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# Priapism – we need to act fast. Definition, diagnosis and management

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## Abstract

Priapism refers to a prolonged erection caused by dysfunction in the mechanisms that control penile tumescence, rigidity, and flaccidity. An accurate diagnosis of priapism is urgent and

requires identifying the underlying hemodynamic causes. The aim of this study is to identify the different types of priapism, examine its pathogenesis and epidemiology, and to present evidence-based guidelines for effective management. A thorough review of the current guidelines and relevant literature was conducted. The articles with the highest level of evidence were chosen. Swift diagnosis and effective management of priapism are crucial to prevent unnecessary interventions and ensure the best possible outcomes for erectile function.

**Key words:** priapism, ischemic, non-ischemic, diagnosis, treatment

## 1. Introduction

Priapism is a rare but serious medical condition characterized by a prolonged, often painful erection of the penis that lasts for more than four hours, in the absence of sexual arousal or stimulation. The condition can occur due to a variety of underlying causes and typically involves an abnormality in the blood flow to the penis.[1]

The male penis is composed of two longitudinal corpora cavernosa arranged parallel along the shaft and one corpus spongiosum, which forms the glans of the penis. The corpora cavernosa are made up of numerous sinusoids that fill with blood during an erection, causing them to enlarge and stiffen. Under the influence of sexual arousal, arterial blood flows into the corpora cavernosa and corpus spongiosum, while simultaneously the venous outflow of blood decreases, which allows the erection to be maintained for a longer period, typically until the sexual stimulus or arousal subsides. In priapism, this mechanism is disturbed, leading to a prolonged erection that persists beyond sexual arousal, often due to an abnormality in blood flow or the inability to properly drain blood from the penis.[2]

The current approach to the management of priapism focuses on three objectives: resolving the acute episode, preserving erectile function, and preventing recurrence.[3]

## 2. Categorization

Priapism is categorized into two main types.

Ischemic (Low-flow) Priapism

This is the more common and dangerous type of priapism. It occurs when blood becomes trapped in the penis and is unable to drain properly. As a result, the penis remains erect for extended periods, which can lead to tissue damage if not treated promptly.

Non-ischemic (High-flow) Priapism

This type is less common and usually less painful. It occurs when there is unregulated or excessive blood flow into the penis, typically due to an injury that causes damage to the blood vessels (e.g., pelvic trauma). The erection is generally less rigid than in ischemic priapism.[4]

## 3. Prevalence

Priapism is a rare condition, but its exact frequency can vary depending on the underlying causes. It is estimated to occur in about 1,5 in 100,000 males per year in the general population. However, the incidence may be higher in certain groups.[5]

## 4. Diagnosis

History

Conducting a thorough interview is crucial in the diagnosis and treatment of priapism. The medical history must include detailed information about hematological abnormalities (e.g., sickle cell disease) and a history of pelvic, genital, or perineal injuries. The sexual history should cover the duration of the erection, the presence and degree of pain, any previous pharmacological treatments, recreational drug use, the history of priapism, and methods of treatment, as well as the quality of erections prior to the most recent episode of priapism. The interview can help determine the underlying subtype of priapism.[6][7]

Physical examination

In ischemic priapism, the corpora cavernosa are completely rigid and painful, while the glans penis remains soft. The patient typically experiences intense pain. A pelvic examination may uncover an underlying malignancy in the pelvic or genitourinary region.[8]

In non-ischemic priapism, the corpora cavernosa are tumescent but not completely rigid. Examination of the abdomen, penis, and perineum may show signs of trauma. A neurological assessment is recommended if a neurogenic cause is suspected.[7]

Laboratory testing

Laboratory investigations should encompass a full blood count, white blood cell count with differential, platelet count, and coagulation profile to assess for anemia and identify any blood-related abnormalities.[9]

Aspiration of blood from the corpora cavernosa is mandatory as an initial examination. Blood aspiration from the corpora cavernosa reveals bright red arterial blood in non-ischemic priapism, while the blood is dark in ischemic priapism.[7]

Blood gas analysis is essential to differentiate ischemic priapism from non-ischemic priapism. The blood gas values in high-flow priapism show normal arterial blood with pO2 > 90 mmHg, pCO2 < 40 mmHg, and pH 7.40, while in ischemic priapism (first blood aspiration), the values are pO2 < 30 mmHg, pCO2 > 60 mmHg, and pH < 7.25.[7]

Additional laboratory tests should be determined based on the patient's medical history, clinical examination, and initial findings. These tests may include specialized assessments, such as hemoglobin electrophoresis, to diagnose sickle cell disease or other hemoglobinopathies.[9]

**Table 1:** Key findings in priapism [7]

| | **Ischaemic priapism** | **Non-ischaemic priapism** |
|---|---|---|
| Corpora cavernosa fully rigid | Typically | Seldom |
| Penile pain | Typically | Seldom |
| Abnormal penile blood gas | Typically | Seldom |
| Haematological abnormalities | Sometimes | Seldom |
| Recent intracavernosal injection | Sometimes | Sometimes |
| Perineal trauma | Seldom | Typically |

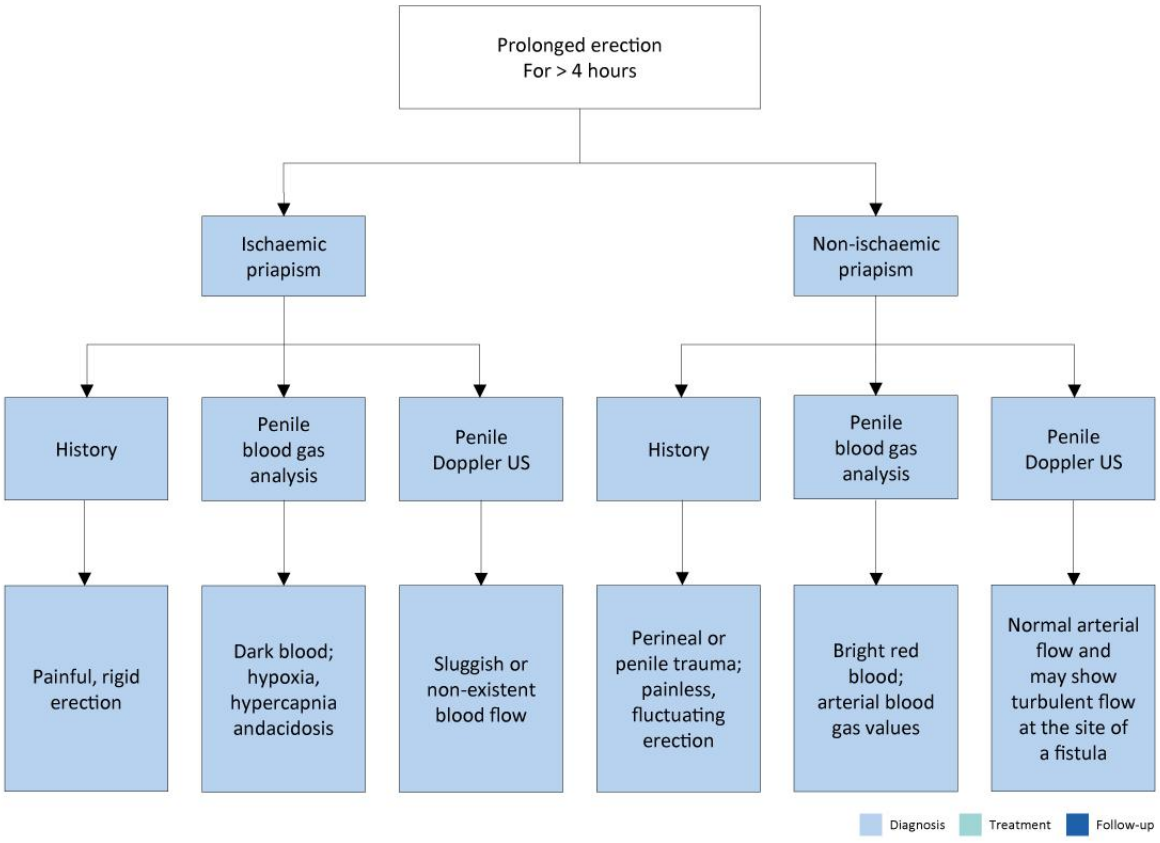
**Table 2**: Typical blood gas values [7]

| **Condition** | **$pO_2$ (mmHg)** | **$pCO_2$ (mmHg)** | **pH** |
|---|---|---|---|
| Normal arterial blood (room air)<br>(similar values are found in arterial priapism) | >90 | <40 | 7.40 |
| Normal mixed venous blood (room air) | 40 | 50 | 7.35 |
| Ischaemic priapism (first corporal aspirate) | < 30 | > 60 | < 7.25 |

Penile imaging

After a clinical diagnosis, Colour Doppler ultrasound of the penis and perineum is recommended and can distinguish between ischemic and non-ischemic priapism, serving as an alternative or supplement to blood gas analysis. Colour Doppler ultrasound can detect the presence of a fistula as a blush, with 100% sensitivity and 73% specificity.[10]
Ultrasound of the penis should be conducted before performing corporal blood aspiration in ischemic priapism to avoid misinterpreting abnormal blood flow, which may resemble a non-ischemic or reperfusion pattern after treatment for low-flow priapism.[11]

**Figure 1:** Differential diagnosis of priapism




There are limited randomized controlled trials on priapism management due to the urgent nature of the condition. However, numerous society guidelines, surgical case reports, and basic science studies have been published. A solid understanding of the underlying pathophysiology and penile hemodynamics enables urologists to safely and effectively prioritize patients for the appropriate medical and surgical treatments.

## 5. Ischemic priapism

Definition

Ischemic priapism is characterized by rigid corpora, little to no blood flow into the cavernous tissue, and complete blockage of venous outflow. This blood stasis leads to a progressively more acidic environment within the corpora, caused by a lack of oxygen (hypoxia) and an excess of carbon dioxide (hypercarbia).[12]

Ischemic priapism is the most prevalent form of priapism, making up more than 95% of all cases.[12]

Ischemic priapism lasting longer than 4 hours resembles compartment syndrome and is marked by the onset of ischemia within the enclosed space of the corpora cavernosa, significantly disrupting blood flow to the area. Immediate medical treatment is essential to prevent irreversible damage, such as smooth muscle necrosis, fibrosis of the corpora, and the onset of permanent erectile dysfunction (ED).[13]

The length of time that ischemic priapism persists is the primary factor in predicting irreversible outcomes, including erectile dysfunction (ED). In this regard, treatments administered more than 48-72 hours after onset may alleviate the erection and pain, but they offer limited clinical benefit in preventing long-term ED.[14]

Etiological factors

In most cases of ischemic priapism, no specific pathophysiological causes can be identified. However, common underlying factors include sickle cell disease (SCD), hematological disorders, neoplastic syndromes, and certain medications (e.g., intracavernosal PGE1 therapy).

**Table 3**: Aetiological factors for the development of priapism [7][15][16]

| | |
|---|---|
| **Idiopathic** | - |
| **Haematological dyscrasias, vascular and other disorders** | ➢ SCD<br>➢ thalassemia<br>➢ leukaemia<br>➢ multiple myeloma<br>➢ haemoglobin Olmsted variant<br>➢ fat emboli during hyperalimentation |

| | |
|---|---|
| | ➢ haemodialysis<br>➢ glucose-6-phosphate dehydrogenase deficiency<br>➢ factor V Leiden mutation<br>➢ vessel vasculitis<br>➢ (e.g., Henoch-Schönlein purpura; Behçet's disease; anti-phospholipid antibodies syndrome) |
| **Infections (toxin-mediated)** | ➢ scorpion sting<br>➢ spider bite<br>➢ rabies |
| **Metabolic disorders** | ➢ amyloidosis<br>➢ Fabry's disease<br>➢ gout |
| **Neurogenic disorders** | ➢ syphilis<br>➢ spinal cord injury<br>➢ cauda equina<br>➢ syndrome<br>➢ autonomic neuropathy<br>➢ lumbar disc herniation<br>➢ spinal stenosis<br>➢ cerebrovascular accident<br>➢ brain tumour<br>➢ spinal anaesthesia |
| **Neoplasms (metastatic or regional infiltration)** | ➢ prostate<br>➢ urethra<br>➢ testis<br>➢ bladder<br>➢ rectal<br>➢ lung, kidney |
| **Medications** | ➢ Vasoactive erectile agents (i.e., papaverine, phentolamine, prostaglandin E1/alprostadil, combination of intracavernous therapies)<br>➢ α-adrenergic receptor antagonists (i.e., prazosin, terazosin, |

| | |
|---|---|
| | doxazosin and tamsulosin)<br>➢ Anti-anxiety agents (hydroxyzine)<br>➢ Anticoagulants (heparin and warfarin)<br>➢ Antidepressants and antipsychotics (i.e., trazodone, bupropion, fluoxetine, sertraline, lithium, clozapine, risperidone, olanzapine, chlorpromazine, thioridazine, phenothiazines and methylphenidate)<br>➢ Antihypertensives (i.e., hydralazine, guanethidine and propranolol)<br>➢ Hormones (i.e., gonadotropin-releasing hormone and testosterone)<br>➢ Recreational drugs (i.e., alcohol, marijuana, cocaine [intra nasal and topical], and crack, cocaine) |

Treatment

Several nonspecific home remedies, such as exercise, ejaculation, ice packs, cold baths, and cold enemas, have been suggested for ischemic priapism. However, there is limited evidence supporting their effectiveness, and they are not recommended—especially if they delay the initiation of more appropriate, evidence-based treatments.[17]

Acute ischemic priapism is a medical emergency that requires immediate intervention. Prompt treatment is essential and should be carried out in a systematic manner. The primary goal of treatment is to achieve penile detumescence without causing pain, thereby preventing corporal smooth muscle fibrosis and the risk of subsequent erectile dysfunction (ED).[13][14]

The first step in managing ischemic priapism should be to perform a dorsal nerve block using an appropriate local anesthetic. Although anesthesia may not relieve ischemic pain, local anesthesia helps facilitate subsequent treatments.[4][7]

First line treatment

The current standard of care for treating ischemic priapism involves a combination of aspiration, with or without irrigation using a 0.9% saline solution, along with intracavernous injection of pharmacological agents. Blood aspiration can be carried out through intracorporeal access, either via the glans or by percutaneous needle insertion into the lateral side of the proximal penile shaft, using a 16 or 18 G angio-catheter or butterfly needle.[18]

Some clinicians recommend using two angiocatheters or butterfly needles simultaneously to expedite drainage, along with concurrent aspiration and irrigation using a saline solution.[19] Pharmacological agents include sympathomimetic drugs like phenylephrine (intracavernous injection of 200 μg every 3-5 minutes, maximum dosage is 1 mg within 1 hour) or adrenaline (intracavernous injection of 2 mL of 1/100,000 adrenaline solution up to five times over 20 minutes).[20][21]

Patients should be informed about the potential side effects of sympathomimetic drugs, such as headache, palpitations, and dizziness. Therefore, it is advisable for patients undergoing repeated aspiration, sympathomimetic injections, or irrigations to be continuously monitored by automated blood pressure cuffs and heart rate monitors.[22]

Second-line treatment

Second-line intervention typically refers to surgical procedures such as creating a shunt or implanting a penile prosthesis in cases of refractory or delayed ischemic priapism, and should be considered only when other treatment options have failed. There is no specific evidence detailing the exact timeframe before transitioning to surgery after first-line treatment; however, a period of at least 1 hour of first-line treatment without improvement may be considered before moving to surgical intervention.[23]

Penile shunt surgery aims to divert ischemic blood from the corpus cavernosum to the corpus spongiosum, restoring normal blood flow in these structures. The procedure involves creating an opening in the tunica albuginea, allowing blood to drain into either the glans, corpus spongiosum, or a nearby vein.[7][24]

The choice of shunt procedure depends on the surgeon's preference and experience with the technique. However, distal shunts are less invasive and are linked to reduced rates of post-operative erectile dysfunction, making them the preferred initial surgical approach.[24]

There are four recognized categories of shunt procedures:

- Percutaneous distal (corpora-glanular) shunts: Winter’s procedure, Ebbehoj’s technique and T-Shunt.
- Open distal (corpora-glanular) shunts: Al-Ghorab’s procedure, Burnett’s technique (Snake manoeuvre)
- Open proximal (corpora-spongiosal) shunts: Quackles’s technique
- Vein anastomoses/shunts: Grayhack’s procedure

## 6. Non ischemic priapism

Non-ischemic priapism is a prolonged erection caused by uncontrolled arterial inflow into the cavernous bodies. It is much rarer than ischemic priapism, accounting for only 5% of all priapism cases. The most common cause of non-ischemic priapism is blunt trauma to the perineum or penis. This injury typically causes a tear in the cavernosal artery or its branches, creating a fistula between the artery and the lacunar spaces of the sinusoidal tissue. The resulting surge in blood flow leads to an ongoing and extended erection.[7][25]

There is often a delay of two to three weeks between the trauma and the onset of priapism. This delay is believed to result from spasm or ischemic necrosis of the affected artery, with the fistula forming only after the spasm resolves or the ischemic segment ruptures. Priapism usually occurs after a nocturnal erection or one related to sexual activity, causing a sudden surge in blood flow and pressure in the cavernous arteries. Patients typically report an erection that is not fully rigid and is painless, as venous drainage remains unaffected and the penile tissue does not undergo ischemia.[26]

While it is traditionally believed that non-ischemic priapism does not require urgent management, as the corpus cavernosum does not contain ischemic blood, recent data suggest that the duration of non-ischemic priapism can also affect erectile function.[27] The primary goal of treatment is to close the fistula. Non-ischemic priapism may be managed with conservative approaches or direct perineal compression. If these methods are ineffective, selective arterial embolization is required.[28] Conservative treatment may involve applying ice to the perineum or performing perineal compression, usually guided by ultrasound. In some cases, the fistula may close on its own.[29] Selective arterial embolization can be carried out using temporary materials like autologous blood clots and gel foam, or permanent agents such as microcoils, ethylene-vinyl alcohol copolymer (PVA), and N-butyl-cyanoacrylate (NBCA).[30] Surgery is infrequently required and should only be considered when selective embolization is contraindicated, unavailable, or has been unsuccessful after multiple attempts.[26]

## 7. Summary

Priapism is a frequent urologic emergency that urologists should be proficient in managing. The primary objectives of diagnosis and treatment are to resolve the acute episode, preserve erectile function, and prevent recurrence. Management of priapism is tailored to the specific diagnosis. While conservative treatment options like aspiration, irrigation, and surgical shunts

are effective for many patients, those who are resistant to these interventions or experience prolonged priapism may benefit from the implantation of a penile prosthesis (PP). Ongoing research is essential to better understand the pathology of corporal smooth muscle in relation to genetic and acquired conditions that contribute to ischemic priapism. It is crucial to document erectile function outcomes based on the duration of ischemic priapism, the time to intervention, and the types of interventions used in order to develop evidence-based guidelines.

**Disclosure**

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