



Functional Urology

Ischemic penile necrosis following embolization of the prostate for benign prostatic hyperplasia: A case report

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ABSTRACT

Prostatic artery embolization (PAE) provides a minimally invasive approach for treating benign prostatic hyperplasia (BPH) by occluding prostatic arteries to decrease prostate volume. While offering benefits, PAE can lead to severe complications, such as ischemic necrosis of the penis, due to unintended embolization of penile arteries. This is highlighted by the case of a 62-year-old man who, after PAE, suffered from glans necrosis accompanied by intense perineal pain and acute urinary retention. Although conservative treatment facilitated recovery, his erectile function remains compromised and urinary symptoms have worsened. This underscores the importance of discussing potential risks and alternatives with patient.

1. Introduction

Prostatic artery embolization (PAE) is a minimally invasive procedure that is increasingly used to treat benign prostatic hyperplasia (BPH).¹ The principle involves selective embolizing of the prostatic arteries in order to induce ischemic necrosis of the prostate, leading to a reduction in its size and consequently a reduction in lower urinary tract symptoms (LUTS).² Although prostatic artery embolization (PAE) is generally safe and effective, it is not devoid of complications, largely due to the vascular complexity of the pelvic region.³ Among these complications, ischemic penile necrosis stands out as a rare but serious condition, resulting from inadvertent embolization of the adjacent penile arteries.¹ We present a case of ischemic penile necrosis in a 62-year-old patient who had undergone prostatic artery embolization as part of his treatment for benign prostatic hyperplasia.

2. Case presentation

A 62-year-old patient came to the emergency department on the 10th day after prostatic artery embolization, experiencing acute perineal pain and severe dysuria. On physical examination, the patient was found to be hemodynamically and respiratory stable, as well as afebrile. He

reported experiencing intense perineal pain, which he rated as 10/10 on the visual analogue scale. Urological examination revealed an ulceration around the urinary meatus that appeared necrotic and covered with scabs. A rectal examination showed a firm and painful prostate.

The patient experienced symptoms one day after choosing prostatic embolization for his benign prostatic hyperplasia (BPH), which did not improve with alpha-blocker treatment (alfuzosin). An ultrasound showed that his prostate weighed 70 g, leading to a severe International Prostate Symptom Score (IPSS) of 28 and a Quality of Life (QoL) score of 6. However, his erectile function remained normal, with a score of 21 on the International Index of Erectile Function-5 (IIEF-5). He had a maximum urine flow rate of 5 ml/s. For personal reasons, the patient underwent bilateral embolization of the prostatic artery conducted in an external facility. The pre-embolization angioscan of the prostatic arteries showed a prostatic artery that originated bilaterally from the inferior vesical artery, without any detectable anastomosis (Fig. 1).

Embolization was performed bilaterally under digital subtraction angiographic guidance, without using a cone beam, using microspheres 500–700 μm microspheres. The day after the operation, the patient began to experience painful glans ecchymosis, which progressed to necrosis on the sixth day (Fig. 2), accompanied by a deterioration of his urinary symptoms. This led him to seek care at the emergency

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department.

A pelvic magnetic resonance imaging showed haemorrhagic lesions in the left penile bulb (Fig. 3-a), accompanied by a lack of enhancement (Fig. 3-b). Penile Doppler ultrasound revealed an isolated obstruction of the right dorsal penile artery with permeabilization upstream (Fig. 4-a), while the cavernous arteries (Fig. 4-b) and periurethral artery remained permeable (Fig. 4-c).

Initial management involved the administration of analgesics (morphine) and local care (fusidic acid), along with cleansing using saline and sterile compresses. Subsequently, acute urine retention occurred, which required urinary catheterisation with an 18 gauge silicone Foley catheter. Conservative treatment was considered, including oral analgesics (Paracetamol 400 mg - Codeine 20 mg three times daily), tadalafil 5 mg/day, acetylsalicylic acid 100 mg/day, and continuation of daily local care.

The patient was monitored regularly. From his admission (Fig. 5-a) to day 18 after the embolization, a noticeable reduction in pain was observed, with the pain score decreasing to 6/10, allowing for the removal of the urinary catheter. This marked the beginning of the healing process, characterised by the formation of crusts (Fig. 5-b). On day 60, the patient reported no pain and the glans had fully healed (Fig. 5-c). From a urinary point of view, the International Prostate Symptom Score (IPSS) was 26, indicating severe dysuria characterised by a 'sprinkler head' pattern of urination. Follow-up ultrasound showed a prostate weighing 70 g with heterogeneous appearance, including necrosis areas, a grade 3 prostatic protrusion index, and a residual post-void volume of 40 ml. The maximum urinary flow rate was measured at 4.2 ml/s. Furthermore, the patient experienced a significant deterioration in erectile function, scoring 7 points on the International Index of

Erectile Function-5 (IIEF-5), which prevented sexual intercourse.

3. Discussion

Prostatic artery embolization (PAE) represents a novel, minimally invasive approach to the treatment of patients with benign prostatic hyperplasia (BPH). However, its application in clinical practice is still under investigation.¹ In fact, although PAE has been developed to avoid altering ejaculatory function - a common problem associated with endoscopic resection⁴ - it has yet to be included in the recommended management strategies for benign prostatic hyperplasia.^{5,6} This omission is due in part to insufficient data on its potential complications.

Penile necrosis is one of the major complications of PAE, with the potential for long-term urinary and sexual dysfunction.⁷ It results from the migration of intravascular particles into the penile artery, most commonly as a consequence of non-targeted embolization.⁸

The clinical presentation is primarily characterised by intense recurrent pain in the penis, accompanied by a worsening of urinary symptoms, manifested by pronounced dysuria, with a probability of progressing to acute urinary retention.⁹ In the reported case, the patient exhibited intense perineal pain associated with the progressive onset of complete urinary retention, necessitating catheterisation of the bladder. This deterioration in lower urinary tract symptoms (LUTS) could be attributed to bladder damage associated with microparticle migration, as well as detrusor hyperactivity.¹⁰ Disorders of sexual function were also observed, including erectile dysfunction and pain after ejaculation.⁷ Ischemia of the cavernous artery, the deep dorsal artery, or the bulbourethral artery may be the underlying cause of impaired erectile function.¹⁰

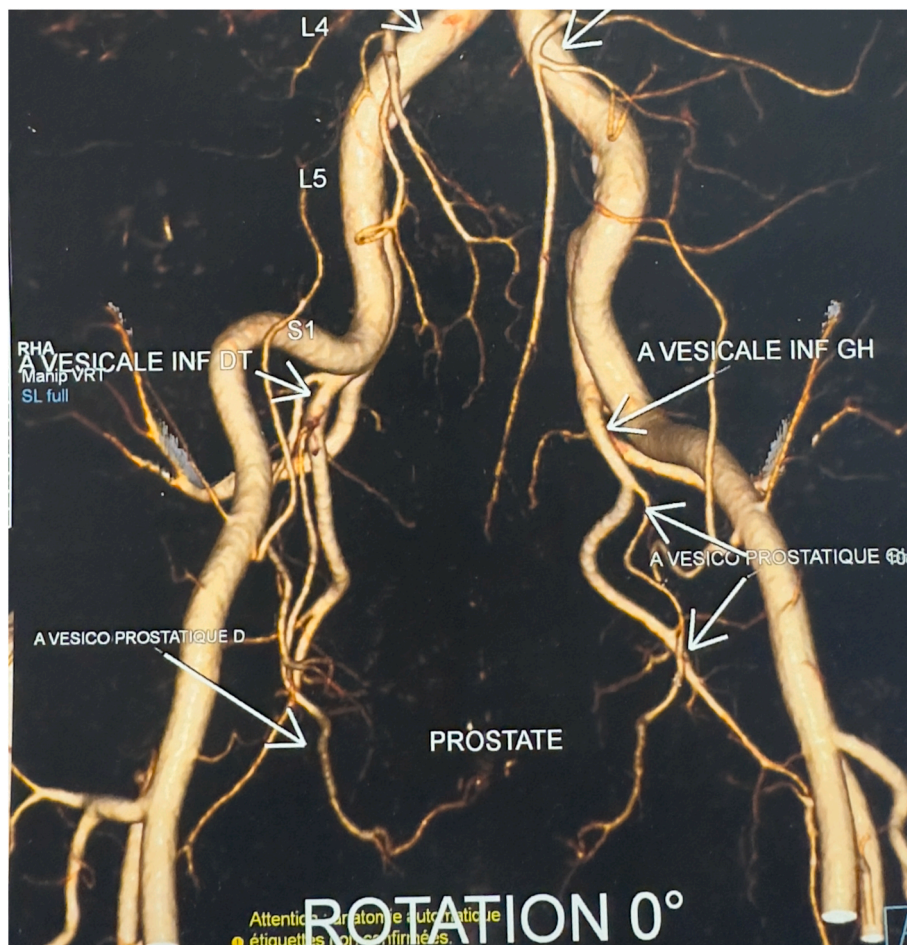


Fig. 1. Pre-embolization angiography of the prostatic arteries showing their origin from the inferior vesical artery.



Fig. 2. Peri-meatal necrosis of the glans on the 6th day after embolization.

The diagnosis of penile necrosis is clinical, characterised by areas of discolouration, ulceration, or necrosis, most frequently in the glans.⁷ Diagnostic efforts can be enhanced with Doppler ultrasound of the penile vessels, which can uncover obstruction in one or more penile arteries and provide a detailed overview of the patient's erectile hemodynamics.¹¹ Furthermore, complementary magnetic resonance imaging will reveal areas of hemorrhagic infarction, evident by hyperintensity of T1 and hypointensity of T2, in the central gland of the embolised side.¹²

Complications after PAE are often attributed to a limited understanding of the anatomy of the target vessel. Factors such as variability in the origin of prostatic arteries, tortuosity, and vessel stenosis upstream of these arteries predispose people to these complications.¹³ Preoperative angioscan of the prostatic arteries has shown a sensitivity

of 59 % and a specificity of 94 % for detecting these anastomoses.¹⁴ Furthermore, intraoperative cone beam computed tomography can help identify prostatic artery anastomoses, facilitating safer and more effective embolization compared to conventional angiography.¹⁵ From a technical point of view, ensuring a better distribution of embolic material in the prostatic arteries can be achieved by performing initial proximal embolization, followed by distal embolization at a later stage.¹⁶ With regard to the optimal diameter of the embolization particles, a consensus has not yet been reached.

Currently, there are no official guidelines for the treatment of penile necrosis following PAE. Treatment measures include bladder catheterisation in cases of urinary retention and the administration of type 5 phosphodiesterase inhibitors for erectile dysfunction. The management strategy seems to focus on local treatments, which include analgesics, anti-inflammatories, fusidic acid or potassium permanganate applied with moist saline compresses.^{1,7,9} Consideration of antibiotic therapy with ciprofloxacin at a dose of 1g per day may also be recommended.¹¹ Furthermore, daily intake of 100 mg Aspirin has shown significant benefits in improving vasculogenic erectile dysfunction.¹⁷ Furthermore, the incorporation of hyperbaric oxygen therapy has been shown to enhance penile sensitivity and erectile function.⁷ The use of Pentoxifylline 400 mg daily to help blood circulation is also documented.¹¹ Revascularisation attempts have not been recognised as a viable treatment approach, with only one reported case of desobstruction, which was unsuccessful.¹⁰

Our study is subject to several limitations. The absence of long-term follow-up prevented the evaluation of sexual function over an extended period. Furthermore, since embolization was performed outside our facility, our limited access to Digital Subtraction Angiography images restricts our ability to precisely analyse the embolization technique used and identify any anastomoses or anatomical variations that could have played a role in the emergence of this complication. These limitations imply that future research should incorporate long-term follow-up and comprehensive documentation of procedures to enhance understanding of the risks associated with prostate embolization.

4. Conclusion

The embolization of prostatic arteries (PAE) is a technique that is not without risks, including potential complications affecting the penis, bladder, or rectum. These risks arise from the operator-dependent nature of the procedure, the prevalence of anatomical variations, and the embolization technique itself. It is crucial that patients are fully informed about the potential impacts of PAE on sexual and urinary



Fig. 3. Magnetic resonance imaging of the perineal region showing hemorrhagic lesions in the left penile bulb, accompanied by a lack of enhancement
a) axial T1 fat-saturated sequence showing a hyperintense lesion of the left penile
b) postcontrast T1 sequence showing a hyperintense lesion of the left penile bulb with an enhancement defect.

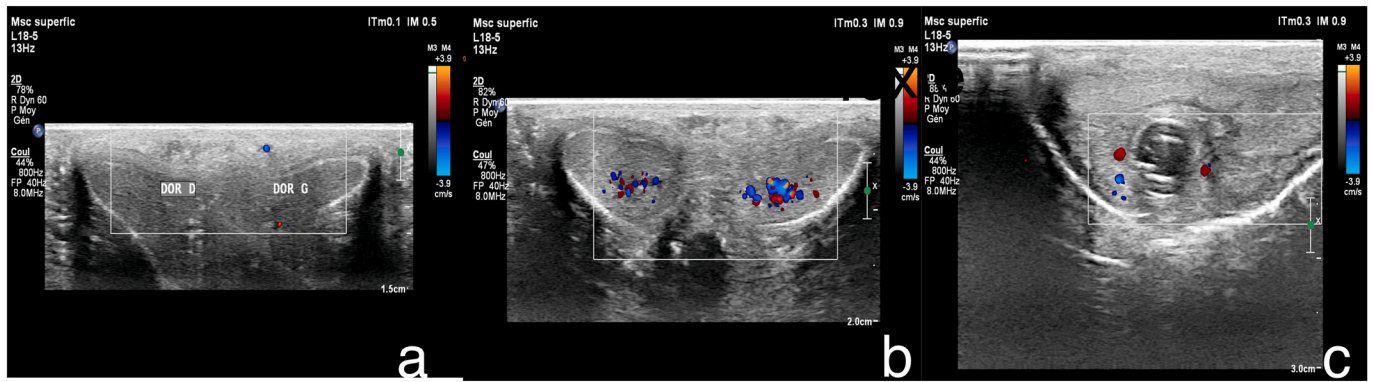


Fig. 4. Doppler ultrasound of the penile arteries showing an isolated obstruction of the dorsal right penile artery.

- a) Doppler ultrasound of the dorsal penile artery showing an isolated obstruction of the right dorsal penile artery with upstream permeabilization.
 b) Doppler ultrasound of the cavernous arteries showing their permeability.
 c) Doppler ultrasound of the urethral artery showing its permeability.

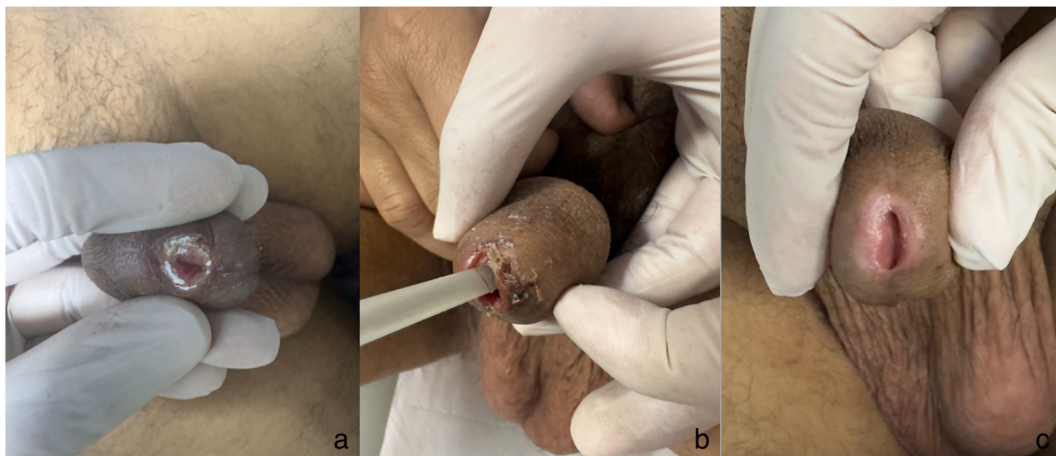


Fig. 5. Progression of glans penis avascular necrosis following prostatic artery embolization

- a) 10 days after operation
 b) 18 days after operation
 c) 60 days after operation.

functions to help them make well-informed decisions. Discussing alternative treatments for benign prostatic hyperplasia (BPH) is important, considering the severity of potential complications from PAE. Early identification and management of complications such as ischemic penile necrosis are crucial for reducing severity and improving outcomes.

CRediT authorship contribution statement

Ghassane El Omri: Conceptualization, Data curation, Investigation, Methodology, Resources, Writing – original draft, Writing – review & editing. **Anas Taghouan:** Conceptualization, Funding acquisition, Investigation, Methodology, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. **Hamza Rais:** Conceptualization, Investigation, Methodology, Resources, Visualization. **Younes Houry:** Investigation. **Moussaab Rachid:** Investigation. **Mohamed Reda Cherkaoui Jaouad:** Investigation, Resources. **Abdeljalil Heddad:** Conceptualization, Supervision, Validation.

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Abbreviations

UM6SS: Mohammed VI University of Health Sciences WHO: World Health Organisation
 PAE:: Prostatic artery embolization BPH: benign prostatic hyperplasia LUTS: lower urinary tract symptoms
 IPSS:: International Prostate Symptom Score QoL: Quality of Life
 IIEF-5:: Index of Erectile Function-5