cellular matrix proteins and, in addition, may degrade scar tissue by increasing collagenases. In order to simplify treatment and avoid penile injections while maintaining benefits, the effectiveness of verapamil by topical administration was evaluated. A double-blind randomized analysis over three-months demonstrated that when compared to placebo, patients receiving topical verapamil had significant improvements in curvature and erectile quality, as well as decreased plaque size<sup>47</sup>. The exact mechanism for improvement with this treatment may be hard to explain. In a small study of men who agreed to have topical verapamil applied prior to penile prosthesis surgery, no verapamil was seen within the dorsal tunical biopsy obtained at the time of surgery. This statistic implies a lack of verapamil absorption into the region affected by Peyronie's. On the other hand, systemic verapamil absorption was identified by urinary excretion<sup>48</sup>.

2. *Iontophoresis* (Fig. 3): iontophoresis is the electro-

Fig. 3. Iontophoresis. *Iontoforesi*.



kinetic transdermal transport of charged molecules into diseased tissue. Use of this technology in Peyronie's has been extrapolated from successful applications for the treatment of arthritis and other soft tissue diseases. In 1995, Montorsi reported effectively treating Peyronie's by transporting dexamethasone and verapamil to the plaque using iontophoresis<sup>49</sup>. A more recent study (Riedl, 2000) exposed 100 men to iontophoresis carrying dexamethasone, lidocaine and verapamil. In this case 96% reported less pain, 37% described a subjective improvement in curvature, and 53% experienced a reduction in plaque size. Unfortunately, 15% had recurrence of their disease at 5.5 months<sup>50</sup>.

### Surgical Treatment

In most men, medical treatment for Peyronie's will result in pain-free erections. Unfortunately, only a fraction will experience any significant straightening of their phallus. Because of this, particularly for those men with more severe curvature, most contemplate surgical intervention at some time. At this point, it is imperative that patients understand that surgery is not a cure for the disease process. Because of this, guidelines exist to determine which patients will achieve the best surgical outcomes (Tab. II)<sup>51 52</sup>. Surgical options include: (1) penile prosthesis, (2) tunical lengthening (grafting), and (3) tunical shortening (a Nesbit-like plication). The best possible surgical outcome requires both careful patient selection, and the realization that some cases require a combination of procedures. A combination of patient preference and his willingness to accept risk will often direct the sur-

**Tab. II.** Peyronie's: Best Surgical Outcomes. *Malattia di La Peyronie's: migliori risultati clinici.*

1. Evidence for stable disease.
  - a. 12-18 months from onset of disease. Patient in *chronic phase* of disease.
  - b. Stable curvature for at least 6 months.
  - c. Painless curvature
  - d. Extensive plaque calcification
2. Failure to improve with conservative measures.
3. Unable to engage in coitus.
  - a. Extensive deformity
  - b. Ventral deformity (causes more difficulty with penetration than dorsal or lateral defects)
  - c. Associated erectile dysfunction
    - i. Hourglass deformity
    - ii. Hinge segment
4. Both patients and partner must understand goals, risks, and limitations of proposed surgery.

gical approach. For instance, to minimize penile shortening some men choose a grafting procedure in spite of a risk of erectile dysfunction. On the other hand, those who wish to minimize the risk of erectile dysfunction most likely choose a Nesbit-like procedure.

### PENILE PROSTHESIS

Penile prosthesis implantation is typically reserved for the treatment of patients who have erectile dysfunction (ED) associated with Peyronie's. As medical treatments for ED advance, fewer patients require implantation as their best treatment option. Fortunately, the corporal tissue underlying Peyronie's plaque is "uniformly uninvolved"<sup>1</sup>. Because of this, most patients with mild-to-moderate curvature can expect an excellent outcome simply by cylinder insertion. On the other hand, for cases of severe deformity, intra-operative "remodeling" of the penis over inflated cylinders has been quite effective<sup>53</sup>. When remodeling alone is ineffective, however, a judiciously placed incision or graft may further enhance the surgical outcome (Fig. 4).

### TUNICAL SHORTENING

In 1965, Nesbit was the first to describe removal of tunical ellipses opposite an inelastic corporal segment to treat congenital penile curvature<sup>54</sup>. Fourteen years later, this technique finally translated into a successful treatment option for Peyronie's disease<sup>55</sup>. Modifications that have simplified, and thereby also reduced morbidity, include the transverse closure of longitudinal corporotomies<sup>56 57</sup>, and an incision-free suture-based imbrication<sup>58</sup>. Overall, success rates have improved with better patient selection and the addition of a non-absorbable suture to each plication site. This reduces long-term distraction failures. The best candidate for tunical shortening should have ad-

equated erections, a mature plaque without concomitant hourglass deformity, a curvature of less than 60 degrees, and adequate penile length. The most common "complication" of this procedure is loss of penile length, which fortunately, rarely affects sexual relations. In fact, overall success rates for the original Nesbit procedure were 82% (n = 295)<sup>59 60</sup>, with rates of 79-95% reported for Nesbit-modifications<sup>56 57 61 62</sup>. Other adverse events include phimosis, penile narrowing, ED, suture granuloma, and palpable suture lumps<sup>11</sup>. Plication techniques will remain an important treatment option for Peyronie's. From a surgeon's point of view, it is a relatively straightforward surgical procedure that also lends itself to enhancing, or "touching-up", other operative approaches. From a patient's perspective, it carries the lowest risk (5%) of post-operative ED<sup>1</sup>.

### TUNICAL LENGTHENING

Inclusion criteria for tunical lengthening contrast with those just mentioned for plication. Surgeons should consider grafting men with a shorter phallus, more proximal plaque, and a curvature greater than 60-degrees. Additionally, those patients with an hourglass deformity or a lateral curvature bend seem to do better with grafting procedures. Replacement of diseased tunica was largely unsuccessful until Devine and Horton introduced dermal grafting in 1974<sup>63</sup>. Since then, an array of grafting materials have been studied and include autologous tissue such as temporalis fascia, dura mater, tunica vaginalis, vascularized preputial, and dorsal/saphenous veins; cadaveric tissues such as dermis, fascia, and pericardium; and lastly, synthetic materials such as Dacron, Gore-Tex, and silastic<sup>11 13</sup>. Unfortunately, no material has been found that perfectly replaces diseased tunica albuginea. Also, in addition to not hav-

Fig. 4. Modelling over a penile prosthesis. *Rimodellamento su protesi peniena.*



ing optimal grafting material, another problem with this type of management rests with the concept of “complete” plaque excision. First, it appears that the deleterious histological effects of Peyronie’s extends well beyond “visibly” altered tunica vaginalis, making the goal of complete surgical excision a difficult, if not impossible, task. Second, grafting large areas seems to have a negative effect on erectile function, resulting in ED rates as high as 25%<sup>1</sup>. Lastly, although initial surgical results were excellent, graft contracture and long-term failures resulted in a disappointing 17% re-operation rate<sup>64</sup>.

In an effort to improve complication rates associated with plaque excision, Gelbard and Hayden (1991) introduced the concept of plaque “incision” with grafting<sup>65</sup>. Apparently, less disruption of the tunica and its underlying erectile tissue resulted in improved rates of postoperative erectile function<sup>11</sup>. Of all the grafting materials available, the optimal replacement for diseased tunica albuginea has yet to be determined.

1. Autologous tissue may be seen as the gold standard. For instance, temporalis fascia is strong, relatively avascular, and due to its low metabolic requirements, has little tendency to contract<sup>1</sup>.

2. Dermal grafts are also popular. However, the secondary incision required for graft harvesting is seen as a drawback for some surgeons. An additional drawback is graft contracture. Studies report recurrent penile curvature (35%), progressive shortening (40%), and a 17% re-operation rate at 10 years<sup>66,67</sup>.

3. Cadaveric pericardium (Tutoplast) offers good results by coupling excellent tensile strength and multi-directional elasticity/expansion by 30%<sup>68</sup>, while

avoiding secondary, tissue-harvesting incision(s). The drawback, similar to dermal grafting, however, is contraction with recurrent penile curvature. In a retrospective telephone interview, 44% of patients with pericardium grafting reported recurrent curvature, although most continued to have successful coitus and were pleased with their outcomes<sup>69</sup>.

4. Small intestinal submucosa (SIS) is a collagen-based xenogenic graft derived from the submucosal layer of the porcine small intestine. It has been shown to promote tissue-specific regeneration<sup>70</sup>, and supports the growth of endothelial cells. SIS acts as a scaffold to promote angiogenesis, host cell migration and differentiation – resulting in tissue that is structurally and functionally similar to the original<sup>68</sup>. In small numbers, SIS has been used successfully to repair severe chordee and Peyronie’s without significant contraction or histological alterations<sup>70,71</sup>. SIS holds promise as a tunical substitute, but needs more clinical and long-term study before widespread Peyronie’s use can be suggested.

5. Vein Grafts have the theoretical advantage of endothelial-to-endothelial contact when grafted to underlying cavernosal tissue<sup>68</sup>. Two sources for this type of graft include the saphenous vein and dorsal penile vein. Once again, post-operative curvature (20%) and penile shortening (17%) are potential disadvantages when using venous grafts. In addition, a small group of patients (5%) experience graft herniation<sup>72,73</sup>.

6. Rotational flaps of tunica vaginalis.

7. Synthetic material: Gortex.

Tunical excision (preferably incision) with grafting offers an excellent surgical option for men with curvatures over 60-degrees and good erectile function that are willing to risk a higher rate of post-operative ED. Although the best grafting material has yet to be determined, the authors use pericardium. SIS grafting, however, seems to offer many benefits, but also requires additional clinical trials.

The use of a penile extender device (Fig. 5) on an 8 to 12-hour daily regimen has been advocated as an effective and safe way to minimize loss of penile length in patients operated for Peyronie’s disease<sup>74</sup>.

## Conclusions

Unfortunately, although a multitude of articles have been written about the Peyronie’s disease, very little definitive material is available to direct, or standardize, the treatment of this disease. The authors hope

Fig. 5. Andro-penis device in use. *Distanziatore penieno*.



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**Domanda 1: Dopo quanto tempo minimo dall'arresto della sintomatologia e della progressione della curvatura la malattia può considerarsi "stabilizzata" e quindi operabile?**

- a. almeno 3 mesi
- b. almeno 6 mesi
- c. almeno 18 mesi
- d. almeno 24 mesi

**Domanda 2: Tutti i seguenti possono essere correlati clinici della malattia di La Peyronie TRANNE:**

- a. dolore in fase attiva
- b. deformità in erezione
- c. alterazioni allo spermioγραμμα
- d. difficoltà al coito

**Domanda 3: La malattia di La Peyronie può associarsi a tutte le seguenti condizioni TRANNE:**

- a. ittero di Gilbert
- b. malattia di Dupuytren
- c. malattia di Lederhose
- d. pregresso trauma in erezione

**Domanda 4: Il principale limite clinico della correzione secondo Nesbit della curvatura peniena è:**

- a. il rischio di deficit erettile
- b. il rischio di alterazioni eiaculatorie
- c. il risultante accorciamento penieno
- d. il rischio di problemi menzionali

**Domanda 5: Il principale limite clinico della correzione della curvatura peniena mediante incisione dell'albuginea e patch è:**

- a. il rischio di deficit erettile
- b. il rischio di alterazioni eiaculatorie
- c. il risultante accorciamento penieno
- d. il rischio di problemi minzionali