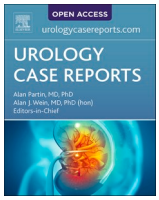
Urology Case Reports 54 (2024) 102724

Contents lists available at ScienceDirect

Urology Case Reports

journal homepage: www.elsevier.com/locate/eucr



Oncology

Renal cell carcinoma metastasis to the penis: A case report and literature review

Dae Yeon Cho [a], Hyun Jung Kim [b], Jae Yoon Kim [a,*]

[a] Department of Urology, Sanggye Paik Hospital, Inje University College of Medicine, 1342 Dongil-ro, Nowon-gu, Seoul, 01757, Republic of Korea
[b] Department of Pathology, Sanggye Paik Hospital, Inje University College of Medicine, 1342 Dongil-ro, Nowon-gu, Seoul, 01757, Republic of Korea

ARTICLE INFO

Keywords:
Renal cell carcinoma
Metastasis
Penis
Kidneys
Cancer
Case report

ABSTRACT

Metastasis to the penis from RCC or any other primary cancer site is unusual; when it does occur, it often involves multiple organs. A 75-year-old man presented with penile pain and swelling. Three months earlier, he had open radical nephrectomy with thrombectomy and was diagnosed with clear-cell RCC with tumor thrombosis in the IVC. The follow-up imaging indicated metastasis in the penis, prompting a total penectomy due to worsening pain. The excised mass displayed features consistent with metastatic RCC. This case underscores the need to consider rare metastatic sites, such as metastasis of RCC to the penis, in RCC patients.

1. Introduction

Renal cell carcinoma (RCC) constitutes 2–3% of all cancer cases and has its highest prevalence in Western countries. Approximately 25–30% of patients manifest metastatic disease at the time of initial diagnosis.[1] The most common sites of RCC metastasis are the lungs, bones, liver, and brain.[1,2] Metastasis to the penis from RCC or any other primary cancer site is unusual; when it does occur, it often involves multiple organs. In this report, we present an unusual case of renal clear cell carcinoma with metastasis to the corpora cavernosum of the penis.

2. Case presentation

A 75-year-old man presented to the hospital with pain and swelling in the penile region. Approximately 3 months prior, the patient had underwent a computed tomography (CT) scan, which revealed a ~13 cm-sized, heterogeneous mass in the lower pole of the right kidney with robust arterial enhancement. Evidence of tumor thrombosis in the inferior vena cava (IVC) was also observed (Fig. 1). The patient's ECOG performance status score was 0, indicating full activity without restrictions. According to the American Joint Committee on Cancer (AJCC) TNM system, the patient's stage grouping was T3N0M0, corresponding to stage III. The Mayo classification of the primary tumor thrombus in this patient was categorized as level I.

The patient underwent open radical nephrectomy with thrombectomy, and was subsequently diagnosed with clear-cell RCC accompanied by tumor thrombosis in the IVC, via microscopic and immunohistochemical examination. About a month after the surgical procedure, he began experiencing penile discomfort, which worsened over three months, prompting his hospital visit.

Physical examination revealed a palpable mass at the penoscrotal junction. The mass was tender, firm, free of ulcerations or rashes, and measured ~5 cm in diameter.

Follow-up CT scan revealed an irregularly shaped, enhanced mass in the penis that suggested metastasis. (Fig. 2). Magnetic resonance imaging (MRI) findings revealed a lobulated contour and heterogeneously enhanced mass-like lesion in the corpus cavernosa on T2-weighted images, which suggested metastasis (Fig. 2). A positron emission tomography (PET)-CT showed an irregular level of increased fludeoxyglucose (FDG) uptake in the penis (Fig. 2).

Following these findings, a penile mass biopsy was conducted for histological examination and tumor removal. Subsequent histopathological analysis confirmed metastatic clear-cell carcinoma, consistent with the patient's previous RCC.

In accordance with the Memorial Sloan-Kettering (MSK) risk classification for metastatic RCC, the patient fell into an intermediate risk group, with one risk factor due to the time from initial diagnosis to systemic therapy initiation being less than one year.

After the penile mass excision, targeted therapy and radiotherapy were used to manage the remaining tumor. Sunitinib, a protein kinase inhibitor categorized as a targeted cancer medication, was administered once daily for about 4 weeks spanning 3 cycles. Following completion of

* Corresponding author.
E-mail address: guidepro@hanmail.net (J.Y. Kim).

https://doi.org/10.1016/j.eucr.2024.102724
Received 9 February 2024; Received in revised form 18 March 2024; Accepted 23 March 2024
Available online 25 March 2024
2214-4420/© 2024 Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

radiotherapy, a follow-up CT scan revealed a decrease in tumor size from 5.1 to 3.4 cm.

However, owing to the patient's ongoing and worsening pain, the decision was made to proceed with a total penectomy, followed by a perineal urethrostomy and placement of a suprapubic cystostomy. The suprapubic cystostomy catheter was removed after one month, allowing the patient to urinate through the perineal urethrostomy. Prior to performing a total penectomy, we conducted a cystoscopy. During this procedure, we identified signs of urethral stricture, likely attributed to infiltration from the corpus cavernosum and surrounding structures.

The excised tissue displayed an ill-defined firm mass ($4.3 \times 3.2 \times 2.5$ cm^3) at the penile shaft. Upon inspection of the cut surface of the mass, gray-yellowish and necrotic features were observed, infiltrating the corpus cavernosum and surrounding structures. Histopathological examination confirmed the presence of metastatic RCC of the clear cell type, accompanied by extensive necrosis, hemorrhage, and a clear surgical resection margin (Fig. 3).

The patient did not experience any significant discomfort following the total penectomy procedure, and recovered without any notable complications. Regular follow-up imaging and laboratory tests are scheduled to monitor the patient for any recurrence or additional metastases.

3. Discussion

Penile metastatic tumors are rare; clinical manifestations include indurated nodules, mass formations, priapisms, and ulcerations.[3] Secondary cancers affecting the penis are exceedingly rare, with only ~300 cases documented over the past century. The prostate and bladder are often the primary tumor sites in such cases; metastases from the kidneys occur in only ~10% of all instances of secondary penile cancers.[3,4]

Additionally, its presentation as an isolated lesion is even more exceptional, with only a few such isolated cases having been reported in the literature thus far. The atypical presentation in this instance, in which the metastasis was isolated from the penis, underscores the unpredictable nature of cancer spread.

However, the mechanisms underlying metastasis to distant and uncommon sites remain unclear. This particular presentation supports the hypothesis that hematogenous dissemination occurs through invasion of the arterial system. Moreover, in some cases, owing to the heightened intra-abdominal pressure caused by substantial kidney tumors, emboli selectively disseminate in a retrograde manner from the renal vein to the pudendal veins, and ultimately to the dorsal vein of the penis. [5]

Among such documented cases, the left kidney was identified as the primary site of carcinoma in more than half.[2,3] In our patient, although the right kidney was identified as the primary site of carcinoma, the aggressive nature of the tumor and the presence of tumor thrombosis may have contributed to the occurrence of metastasis to the penis. In this case, we also observed a right scrotal varicocele, likely attributable to thrombosis and extrinsic compression of the right gonadal vein caused by the large mass in the right kidney. This could signify high pressure in the venous flow and may have also acted as a contributing factor behind the penile metastasis.

Extensive efforts have been dedicated to extending the clinical benefits of tyrosine kinase inhibitors (TKIs) and immunotherapy (IO) from the metastatic to the adjuvant setting, driven by the notably decreased survival rates in patients with relapsed or metastatic RCC.[1] Patients with high-risk RCC and potential for recurrences, like this one, may consider adjuvant treatments such as Pembrolizumab. However, in Korea, as of 2023, adjuvant chemotherapy for RCC is entirely non-reimbursable. Consequently, patients must bear the full cost of the medication themselves. These policies place limitations on physicians in selecting available adjuvant treatments for RCC patients. The patient declined to undergo treatment with adjuvant therapies like

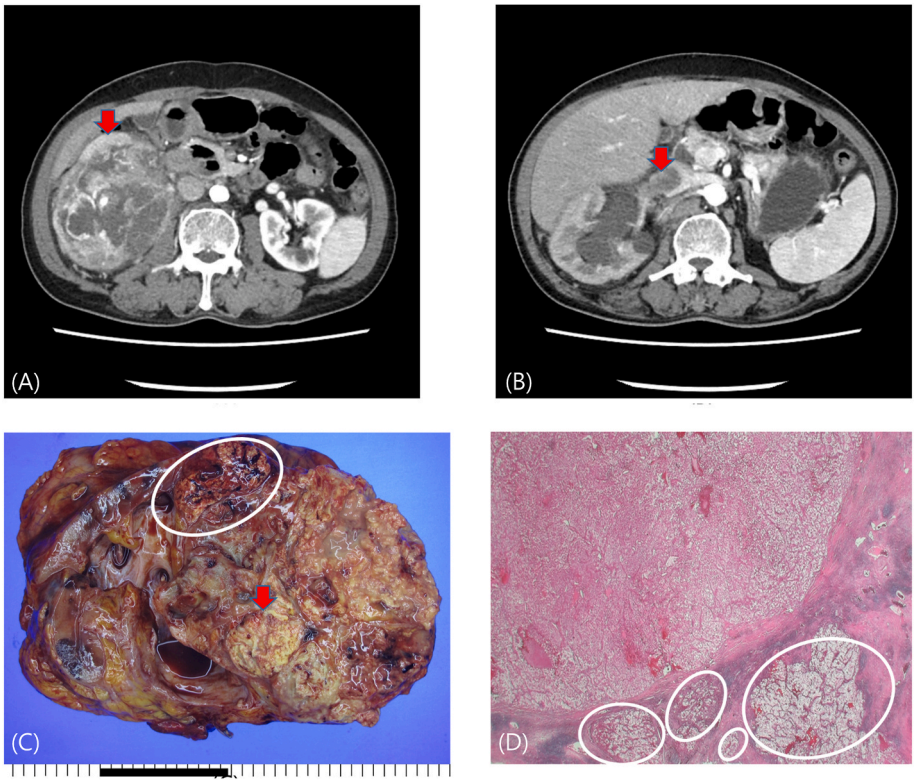


Fig. 1. Computed tomography (CT) scan of the patient's abdomen. (A) A ~13 cm-sized, heterogeneous mass in the lower pole of the right kidney, exhibiting robust arterial enhancement. (B) Tumor thrombosis in the inferior vena cava (IVC). (C) A renal mass (12.5cm in greatest dimension) replaces near entire right kidney. The cut surface is diffusely necrotic (red arrow) with frequent tumor thrombi (white circle) at large vessels. (D) The tumor is partly encapsulated with multiple venous tumor invasion (white circles). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Pembrolizumab due to its expensive cost and lack of insurance coverage.

Our patient had severe penile pain and dysuria, but without priapism. We hypothesize that large penile tumors cause a mass effect at the base of the penis, which irritates its dorsal nerve and thus leads to discomfort.

The treatment approach is guided by the principles governing the management of metastatic RCC. The decision for surgical intervention, including total penectomy, was made in this case considering the limited extent of the metastasis.

The prevailing consensus in most studies is that metastasis to the penis arising from RCC typically signifies a more advanced stage of the disease and correlates with an unfavorable prognosis. [3,4]

However, unlike the previously reported cases, our patient reported immediate symptom relief after the total penectomy procedure. Although further follow-ups are necessary, there are currently no signs of recurrence or additional metastases at the time of writing this report. This suggests that surgical treatment may be a more appropriate therapeutic approach towards metastasis of RCC to the penis with no involvement of other organs.

This case emphasizes the importance of clinical awareness and vigilance for atypical presentations—particularly in patients with a history of RCC. Increased suspicion and thorough diagnostic evaluation are essential for the timely identification and management of uncommon metastatic occurrences.

4. Conclusions

This case highlights the importance of considering rare metastatic sites, such as metastasis of RCC to the penis, in patients with a history of RCC. Timely diagnosis and comprehensive treatment strategies are essential for optimal patient outcomes in such cases.

Funding

None.

Reporting checklist

The authors have completed the CARE reporting checklist.

Conflicts of interest

All authors have completed the ICMJE uniform disclosure form. The authors declare no conflicts of interest.

Ethical statement

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the Declaration of Helsinki (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

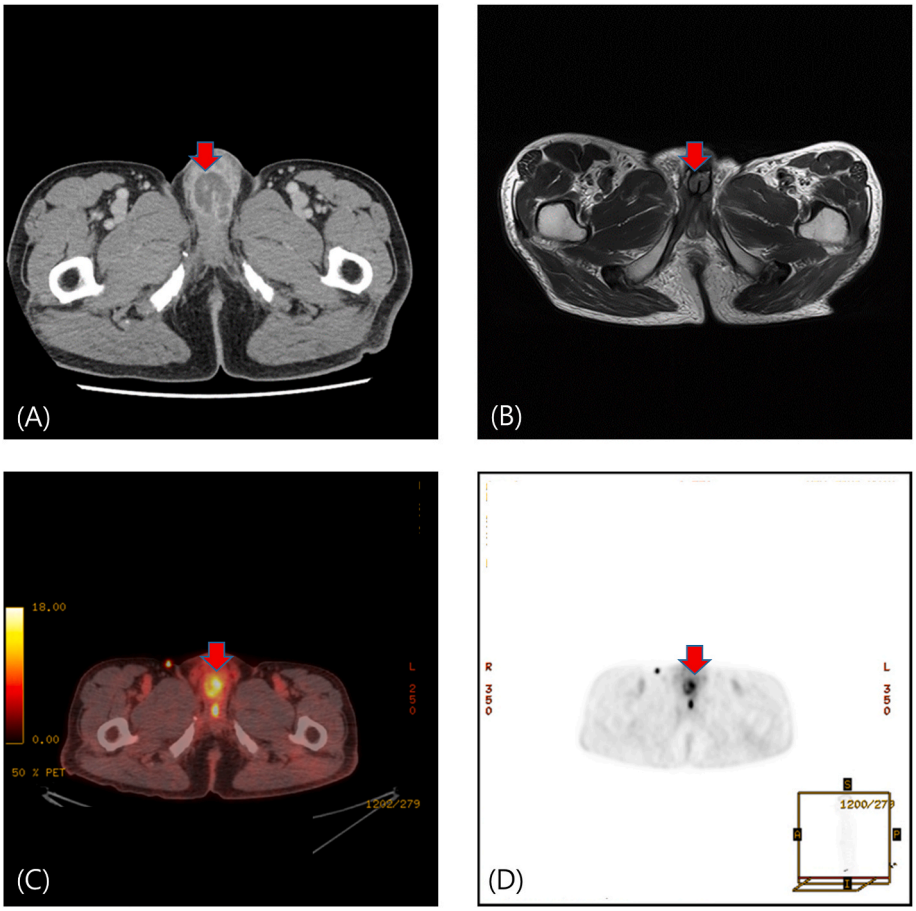


Fig. 2. (A) An irregularly-shaped enhanced mass in the penis, visible on a CT scan. (B) Magnetic resonance imaging (MRI) findings showing a heterogeneously enhanced mass-like lesion in the corpus cavernosa of the penis on T2-weighted images. (C), (D) Positron emission tomography (PET)-CT showed an irregular increased fludeoxyglucose (FDG) uptake in the penis.

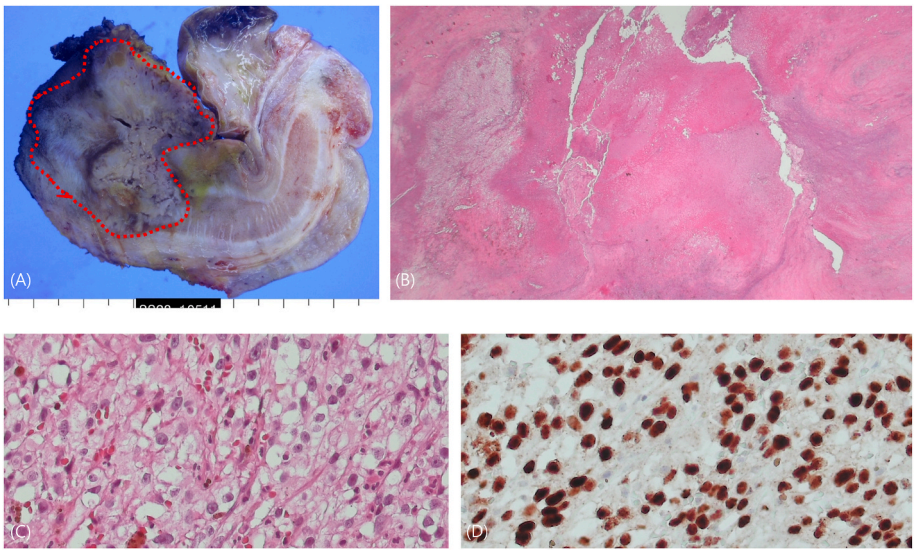


Fig. 3. Histopathological findings of the resected penile tissue. (A) A penectomy specimen shows an ill-defined nodular mass (4.3x3.2 × 2.5cm) (round red circle) with extensive hemorrhage and necrosis. (B) The light microscopic finding disclose a solid proliferation of clear cells with extensive necrosis. (C) The composed tumor cells have clear cytoplasm (D) with PAX-8 nuclear immunohistochemical expression. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

CRediT authorship contribution statement

Dae Yeon Cho: Writing – review & editing, Supervision, Resources, Methodology, Investigation. **Hyun Jung Kim:** Writing – review & editing, Visualization, Resources, Methodology, Investigation, Data curation. **Jae Yoon Kim:** Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Methodology, Investigation, Formal analysis, Conceptualization.

Acknowledgements

The authors thank the staff at the Department of Urology of Sanggye Paik Hospital, Inje University College of Medicine.

References

1. Ljungberg B, Albiges L, Abu-Ghanem Y, et al. European Association of Urology guidelines on renal cell carcinoma: the 2019 update. *Eur Urol*. 2019;75:799–810. https://doi.org/10.1016/j.eururo.2019.02.011.
2. Bianchi M, Sun M, Jeldres C, et al. Distribution of metastatic sites in RCC: a population based analysis. *Ann Oncol*. 2012;23:973–980. https://doi.org/10.1093/annonc/mdr362.
3. Hizli F, Berkmen F. Penile metastasis from other malignancies. A study of ten cases and review of the literature. *Urol Int*. 2006;76:118–121. https://doi.org/10.1159/000090872.
4. Tsanou E, Sintou-Mantela E, Pappa L, Grammeniatis E, Malamou-Mitsi V. Fine-needle aspiration of secondary malignancies of the penis: a report of three cases. *Diagn Cytopathol*. 2003;29:229–232. https://doi.org/10.1002/dc.10354.
5. Liou VD, Darwish OM, Henry MM, Jun IC, Siddiqui SA. Sarcomatoid renal cell carcinoma metastasis to the penis. *Case Rep Urol*. 2015;2015, 467974. https://doi.org/10.1155/2015/467974.