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Diagnosis and Treatment of Ischemic Priapism in the Past 20 Years: What is New?

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ABSTRACT

Introduction: *Ischemic priapism (IP) is the most common form of Priapism. IP causes time-dependent damage to smooth muscle, which can lead to significant morbidity including permanent erectile dysfunction (ED), penile shortening, penile curvature, and loss of girth, without immediate intervention. In our study we revisited the most current developments in the diagnosis and treatment of this condition.*

Methods: *We searched the PubMed, CINAHL, ScienceDirect, LILACS, SciELO, and Google Scholar databases using the MeSH terms "priapism surgery," "corpus cavernosum", "shunt priapism," "ischemic priapism," and "penile prosthesis." The search was restricted to studies published in English, Portuguese, and Spanish between January 2005 and February 2025. After the deletion of duplicates, two researchers screened the abstracts of the retrieved articles. Articles selected for review were read by at least two researchers. Their notes were compared and arranged thematically.*

Results: *We ultimately analyzed 15 studies evaluating the most current types of priapism, epidemiological chararacteristics, diagnostic methods and surgical treatment.*

Conclusion: *IP affects mainly young men and can have devastating physical and psychological consequences if no devastating treated appropriately. Decisive management is needed to prevent time-dependent damage to the cavernous tissue and preserve sexual function. When conservative measures are not effective, distal shunts should be used with or without tunneling maneuvers. Currently, proximal shunt use and venous anastomosis are not recommended. In patients with IP episodes lasting more than 48 or 72 h and in refractory cases in which shunt use fails, penile prosthesis implantation is the most appropriate treatment option.*

Keywords
Priapism, Ischemic Priapism.

Introduction
Priapism is a urological emergency [1], and ischemic priapism (IP) is the most common form of this condition. IP causes time-dependent damage to smooth muscle, which can lead to significant morbidity including permanent erectile dysfunction (ED), penile shortening, penile curvature, and loss of girth, without immediate intervention [1,2].

The surgical treatment of IP has evolved over time. In this narrative review, we present diagnostic and treatment approaches employed for IP in the last 20 years.

Methods
We searched the PubMed, CINAHL, ScienceDirect, LILACS, SciELO, and Google Scholar databases using the MeSH terms "priapism surgery," "corpus cavernosum", "shunt priapism," "ischemic priapism," and "penile prosthesis." The search was restricted to studies published in English, Portuguese, and Spanish

between January 2005 and February 2025.

After the deletion of duplicates, two researchers screened the abstracts of the retrieved articles. Articles selected for review were read by at least two researchers. Their notes were compared and arranged thematically.

Results

We ultimately analyzed 15 studies with the following results:

Types of Priapism

Three types of priapism are currently recognized: ischemic, non-ischemic, and intermittent. IP is the most common, responsible for 95% of priapism cases. It is a corpus cavernosum compartment syndrome that restricts or blocks arterial flow to the penis. Non-ischemic priapism (NIP) refers to an erection that occurs due to the dysregulation of the penile arterial flow, usually as the result of penile trauma, that leads to arteriocavernous fistula formation. NIP may resolve spontaneously and carries a lower risk of ED development than does IP. Refractory cases of NIP are treated with selective arterial embolization [1,2].

Intermittent priapism is a subtype of IP characterized by recurrent painful erections lasting <4 h. It may resolve spontaneously or progress to a major ischemic event. It is treated with the goals of reducing the episode frequency and duration and preventing progression. Generally, patients are offered long-term pharmacotherapy [2,3]. Many patients with sickle cell disease who develop IP have histories of intermittent priapism, reflecting the shared pathology of these conditions [3,4].

Acute (veno-occlusive, low-flow) IP presents as a persistent, nonsexual erection characterized by little or no cavernous arterial blood flow and abnormal [hypoxic, hypercapnic, or acidotic] cavernous blood gases. The corpora cavernosa are completely rigid and sensitive on palpation, and patients report pain. Various etiological factors could lead to the failure of the detumescence mechanism in this condition. Acute IP is an emergent condition; left untreated, its natural history involves days to weeks of painful erections followed by the permanent loss of erectile function. The condition thus requires immediate evaluation and, potentially, the performance of an emergency procedure [5,6].

Epidemiological Characteristics

The analysis of priapism from epidemiological, etiological, diagnostic, and therapeutic perspectives is essential to improve affected patients' quality of life [7,8].

The prevalence of IP may vary geographically, influenced by genetic and socioeconomic factors. The incidence of the condition is not well established due to underreporting and the variability of its clinical presentation. The following pertinent epidemiological data were extracted from studies included in this review:

- Up to 35% of men with sickle cell disease experience episodes of priapism between the ages of 5 and 15 years, with a high recurrence rate when not treated appropriately [3,6].
- The estimated annual incidence is 1.5 cases per 100,000 men, and IP is the most common type, associated with recreational and antipsychotic drug use [1,2].
- Up to 5% of men with acute leukemia have priapism, and early intervention in these cases significantly improves the condition and reduces the risk of subsequent ED development [2].
- Between 2006 and 2009, 32,462 emergency department visits for priapism were recorded in the United States; similar statistics have been reported for other countries [9].
- Some cases of a clitoral variant of priapism in women, associated with malignant neoplasms and antidepressant medication use, have been reported [10].

Diagnosis of Priapism

The diagnosis of priapism is based on anamnesis and physical examination, aided by specific complementary tests, among which cavernous blood gas analysis is essential. The latest guideline from the American Urological Association makes four recommendations for priapism diagnosis [6]:

- the collection of the patient's clinical, sexual, and surgical history, and the performance of a physical examination including the genitals and perineum
- the performance of cavernous arterial blood gas analysis during the initial manifestation of priapism
- the use of penile Doppler ultrasound when the diagnosis of IP versus NIP is uncertain
- the request for additional tests to determine the etiology of diagnosed IP, provided that these tests can be performed simultaneously and do not delay definitive treatment.

Surgical Treatment

The surgical treatment of IP and employee in cases refractories to the measures conservative. A cavernous shunt is placed, and a penile prosthesis is implanted if the shunt fails. The main types of cavernous shunt described are percutaneous distal shunts, open distal shunts, proximal shunts, and venous anastomosis [11].
The following percutaneous distal bypass procedures have been described in the literature:

Winter Technique

A biopsy needle is used to create communication between the corpora cavernosa and the glans, allowing for the external drainage of blood trapped in the former [12].

Ebbehoj Technique

Multiple small incisions are made in the distal tunica albuginea of the corpus cavernosum. Reported detumescence and ED rates following the use of this technique are 61% and 39%, respectively [2].

T-shunt Placement

A deep incision is made in the corpus cavernosum body with a #11 blade, which is immediately rotated 90° laterally with movement away from the urethral ostium. In an optional second stage, a #8

Hegar dilator is passed through the newly formed fistula. Reported detumescence and ED rates following this procedure are 92% and 38%, respectively [13].

These procedures are performed relatively quickly, produce immediate relief, are less complex than proximal procedures, and are effective when performed in the first hours of priapism manifestation. In some cases, however, additional measures are needed to achieve complete resolution, especially in cases of prolonged priapism. These measures include the following:

Al-Gorhab Technique: This open distal bypass procedure involves the bilateral excision of a circular segment from the distal tunica albuginea, the glans defect, and closure with absorbable sutures [14].

Quackels Technique: Proximal communication is created between the corpora cavernosa and the corpus spongiosum of the penis. Proximal shunting has fallen into disuse due to the greater risk of complications such as urethrocavernous fistula and urethral stricture [15].

Grayhack Technique: An anastomosis is performed between the corpora cavernosa and the saphenous vein. The incision is then closed and a dressing is applied. Venous anastomoses have been abandoned due to the risk of pulmonary embolism and greater technical difficulty of the procedure [16].

Penoscrotal Decompression: A 3-cm incision is made at the penoscrotal junction and the corpus cavernosum is exposed. A unilateral and developed opening is made, through which deoxygenated blood is expressed. This is a promising technique, but further studies are needed to confirm its long-term effectiveness [17].

Penile Prosthesis Implantation: This approach is appropriate when IP has caused irreversible tissue damage involving necrosis or fibrosis of the corpora cavernosa that prevents normal erectile function [i.e., when an episode has lasted >72 h], and when previous procedures have not generated the desired result. Inflatable prostheses allow for more natural and physiological erectile function and have a better appearance and sensation when not inflated, but they are more expensive and prone to mechanical failure. Semi-rigid prostheses have a lower risk of mechanical failure and are implanted with a simpler and less-invasive surgical procedure, but they are less natural and can cause more discomfort and cavernous tissue wear [18,19]. The choice of penile prosthesis depends on the extent of tissue damage and the patient's preference. Thorough evaluation and detailed consultation with a urology specialist are crucial for the determination of the best treatment option.

Discussion

Priapism, defined as a penile erection persisting for >4 h despite orgasm and in the absence of sexual stimulation, is a urological emergency. It has three types: IP, NIP, and intermittent priapism [1]. IP is most common, accounting for 95% of priapism cases. It is a corpus cavernosum compartment syndrome resulting in the restriction or blocking of arterial flow to the penis. Without immediate intervention, it causes time-dependent damage to smooth muscle, which can lead to significant morbidity (including permanent ED, penile shortening, penile curvature, and loss of girth) [1,2].

The surgical treatment of IP has evolved over time from invasive and health-threatening procedures (e.g., direct penile incision with knives) used in ancient times to less-invasive cavernous blood aspiration with hypodermic needles in the 18th and 19th centuries and the use of various types of shunt to create communication between the corpora cavernosa and adjacent structures (i.e., via Winter, Al-Ghorab, Quackels, Grayhack, T-shunt, and penoscrotal procedures) in the 20th century. The most recent innovations are minimally invasive endovascular procedures and the use of lasers to create shunts with greater precision, which minimize complications and improve patient outcomes [2].

The first step in the treatment of priapism is the aspiration of the corpus cavernosum using a 16–18-gauge scalpel. A sample of the corpus cavernosum aspirate should be submitted to blood gas analysis. Hypoxic, hypercapnic, and acidotic blood gas confirms the diagnosis of IP [1,2]. After aspiration, the corpus cavernosum can be irrigated with 0.9% normal saline, which leads to detumescence in approximately 30% of cases [2,3]. If this fails, a sympathomimetic agent should be injected into the corpus cavernosum with simultaneous cardiac monitoring [4]. Phenylephrine is the most commonly used agent, and it achieves detumescence in up to 80% of cases [1,2]. In refractory cases, surgical treatment is required to preserve erectile function, prevent tissue necrosis, alleviate pain, avoid major complications, and improve the patient's quality of life [2].

Conclusion

IP affects mainly young men and can have devastating physical and psychological consequences if no devastating treated appropriately. Decisive management is needed to prevent time-dependent damage to the cavernous tissue and preserve sexual function. When conservative measures are not effective, distal shunts should be used with or without tunneling maneuvers. Currently, proximal shunt use and venous anastomosis are not recommended. In patients with IP episodes lasting more than 48 or 72 h and in refractory cases in which shunt use fails, penile prosthesis implantation is the most appropriate treatment option.

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