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CLINICAL CASE

Approach and treatment of Peyronie's disease: case review and literature review

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Abstract

Peyronie's disease is an uncommon yet debilitating urological condition that affects erectile function and patients' quality of life, more prevalent than commonly believed. It was first described in 1743 by Francois Gigot de la Peyronie's, characterized by penile deformity due to a fibrous plaque in the tunica albuginea, primarily attributed to microtrauma and impaired healing mechanisms, leading to abnormal remodeling and persistent scarring throughout different phases of the healing process.

Keywords: *Peyronie's disease. Treatment of Peyronie's disease. Tunica albuginea. Penile deformity.*

Introducción

Peyronie's disease (PD) is a urological condition that affects the erectile function and quality of life of patients, being more frequent than you think. First described in 1743 by Francois Gigot de la Peyronie, this disease is an acquired and progressive disorder that affects the connective tissue of the tunica albuginea, the enveloping membrane of the penis, and is characterized by the formation of a fibrous plaque that causes a deformity in the penile structure. This disorder manifests itself with a significant variation in prevalence, reporting between 3% and 20% in the adult male population. PD goes through two clinical phases: the acute phase, in which patients experience pain during erection and a progressive deformity of the penis, and the chronic or stable phase, where the curvature stabilizes[1]. Erectile dysfunction (ED) and pain are common symptoms that affect the quality of life of PD patients. The etiology of PD is not fully understood; however, it has been proposed that repeated microtraumas are one of the main causes, causing microvascular lesions and tears in the tunica albuginea[2]. This triggers a cascade of inflammatory events that leads to the formation of fibrous tissue.

Historically, studies on the prevalence of PD have shown considerable variability, in part due to differences in the study populations and methodologies used. From the first reports in 1928, when 550 cases were documented worldwide, to more recent studies, a wide range of prevalence figures have been observed, reaching up to 9% in some populations. However, the researchers suggest that the actual prevalence could be even higher due to factors such as patients' reluctance to report symptoms, lack of recognition of the problem, and stigma attached to sexual disorders. This phenomenon indicates that PD may be underdiagnosed and therefore underestimated in current clinical practice. In terms of demographic characteristics, studies have found that the prevalence of PD increases with age, peaking in men over 70 years of age. In general, patients are middle-aged men, around 50 years of age, although a high prevalence has also been identified in

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specific subpopulations, such as those who have undergone radical prostatectomy or those who have ED associated with diabetes mellitus[3]. These factors suggest that PD could be related not only to aging but also to conditions that affect the vascular system and connective tissue[4].

The pathophysiology of PD is complex and multifactorial, involving a series of cellular and molecular processes that lead to the formation of fibrous plaques in the tunica albuginea of the penis. This scar tissue formation results in curvature and deformity during erection, causing pain and, in many cases, ED. Despite advances in research, the understanding of the precise mechanisms behind PD remains incomplete, and its etiology is considered multifactorial, encompassing genetic, environmental, and trauma response factors[3]. One of the main postulated mechanisms for PD is an abnormal scarring response in genetically predisposed individuals. It is suggested that repetitive trauma or microtrauma to the penis, often due to sexual activity or mechanical manipulation, causes damage to the tunica albuginea. Normally, this tissue should heal without significant complications; however, in patients with a predisposition to PD, these microtraumas trigger an inflammatory cascade that results in aberrant or excessive scarring, rather than a complete recovery of the original tissue structure and functionality[3].

During this healing process, there is an alteration in the extracellular matrix (ECM), with an excessive accumulation of collagen and other components of the ECM in the tunica albuginea. This excess ECM is largely mediated by transforming growth factor beta 1 (TGF-b1), a protein that plays a crucial role in fibrosis. TGF-b1 stimulates the differentiation of fibroblasts into myofibroblasts, cells that increase the production of collagen and other ECM proteins, leading to the formation of fibrous plaques. This inflammatory process also includes the attraction of inflammatory cells to the site of injury, increasing vasodilation and vascular permeability, which perpetuates the cycle of inflammation and fibrosis in the affected area[3]. In addition to TGF-b1, a number of cellular and molecular pathways have been identified that contribute to the fibrosis process in PD. Among them, epigenetic pathways that include the regulation of histone deacetylases, enzymes that modulate gene expression and that can influence the inflammatory response and the accumulation of scar tissue, stand out. These epigenetic mechanisms suggest that fibrosis in PD may be conditioned by environmental and lifestyle factors that affect the expression of genes involved in scarring and inflammatory response, opening up new areas of research to understand and possibly modify the evolution of the disease[5].

An interesting aspect in the pathophysiology of PD is the calcification of fibrous plaques, a feature that is observed in a significant part of advanced cases of the disease. Although the exact mechanism of calcification is not completely clear, some studies have suggested that calcified plaques contain osteoblast-like cells, which are responsible for bone formation in other tissues[4]. This suggests that calcification in PD may be related to a process of metaplastic ossification, in which the fibrous tissue of the plaque develops bone-like characteristics. This metaplastic ossification appears to be a late finding in the evolution of PD plaque and represents a unique pathological process that has been associated with increased disease chronicity and severity[6].

In histopathological studies of calcified plaque biopsies, not only osteoblasts have been found, but also areas of ossified tissue surrounded by fibroblasts and inflammatory cells. These findings challenge traditional models of soft-tissue calcification and suggest that PD patients who present with calcification may have a different tissue healing and remodeling profile than those who do not develop calcified plaques. In addition, the presence of calcification has been associated with a lower response to conservative treatments, which highlights the importance of early identification of this process in the course of the disease to guide clinical management[6].

This article aims to present two clinical cases of PD, highlighting the challenges faced by health professionals in the diagnosis, management, and treatment of this condition. Through the discussion of this case and the review of current therapeutic options, we seek to contribute to a better understanding of PD and the identification of strategies that allow a more effective and personalized management of the disease. In this way, it is intended to provide information that helps to optimize the quality of life of patients affected by PD and to guide future research in the development of more effective and less invasive therapeutic interventions. We present two clinical cases that highlight the challenges in the diagnosis and management of this disease.

Case 1

A 54-year-old male patient with no chronic history of degenerative disease who came to the urology department due to penile curvature during erection, with difficulty and pain on penetration, presented with ventral

curvature of more than 45° without pain, with the presence of plaque on the ventral aspect of the penis in its proximal third of approximately 1 cm. Evidence by clinical and imaging study (ultrasound), which showed a hyperechogenic in the location described, was diagnosed as PD and was scheduled for penis plasty with vaginal tunical graft.

Case 2

A 64-year-old male patient presents penile curvature after trauma during intercourse two years before the onset of the curvature, currently with difficulty in penetration, not reporting ED. For a year, he has not presented pain; however, on examination, he presents a plaque on the ventral aspect of the penis of 1 cm, with an angulation of the penis > 45°, and he is programmed for penis plasty with vaginal tunica graft.

A circumferential incision is made in the skin, and circumcision is made if necessary. The penis is stripped down to its base, separating the dartos and Colles' fascia well from the underlying Buck's fascia. A tourniquet is placed at the base of the penis with a Penrose drain, and an artificial erection is made by applying saline solution with the help of a puncture to identify the plaque and the beginning of the curvature. Once the direction of the curvature is identified, the separation of the vasculonervous bundle on the dorsum of the penis is continued (Fig. 1), complete resection of the plaque is performed, leaving edges free of fibrosis macroscopically (Fig. 2), we proceed to place the vaginal tunica graft in which it is one third larger than the defect, with a 4-0 monocril suture and surpass (Fig. 3). A new artificial erection is provoked, ensuring its correction and absence of leakage (Fig. 4). Remove the tourniquet and close the foreskin leaving a bandage for 3 h.

Both patients evolved satisfactorily, as for the first case, the transurethral tube was removed after 24 h, he had morning erections 2 weeks after the surgical procedure, and began sexual life at 4 months. In the second case, the transurethral tube is removed after 24 h, morning erections are presented 3 weeks after the surgical procedure, and sexual life begins at 6 months.

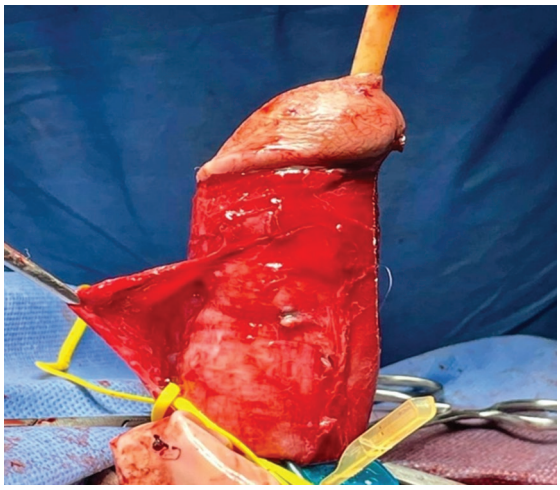


Figure 1. Release of the dorsal vasculonervous complex and exposure of plaque in the dorsal region, ensuring anatomical isolation during the procedure.

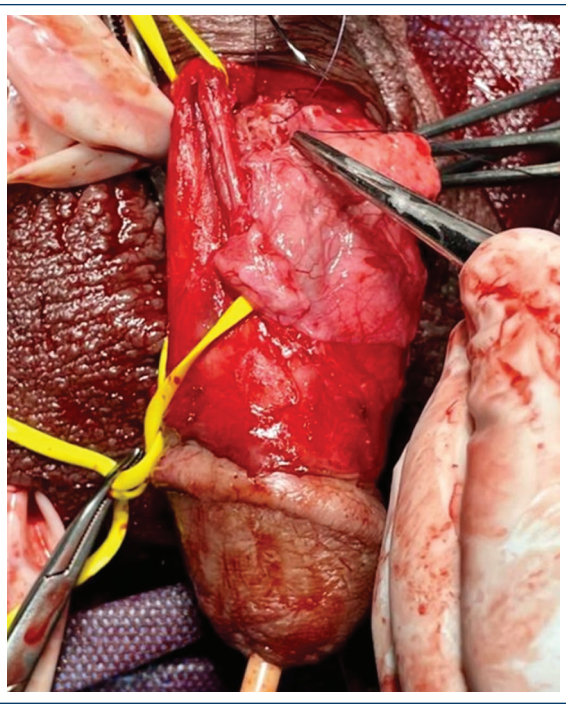


Figure 2. Careful fixation of the tunica vaginalis graft obtained from the right testicle, ensuring its proper integration and functionality at the surgical site.

Discussion

The diagnosis of PD is eminently clinical and depends on a detailed history and a physical examination focused on the genitals. The clinical evaluation includes the history of symptoms: pain during erections, palpation of nodules in the penis, and the assessment of curvature, length, circumference, and erectile function. The Wessells technique, in which the patient is placed supine with 90° traction of the penis and pressure on

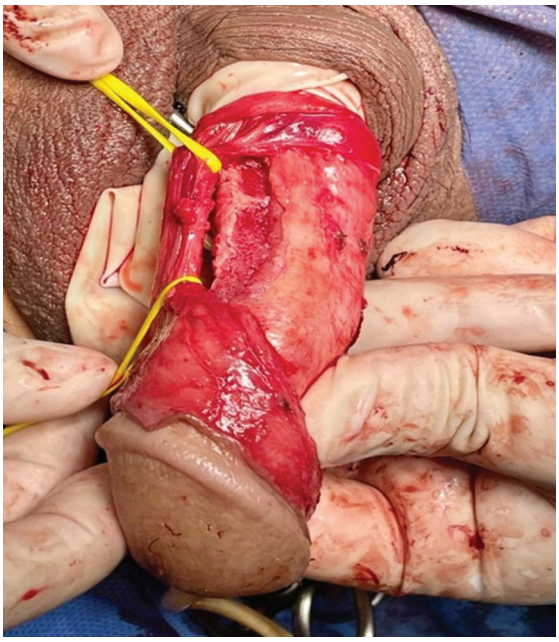


Figure 3. Resection of the dorsal fibrous plaque, preserving adjacent neurovascular structures.



Figure 4. The vaginal tunica graft obtained from the right testicle was fixed, selecting a size 30% larger than that of the defect to ensure adequate coverage. At the end of the procedure, a saline penile erection test was performed, with no evidence of residual curvature.

the pubic bone, can be used to measure length. Examination of the flaccid and erect penis provides information on the location, size, and calcification of the plaques, as well as on the direction and degree of curvature. A goniometer allows the curvature to be measured, and the width can be measured at the base and in areas of narrowing. It is critical to determine whether PD is in the acute or chronic phase, as treatments vary significantly. During the acute phase, patients may experience pain and curvature, although plaques may not be initially palpable. ED may appear in this phase and persist in the stable phase, where the pain disappears, and the curvature stabilizes.

For a more accurate assessment of disease severity and progression, questionnaires such as the Peyronie's Disease Questionnaire (PDQ) and the Sexual Health Inventory Questionnaire for Men may be used. Imaging tests such as penile Doppler ultrasound and magnetic resonance imaging (MRI) can identify plaques and assess their extent and calcification. Although MRI is not routinely recommended, Doppler ultrasound is a useful tool because of its high sensitivity and non-invasiveness. The differential diagnosis should include conditions such as congenital curvature of the penis, thrombosis or tear of the dorsal vein, penile fracture, and cancer.

The management of PD represents a considerable clinical challenge. There is no pharmacological treatment that has been shown to be completely effective in halting the progression of the disease, and available options, such as anti-inflammatory and antisclerosing agents, have limited effects, usually aimed at relieving pain in the acute phase without significantly altering the course of PD. The choice of therapy for PD depends on the stage the patient is in. In the initial stages, a conservative approach is generally recommended:

- Oral therapy: during the early stages of the disease, conservative treatment may include the use of medications such as vitamin E, colchicine, potassium aminobenzoate, and tamoxifen citrate, although their effectiveness is not fully proven.
- Intralesional therapy: this therapy consists of the direct injection of drugs into the fibrous plaque, with the aim of stabilizing the disease and preventing its progression. Medications used include corticosteroids, calcium channel blockers, and interferons, although the long-term effectiveness of these injections is still under investigation[7].
- Clostridium histolyticum (collagenase): this enzyme is a newer option in non-surgical treatment. It is applied in doses of 0.58 mg intralesionally in up to

4 cycles (2 injections/cycle, with intervals of 48-72 h between injections). Subsequently, penile stretching or remodeling exercises are performed for 30 s, 3 times each time, with an interval of 6 weeks between cycles.

For patients who reach the chronic phase of PD and have a significant deformity that affects their sexual function, surgical treatment is usually the primary option. However, this type of intervention carries risks, such as the possibility of residual curvature, decreased penile length, and changes in erectile function[8], highlighting the importance of investigating less invasive and more effective alternatives to address both the acute and chronic phases of the disease. Surgery is usually reserved for patients with a stable curvature, no disease progression, or pain for at least one year. These patients, although pain-free, experience deformities that impact their sex life. Before proceeding, it is crucial to inform them about the possible persistence of a residual curvature of up to 20°, in addition to other associated risks, such as decreased penile length, rigidity, and alterations in sensation[8].

– Tunica albuginea plication: this procedure corrects simple curvatures of < 60-70°. The Nesbit technique involves an excision in the tunic on the side opposite the curvature, followed by a permanent suture. There are variants such as the Yachia technique, which uses a vertical incision and transverse closure (Heineke-Mikulicz technique), and the Duckett-Baskin modification, which uses parallel transverse incisions with non-absorbable sutures[9].
– Grafting for complex curvatures (> 60°): to correct major curvatures, incision or partial excision techniques accompanied by grafts are used. Grafts may include autologous materials (such as tunica vaginalis, temporal fascia, or fascia lata), buccal mucosa, or xenografts such as porcine intestinal submucosa and bovine or human pericardium. The tunica vaginalis is a thin membrane that covers the testicles and has gained acceptance as a surgical option due to its ease of extraction, histological compatibility, and good blood supply, which favors graft integration. Compared to synthetic grafts, the tunica vaginalis is cheaper and has a lower risk of being removed due to post-operative infections[10]. The surgical procedure includes exposing the fibrous plaque, making an incision in the tunica albuginea to expose the underlying tissue, and harvesting the tunica vaginalis from the patient's ipsilateral testicle. The graft is then adapted and sutured to the affected site, ensuring its fixation without excessive stress and maintaining its vascularization. This surgical approach has been shown to be effective and safe in correcting the curvature associated with PD, providing good results in terms of erectile function and sexual satisfaction[11].

In summary, PD is a complex condition that can have a significant impact on patients' sexual function and quality of life. A multidisciplinary approach involving urologists, radiologists, and other specialists is critical to an accurate diagnosis and effective management of this disease. In addition, more research is needed to develop more effective therapies and better understand the underlying pathophysiology of PD.

Conclusion

PD is a complex condition that affects a significant percentage of the adult male population, with a prevalence that varies widely across studies. It is characterized by the formation of fibrous plaques on the penis, which can cause pain, curvature, and difficulties in sexual intercourse. Treatment for PD can be both non-surgical and surgical, depending on the stage of the disease and the severity of symptoms. In the acute phase, drug therapies can be used to relieve pain and prevent disease progression, although their long-term effectiveness is limited. Intralesional therapy with Clostridium histolyticum collagenase has emerged as a promising option in non-surgical treatment, demonstrating significant reductions in penile curvature in some patients.

For those with stable disease and persistent symptoms, tunica albuginea plication is a commonly used surgical option. This procedure seeks to correct the curvature of the penis by removing tissue and applying sutures to straighten the structure. While it can have risks and side effects, plication has been shown to be effective in improving sexual function and quality of life in many patients. In our hospital, we have successfully carried out plication procedures of the tunica albuginea in patients with PD, with satisfactory results in terms of curvature correction, pain relief, and improvement in erectile function. Our comprehensive approach, which includes thorough evaluation, careful procedure planning, and close post-operative follow-up, has contributed to the satisfaction and well-being of our patients.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of human subjects and animals. The authors declare that the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the World Medical Association and the Declaration of Helsinki. The procedures were authorized by the Institutional Ethics Committee.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from all patients, and secured approval from the Ethics Committee. SAGER guidelines have been followed as applicable to the nature of the study.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing or creation of the content of this manuscript.

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