



An unusual complication of prostatic arterial embolization: penile glans necrosis

Una complicación inusual de la embolización arterial prostática: necrosis del glande del pene

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Abstract

Clinical case description: the case of an 84-year-old male is presented, who developed penile glans necrosis over several days following prostatic arterial embolization. Due to the progression of the condition, a partial penectomy had to be performed for resolution.

Relevance: prostatic arterial embolization represents an effective approach for benign prostatic hyperplasia, although it is not without risks. As embolization of non-target areas is a very unusual but serious complication, there is a need of knowing and describing this kind of results.

Clinical implications: despite the unusual nature of penile glans necrosis, early recognition and diagnosis is crucial to prevent the worse outcomes. There are several clinical treatments before a surgical option that includes hyperbaric oxygen therapy or phosphodiesterase 5 inhibitors which have a short opportunity window.

Conclusion: gland necrosis is a rare but serious condition that requires intensive and constant management to try to achieve its reversal. Ultimately, its treatment consists of partial or total penectomy.

Keywords:

Prostate, Embolization,
Necrosis, Glans,
Penectomy.

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Citation: Serret de Troya C, Donis Canet F, García Juarranz C, Bermúdez Rodríguez J, Ziani Akirout H, Sánchez-Pedreño M. An unusual complication of prostatic arterial embolization: penile glans necrosis. *Revista Mexicana de Urología*. 85(4): 1–8.

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Accepted: August 17, 2025

Received: September 25, 2024



Resumen

Descripción del caso clínico: se presenta el caso de un hombre de 84 años que desarrolló necrosis del glande del pene durante varios días tras una embolización arterial prostática. Debido a la progresión de la afección, fue necesario realizar una penectomía parcial para su resolución.

Relevancia: la embolización arterial prostática representa un abordaje eficaz para la hiperplasia prostática benigna, aunque no está exenta de riesgos. Dado que la embolización de áreas no objetivo es una complicación muy poco frecuente, pero grave, es necesario conocer y describir este tipo de resultados.

Implicaciones clínicas: a pesar de la naturaleza inusual de la necrosis del glande del pene, su reconocimiento y diagnóstico tempranos son cruciales para prevenir los peores resultados. Existen varios tratamientos clínicos previos a la opción quirúrgica, que incluyen oxigenoterapia hiperbárica o inhibidores de la fosfodiesterasa 5, que tienen una ventana de oportunidad corta.

Conclusión: la necrosis glandular es una afección poco frecuente, pero grave, que requiere un manejo intensivo y constante para intentar revertirla. En última instancia, su tratamiento consiste en una penectomía parcial o total.

Palabras clave:

Próstata, Embolización,
Necrosis, Glande,
Penectomía

Introduction

Benign prostatic hyperplasia (BPH) is a very common condition, affecting more than 50 % of male population over 60 years old.⁽¹⁾ Among its various treatment options, the development of non-invasive techniques such as prostatic artery embolization (PAE) provides a useful therapeutic option for patients who wish to maintain their sexual life and avoid adverse effects related to erectile function.⁽²⁾ Similarly, PAE can be considered as an alternative to transurethral resection of the prostate (TURP) or laser enucleation (HoLEP/ThuLEP) for patients with comorbidities that make conventional surgery difficult

or impossible, with success rates slightly lower, although similar.⁽¹⁾ According to this technique, the prostatic arterial supply stops when selectively embolized to achieve stasis in the treated prostatic vessels.

Adverse effects (AEs) associated with PAE are usually rare and mild, primarily consisting of acute urinary retention (AUR), hematuria, urinary tract infections (UTIs), inguinal hematoma, or perineal pain.⁽³⁾ However, it is not absent of risk of more severe complications such as rectal bleeding or ischemic processes due to non-target embolisation in the bladder,

rectum or glans. An unusual case of penile glans necrosis (PNG) is presented after performing an EAP.

Clinical case

It is about an 84-year-old male with a medical history that includes arterial hypertension with hypertensive heart disease, dyslipidemia, hyperthyroidism, a previous episode of deep vein thrombosis for which he was anticoagulated (not currently), and an ischemic right parietal stroke of undetermined etiology.

In terms of urology, he presents long-standing hematuria of prostatic origin (prostate size of 155cc), without evidence of malignancy after evaluation. Additionally, he has experienced several episodes of prostatitis and urinary tract infections (UTIs) with acute urinary retention, which in one occasion led to septic shock. He currently has a urinary catheter.

Furthermore, he has suffered UTIs secondary to methicillin-resistant *Staphylococcus aureus* (MRSA), requiring contact isolation.

Given recurrent episodes of prostatitis, UTI and hematuria, it was decided to perform in other center a PAE due to the patient's concomitant diseases to avoid conventional surgery (Figure 1).

Figure 1. Severe case of PGN who involves urethra and >50 % of glans



Thus, with antibiotic prophylaxis and under local anesthesia, a selective catheterization was performed accessing both prostatic arteries through the right common femoral artery, and they were embolized with 200u polyvinyl alcohol (PVA) hydrogel spheres without any incidents.

During the postoperative period, the patient experienced pain in the glans and a small para-meatal ulcer appeared on the dorsal surface, which was managed with dressings by the nursing staff. He was discharged home with a urinary catheter for two weeks.

He presented to our emergency department after 10 days reporting pain and worsening of the previously mentioned ulcer of the glans penis. On physical examination, there was necrotic involvement of the glans affecting the urethra, with edema, pain, and inflammation of non-ischemic parts Figure 1. Due to the progression of the condition, an urgent partial penectomy was performed.

Discussion

Within the different approaches to BPH, prostatic arterial embolization offers an alternative to current surgical options in highly selected patients and should always be performed in experienced centers. Currently, the EAU Guidelines advise its use based on the surgeon's criteria and consider it a technique under investigation.⁽¹⁾

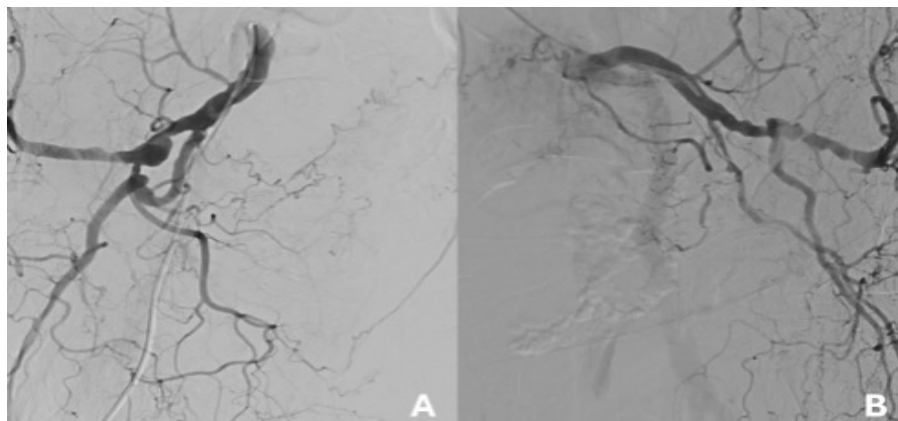
There are multiple clinical scenarios in which PAE may be indicated, such as the management of lower urinary tract symptoms (LUTS) in patients with prostate cancer, as an alternative to long-term indwelling catheters—which are associated with recurrent urinary tract infections and significant comorbidities—and particularly in cases of refractory hematuria of prostatic origin.⁽⁴⁾

Prior to the procedure, it is essential to confirm the prostate as the actual source of the symptoms. For this reason, most centers perform a comprehensive evaluation to rule out alternative diagnoses such as detrusor underactivity, neurogenic bladder, or hematuria originating from the bladder or upper urinary tract. Additionally, assessment of the patient's baseline sexual and functional status is crucial; validated questionnaires such as the International Index of Erectile Function-5 (IIEF-5) should be performed.⁽⁵⁾

Under antibiotic prophylaxis, vascular access is typically obtained via femoral or radial approach. A 5-French (5Fr) catheter is used, with angled catheters (Cobra types) occasionally required to facilitate selective catheterization of the target vessel.⁽⁴⁾

Following advancement through the internal iliac artery, the prostatic artery is identified via angiography using diluted contrast medium (Figure 2).

Figure 2. Arteriography of the internal iliac artery. A: right side. B: left side



Once located, a 0.014" guidewire and microcatheter are navigated into the vessel. A test injection of contrast is then performed to exclude any non-target embolization.^(4,6)

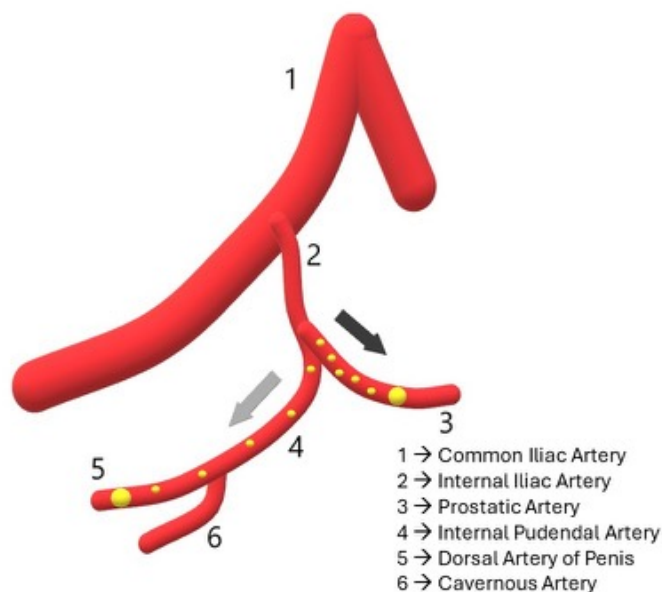
Subsequently, embolization is carried out using embolic agents—hydrogel-coated PVA microspheres (200 μ m) in this case, depending on local availability. The procedure concludes with the removal of the Foley catheter.⁽⁶⁾

Functionally, the results are similar to TURP, with shorter hospital stays (up to -1.94 days in some series) and less bleeding, although with longer surgical times (up to 51.43 minutes).^(1,7)

Regarding adverse events, there are no studies confirming that its adverse effects ratio is worse compared to TURP.⁽¹⁾ In fact, most complications are mild, such as dysuria, urinary tract infections, hematospermia, or acute urinary retention (with some series reporting the latter in up to 8 % of cases).⁽⁸⁾ However, it should be noted that this technique presents extremely rare and specific complications, mainly related to radiation and collateral embolizations. A meta-analysis reported this type of event in 0.3 % of cases (3 out of 1,253 patients).^(4,6)

Thus, the development of glans necrosis is an extremely rare but severe complication.⁽⁹⁾ This happens when during the PAE, the occlusive material loses its selectivity for the prostatic arteries and returns to the internal iliac artery, advancing through the internal pudendal artery and ultimately affecting its terminal branches: the cavernous artery or, in this case, the dorsal artery of the penis (Figure 3).⁽¹⁰⁾

Figure 3. PAE process



The black arrow indicates the correct obstruction flow. The grey arrow indicates the leakage of embolization material to the internal pudendal artery and finally to the dorsal penile artery. (Own design).

The initial manifestation presents with acute pain associated or not with local ischemic changes consisting of tissue edema and alterations in tissue coloration (either pallor or cyanotic appearance), which can evolve into glans ulceration. Its progression leads to necrosis that can involve the urethra and subsequently superinfection and abscess formation in the affected areas.

The management is not standardized. The few published cases initially include conservative management with debridement and care of the necrotic area. Johnson-Arbor *et al.* (2022) describes in more incipient cases a combination of analgesics with phosphodiesterase 5 inhibitors (PDE5) and treatment with hyperbaric oxygen therapy to increase oxygen delivery to ischemic tissues, with favorable results.⁽¹¹⁾ Nevertheless, in most cases, there remains altered sensitivity and associated erectile dysfunction.

In the case reported, the amount of necrotic tissue and urethral involvement, combined with the patient's age and comorbidities, made these therapeutic options unfeasible, leading to partial penectomy as a last resort for cases with poor evolution.⁽¹²⁾ Pathological analysis showed extensive areas of fibrinonecrotic tissue and abscess formation.

Although the clinical course of this case is highly unusual and PAE is generally regarded as a safe procedure, both complication rates and clinical outcomes can potentially be improved through technical refinements. One such improvement involves initiating embolization at the proximal segments of the target vasculature, followed by more distal embolization within the target organ (the prostate, in this context). This strategy is described in the PErFecTED technique (Proximal Embolization First, Then Embolize Distal).⁽¹³⁾ Similarly, it is preferable

to embolize highly vascularized regions, such as the periurethral zone, at the outset of the procedure.^(4,13)

It is important to emphasize that during embolization, the administration of contrast media and embolic agents must be performed very slowly. This is crucial to prevent contrast extravasation into adjacent vessels, which may result in false positives for non-target arterial involvement, as well as to avoid migration of the embolic material into neighboring arteries.^(4,14)

Conclusion

The PAE is a recognized and generally safe treatment for BPH. However, knowing its complications is essential to be able to recognize and treat them properly when they occur.

Gland necrosis is a rare but serious condition that requires intensive and constant management to try to achieve its reversal. Ultimately, its treatment consists of partial or total penectomy.

CRediT Taxonomy

1. **Carlos Serret de Troya:** Writing – original draft.
2. **Francisco Donis Canet:** Writing – review and editing.
3. **Cristina García Juarranz:** Conceptualization.
4. **Julio Bermúdez Rodríguez:** Visualization.
5. **Hajar Ziani Akirout:** Validation.
6. **Mercedes Sánchez-Pedreño:** Data curation.
7. **Adrián García Ron:** Data curation.
8. **Nathalie Pereira Rodríguez:** Data curation.
9. **Miguel Téllez Martínez-Fornés:** Supervision.

10. **Author contributions:** All authors contributed to the design of the work, drafted and reviewed the manuscript and approved the final version of the manuscript.

Conflicts of interest

The authors declare that there are no conflicts of interest.

Funding

This article received no external funding.

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