

Solitary metastasis to the penis from prostate adenocarcinoma - a case report

Hui Lin Wong^{1*}, Haiyuan Shi¹, Li-Tsa Koh²

1. Department of Radiology, Changi General Hospital, Singapore

2. Department of Urology, Changi General Hospital, Singapore

* Correspondence: Hui Lin Wong, Changi General Hospital, 2 Simei Street 3, Singapore 529889, Singapore
(✉ Huilin.wong@mohh.com.sg)

Radiology Case. 2019 Dec; 13(12):20-28 :: DOI: 10.3941/jrcr.v13i12.3846

ABSTRACT

Penile metastasis from prostate adenocarcinoma is rare and the disease is usually disseminated at presentation. We present a case of an 83-year-old man with solitary metastasis to the penis from prostate adenocarcinoma. The clinical presentation and imaging features of penile metastasis from prostate cancer and the other primary penile tumors are discussed.

CASE REPORT

CASE REPORT

An 83-year-old man presented with a painless lump at the base of the penis for a few months. He also complained of lower urinary tract symptoms.

On examination, there was a non-tender hard lump at the right base of the penis which was tethered to the deep tissue. No focal prostate mass was detected on digital rectal examination.

Dedicated penile magnetic resonance imaging (MRI) revealed an enhancing 2.1 x 1.1 x 1.3 cm right corpus cavernosal nodule along the mid-shaft of the penis (Fig. 1). It appeared locally aggressive with infiltration of the enveloping tunica albuginea. Overlying skin was not involved. It returned T1-weighted isointense and T2-weighted hypointense signals. Incidentally, the partially imaged prostate showed a left-sided heterogeneous mass which replaced the normal T2-weighted hyperintense signal of the peripheral zone and focally disrupted the T2-weighted hypointense capsule at the left posterolateral corner (Fig. 2).

He subsequently underwent ultrasound-guided core needle biopsy of the penile lump. Targeted ultrasound (US) during biopsy demonstrated an infiltrative heterogeneous iso-

hypoechoic nodule in the right corpus cavernosum with associated internal vascularity (Fig. 3). Histology revealed poorly differentiated carcinoma. Immunohistochemical staining with prostatic specific acid phosphatase and α -Methylacyl CoA racemase were positive (Fig. 4).

He also underwent a channel transurethral resection of the prostate to treat his bladder outlet obstruction. Histology showed acinar adenocarcinoma (Gleason score 4 + 5) (Fig. 4). The prostate-specific-antigen level was elevated at 303 μ g/L.

Computed tomography (CT) intravenous pyelography did not reveal any other distant metastasis or nodal disease (Fig. 5).

Whole-body bone scan performed showed no evidence of osteoblastic bony metastases (Fig. 6). Treatment options were discussed and he opted for hormonal treatment.

DISCUSSION

Etiology & Demographics:

To the best of the authors' knowledge, there has been no reported case of isolated metastasis to the penis from prostate

cancer. A plausible explanation for its presumed low incidence may be because imaging for prostate cancer (i.e. MRI prostate) does not typically include the penis. The actual incidence may therefore be higher. Nevertheless, the most common penile metastasis still arises from the urogenital tract [1]. Several proposed mechanisms for prostate cancer metastasis to the penis include direct invasion, implantation (from prior instrumentation), retrograde venous flow, arterial or lymphatic dissemination. Retrograde venous flow is deemed the most common pathway, with the spread of tumor cells facilitated by transient episodes of increased intra-abdominal pressure (for example, during coughing or straining) [2]. Not unexpectedly, most of penile metastases are located in the corpora cavernosa [2-3]. These contain venous sinuses which are drained via the emissary veins, subsequently into the cavernosal veins, deep dorsal or spongiosal vein of the penis, and eventually into the prostatic venous plexus or the internal pudendal vein [3-4].

The median age reported for penile metastases from prostate cancer ranged from 65 to 75 years old [1,5]. Most of these patients already had bony metastases when they present with penile metastases [1]. Established risk factors for prostate cancer are age, African American ethnicity and family history [6].

Clinical & Imaging Findings:

Patients can present with penile pain, ulceration, palpable penile nodule, priapism and/or urinary symptoms such as urinary retention, dysuria and hematuria [2,7]. Digital rectal examination may reveal an enlarged hard nodular prostate.

US imaging of the penis typically demonstrates hypoechoic or heterogeneous nodules in the corpora cavernosa and/or corpus spongiosum, associated with vascularity on color Doppler [8]. On MRI, these nodules are of low signal intensity on the T1- and T2-weighted sequences and show enhancement on the post-contrast sequence [2,9]. The primary tumor, as in this case of a prostate adenocarcinoma, may be included in the field of view.

Treatment & Prognosis:

Treatment options for metastatic prostate cancer are dependent on patient clinical status and disease burden. These include chemotherapy, radiotherapy, hormonal therapy (for example, gonadotropin-releasing hormone analogue and androgen receptor inhibitor) or surgical orchiectomy. Partial or total penectomy may be performed for patients with priapism or uncontrollable pain [7]. In selected patients with metastatic castration-resistant prostate cancer, on-going clinical trials using Lutetium-177-prostate-specific membrane antigen radionuclide therapy have shown encouraging results.

Prognosis is very poor as patients usually present with disseminated disease. The average survival is reported to be 6 months upon presentation [7].

Differential Diagnoses:

The main differential diagnosis will be squamous cell carcinoma (SCC), which is the most common primary tumor of the penis, accounting for 95% of all primary penile tumors [9]. There is an association with human papilloma viruses 16 and 18 [10]. It typically presents as a painless skin nodule, with or without associated ulceration [11]. Unlike penile metastases, which are typically located in the corpora cavernosa and do not usually involve the skin, SCCs invariably start at the skin and commonly occur at the glans penis [9]. As SCCs are clinically evident, additional imaging is usually not required. On MRI, SCC appears hypointense relative to the corpora on T1- and T2-weighted sequences and enhances less than the corporal bodies [9].

Primary penile sarcomas (e.g. epithelioid sarcomas, Kaposi sarcomas, leiomyosarcomas and rhabdomyosarcomas) are rare and account for less than 5% of penile tumors. Clinically, one can manifest as a focal induration or palpable mass [11]. MRI appearances of the various sarcomas are varied and non-specific, with no predisposition for certain locations. In general, they show T2-weighted hyperintensity and enhance avidly on post-contrast sequence. They often appear heterogeneous due to internal hemorrhage and necrosis [12].

Anterior urethral carcinoma, most commonly SCC followed by transitional cell carcinoma and adenocarcinoma, can involve the corpus spongiosum and corpus cavernosum through direct extension. It accounts for less than 1% of the urogenital malignancies [13]. Predisposing factors include urethral stricture, chronic inflammation or sexually transmitted disease [14]. Patients commonly present with a palpable penile mass with or without obstruction symptoms. They can also present with urethral stricture, bleeding, urethral discharge, urethral fistula, perineal pain, periurethral abscess or urinary symptoms. MR findings include hypointense mass relative to the corpora on T1- and T2-weight imaging [15].

Primary lymphoma of the penis, most commonly of B-cell origin, is extremely rare [16]. Patient can present with non-healing ulcer, palpable nodule, urethral stricture or periurethral abscess [17]. It commonly involves the corporal bodies followed by the glans penis [16]. On MRI, the lesion is homogeneously isointense on T1- and T2-weighted sequences and shows minimal enhancement [18]. It demonstrates avid uptake on 18Fluorine-fluorodeoxyglucose-positron emission tomography/ computed tomography (18F-FDG-PET/CT) [12].

Peyronie's disease is a benign condition of the penis due to fibrosis of the tunica albuginea from chronic inflammation, which can manifest as a penile mass. Patients often present with focal induration, curvature of the penis and/or pain. The plaques may calcify. On MRI, the plaques appear as hypointense areas of thickening in the tunica albuginea on the T1- and T2-weighted sequences [11,19]. Enhancement of the plaque indicates active inflammation [11,19].

TEACHING POINT

Solitary metastasis to the penis from prostate adenocarcinoma is rare, with the more common primary penile squamous cell carcinoma being the main differential diagnosis. On imaging, penile metastases typically arise from the corpora cavernosa, as opposed to squamous cell carcinoma which typically involves the skin of the glans penis. One should always review the urogenital tract (i.e. prostate, bladder) for any incidental primary tumor in the presence of a penile lesion on MRI.

REFERENCES

1. Kotake Y, Gohji K, Suzuki T, et al. Metastases to the penis from carcinoma of the prostate. *Int J Urol* 2001 Feb;8(2):83-6. DOI: 10.1046/j.1442-2042.2001.00245x. PMID: 11240832
2. Cherian J, Rajan S, Thwaini A, et al. Secondary penile tumours revisited. *Int Semin Surg Oncol*. 2006;3:33. DOI: 10.1186/1477-7800-3-33. PMID: 17032461
3. Luigi M, Renato C, Alessandro Z, et al. A review of penile metastasis. *Onco Rev* 2012 Mar 5; 6(1):e10. DOI: 10.4081/oncol.2012.e10. PMID: 25992200
4. Sidawy AN, Perler BA. *Rutherford's Vascular Surgery and Endovascular Therapy*, 9th edn, Elsevier, 2019, pp 2476. ISBN: 978-0323427913
5. Tu SM, Reyes A, Maa A, et al. Prostate carcinoma with testicular or penile metastases. Clinical, pathologic, and immunohistochemical features. *Cancer* 2002 May 15;94(10):2610-7. DOI: 10.1002/cncr.10546. PMID: 12173328
6. Gann PH. Risk factors for prostate cancer. *Rev Urol* 2002;4(suppl5):S3-S10. PMID: 16986064
7. Philip J, Mathew J. Penile metastasis of prostatic adenocarcinoma: Report of two cases and review of literature. *World J Surg Oncol* 2003 Sep 14;1(1):16. DOI: 10.1186/1477-7819-1-16. PMID: 14521716
8. Nakayama F, Sheth S, Caskey CI, et al. Penile metastasis from prostate cancer: diagnosis with sonography. *J Ultrasound Med* 1997 Nov;16(11):751-3. DOI: 10.7863/jum.1997.16.11.751. PMID: 9360239
9. Singh Ak, Saokar A, Hahn PF, et al. Imaging of penile neoplasms. *Radiographics* 2005 Nov-Dec;25(6):1629-38 DOI: 10.1148/rg.256055069. PMID: 16284139
10. McCance Dj, Kalache A, Ashdown K, et al. Human papillomavirus types 16 and 18 in carcinomas of the penis from Brazil. *Int J cancer* 1986;37:55-59. DOI: 10.1002/ijc.2910370110. PMID: 3000954
11. Pretorius ES, Siegelman ES, Ramchandani P, et al. MR imaging of the penis. *Radiographics* 2001 Oct;21 Spec No:S283-98;discussion S298-9. DOI:

10.1148/radiographics.21.suppl 1.g01oc24s283. PMID: 11598264

12. Thomas K, Spiess P, Caracciolo JT. A report of two deep-seated noncutaneous penile tumors: more than meets the eye. *Radiol Case Rep* 2017 Aug 12;12(4):726-730. DOI: 10.1016/j.radcr.2017.07.012. PMID: 29484058

13. Karnes RJ, Breau RH, Lightner DJ. Surgery for urethral cancer. *Uro Clin North Am* 2010 Aug;37(3):445-57. DOI: 10.1016/j.ucl.2020/04/011. PMID: 20674699

14. Antewerpen I, Gstrein L, Moskovszky, et al. Primary urethral squamous cell carcinoma: a unique manifestation of a penile tumor. *J Int Med Res* 2019 Feb;47(2):999-1004. DOI: 10.1177/0300060518813506. PMID: 30514142

15. Kawashima A, Sandler CM, Wasserman NF, et al. Imaging of urethral disease: a pictorial review. *Radiographics* 2004 Oct;24 Suppl 1:S195-216. DOI: 10.1148/rg.24i045504. PMID: 15486241

16. Gentile G, Broccoli A, Brunocilla E, et al. An isolated penile mass in a young adult turned out to be a primary marginal zone lymphoma of the penis. A case report and a review of literature. *Anticancer Res* 2013 Jun;33(6):2639-42. PMID: 23749921

17. Karki K, Mohsin R, Mubarak M, et al. Primary Non-Hodgkin's lymphoma of penis masquerading as non-healing ulcer in the penile shaft. *Nephrourol Mon*. 2013 Jul 15(3):840-2. DOI: 10.5812/numonthly/6885. PMID: 24282797

18. Chiang KH, Chang PY, Lee SK, et al. MR findings of penile lymphoma. *Br J Radiol* 2006 Jun;79(942):526-8. DOI: 10.1259/bjr/55555394. PMID: 16714757

19. Kirkham AP, Illing RO, Minhas S, et al. MR imaging of nonmalignant penile lesions. *Radiographics* 2008 May-Jun;28(3):837-53. DOI: 10.1148/rg.283075100. PMID: 18480487

FIGURES



Figure 1: An 83-year-old man with solitary penile metastasis from prostate adenocarcinoma.

FINDINGS: MRI of the penis demonstrates 1(A) and 1(B) T2-weighted hypointense and 1(C) T1-weighted isointense nodule measuring 2.1 x 1.1 x 1.3 cm (arrows) in the right corpus cavernosum, disrupting the tunica albuginea (arrowhead). 1(D) shows enhancement of the nodule in the post contrast sequence (arrow).

TECHNIQUE: Siemens AERA MRI scanner. Magnetic strength 1.5 Tesla.

A: Axial T2-weighted, TR 3180 ms, TE 112 ms, slice thickness 3.5 mm.

B: Coronal T2-weighted, TR 4220 ms, TE 110 ms, slice thickness 3.0 mm.

C: Axial T1-weighted, TR 469 ms, TE 11 ms, slice thickness 3.5 mm.

D: Axial contrast enhanced T1-weighted fat saturated, TR 671 ms, TE 11 ms, slice thickness 3.5 mm, 10 ml of Dotarem.

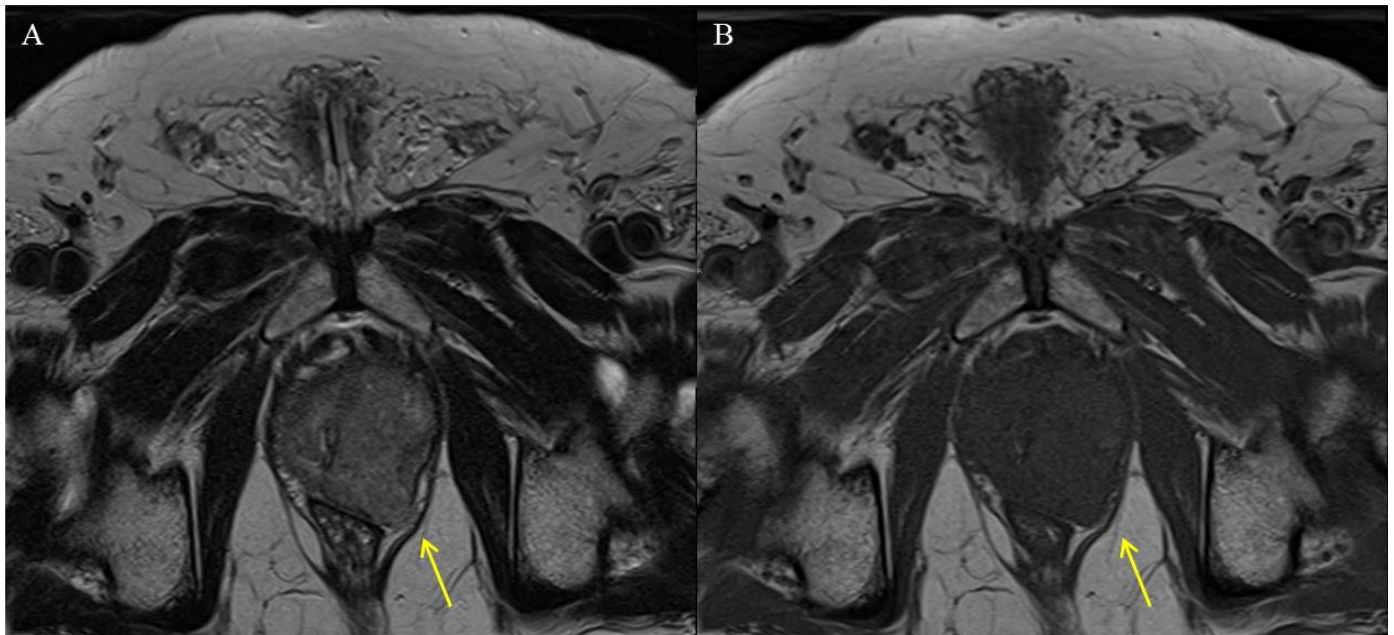


Figure 2: An 83-year-old man with solitary penile metastasis from prostate adenocarcinoma.

FINDINGS: MRI of the penis demonstrates 2(A) and 2(B) heterogeneous T2-weighted signal in the prostate with disruption of the prostate capsule, suspicious for prostate tumor with extra-capsular spread (arrows).

TECHNIQUE: Siemens AERA MRI scanner. Magnetic strength 1.5 Tesla
A: Axial T2-weighted, TR 3180 ms, TE 112 ms, slice thickness 3.5 mm.
B: Axial T1-weighted, TR 469 ms, TE 11 ms, slice thickness 3.5 mm.

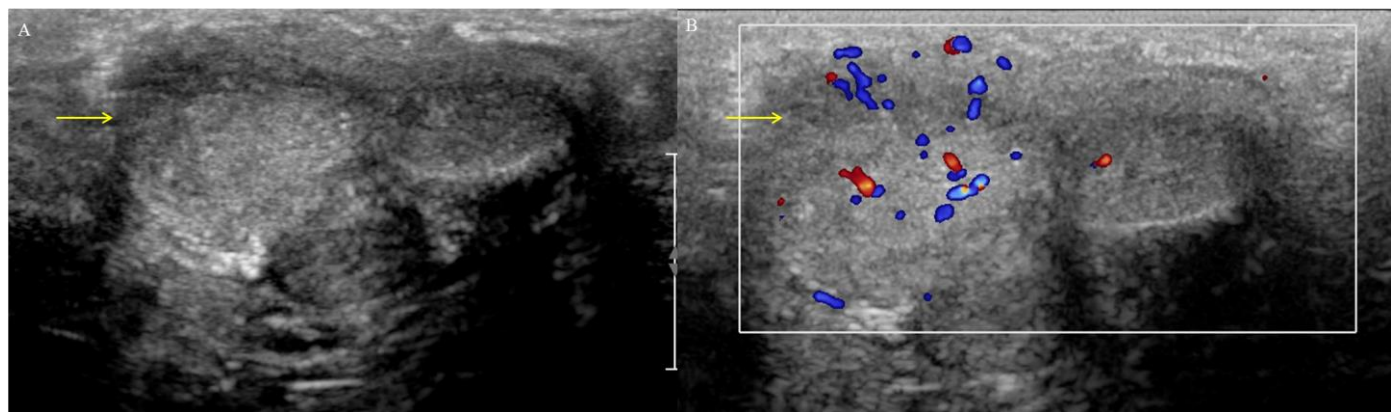


Figure 3: An 83-year-old man with solitary penile metastasis from prostate adenocarcinoma.

FINDINGS: US of the penis demonstrates 3(A) an infiltrative heterogeneous iso-hypoechoic nodule measuring 1.7 x 0.7 cm in the right corpus cavernosum of the penis (arrow). 3(B) demonstrates hypervascularity of the nodule on color Doppler (arrow).

TECHNIQUE: Ultrasound of the penis, high frequency 12-5 MHz linear probe, transverse, 3(A) grey scale and 3(B) color Doppler images.

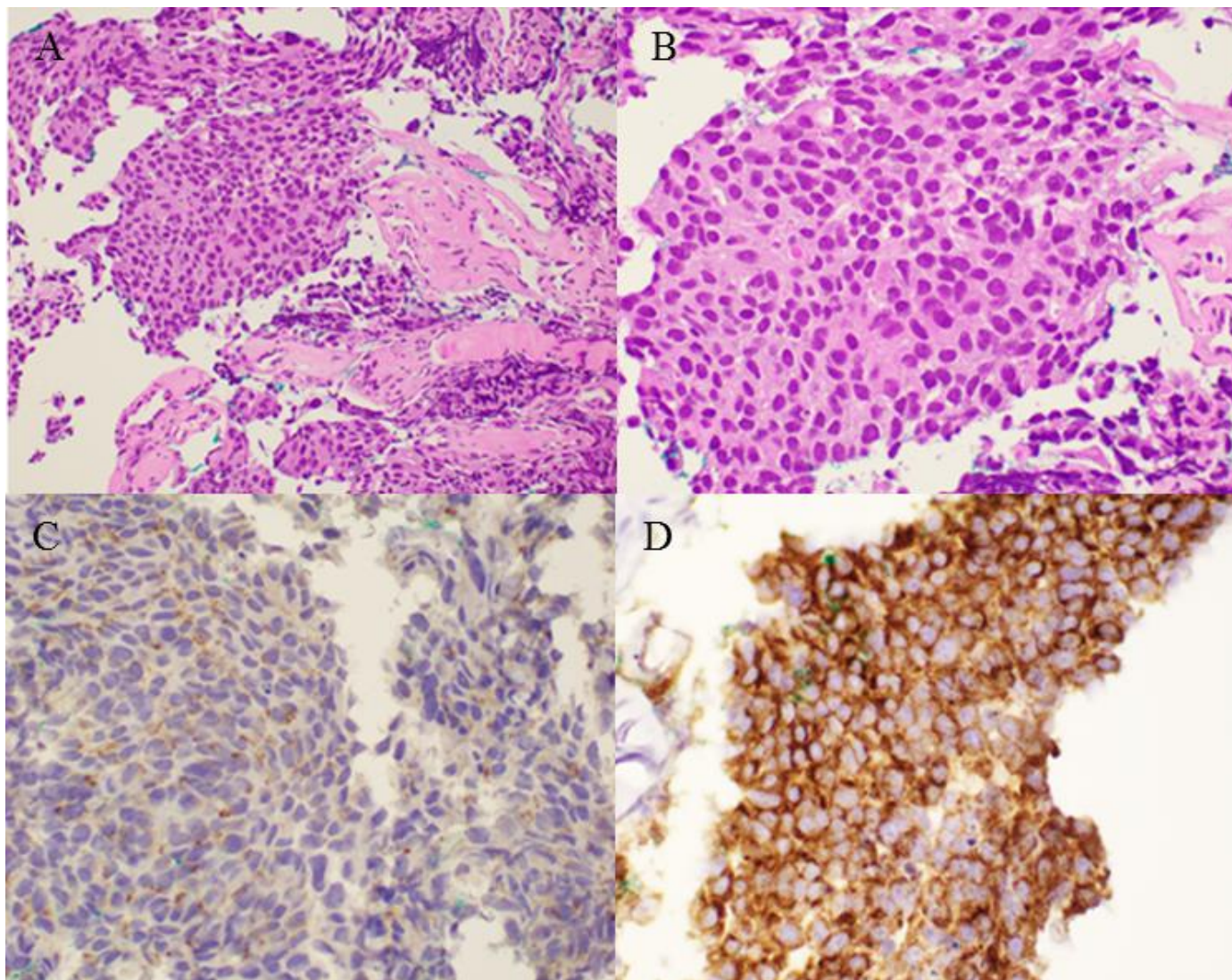


Figure 4: An 83-year-old man with solitary penile metastasis from prostate adenocarcinoma.
Specimen: penile core biopsy tissue

FINDINGS: H&E stain of tumor cells in 4(A) and 4(B) show no glandular or acinar formation. Keratinization is absent. The tumor cells are polygonal, with hyperchromatic nuclei and discernible nucleoli. 4(C) and 4(D) show that the tumor cells are positive for PASP and AMACR stains respectively, which support the diagnosis of metastatic prostate adenocarcinoma.

TECHNIQUE:

- A: Hematoxylin and eosin stain (H&E stain; 200X)
- B: Hematoxylin and eosin stain (H&E stain; 400X)
- C: Prostatic specific acid phosphatase stain (PASP stain)
- D: α -Methylacyl CoA racemase stain (AMACR stain)



Figure 5: An 83-year-old man with solitary penile metastasis from prostate adenocarcinoma.

FINDINGS: CT intravenous pyelography demonstrates 5(A) enlarged heterogeneous prostate indenting the urinary bladder (arrowhead) and trabecular thickening of the urinary bladder wall compatible with chronic bladder outlet obstruction (arrow). 5(B) demonstrates focal bulge in the left posterior aspect of the prostate (open arrow).

TECHNIQUE: CT intravenous pyelography (Aquilion one 320 detector), 85ml Omnipaque 350.
A: Coronal, medullary phase, 120 kV, 57 mA, slice thickness 3.0 mm.
B: Axial, medullary phase, 120 kV, 108 mA, slice thickness 3.0 mm.



Figure 6: An 83-year-old man with solitary penile metastasis from prostate adenocarcinoma.

FINDINGS: Whole body bone scan demonstrates no suspicious radiotracer uptake.

TECHNIQUE: Delayed phase, approximately 4 hours following intravenous administration of 14.6 mCi of Technetium-99m-methyl diphosphonate.

Etiology	<ul style="list-style-type: none"> • Most common mechanism is retrograde venous flow between the prostatic venous plexus and penile vein • Other mechanisms include direct invasion, implantation, arterial or lymphatic dissemination
Incidence	Unknown
Gender Ratio	--
Age Predilection	Median age of 65 to 75 years
Risk factors	Age, African-American ethnicity, family history
Treatment	<p>Treatment options depend on patient clinical status and disease burden:</p> <ul style="list-style-type: none"> • Chemotherapy, radiotherapy, hormonal therapy (gonadotropin-releasing hormone analogue) or surgical orchiectomy • Partial or total penectomy may be performed for patients with priapism or uncontrollable pain
Prognosis	Poor prognosis with median survival of 6 months upon presentation
Findings on imaging	<ul style="list-style-type: none"> • US: hypoechoic or heterogeneous nodule in the corpora cavernosa and corpus spongiosum with vascularity on color Doppler • MRI: nodules are of low signal intensity on the T1- and T2-weighted sequences and show enhancement on the post-contrast sequence

Table 1: Summary table for Solitary Metastasis to the Penis from Prostate Adenocarcinoma

	Imaging Features	Clinical Presentation
Penis metastasis from prostate adenocarcinoma	<ul style="list-style-type: none"> • US: hypoechoic or heterogeneous nodules in the corpora cavernosa and corpus spongiosum with increased vascularity on color Doppler • MRI: nodules are of low signal intensity on the T1- and T2-weighted sequences and show enhancement on the post-contrast sequence 	<ul style="list-style-type: none"> • Presents with penile pain, ulceration, palpable penile nodule, priapism and/or urinary symptoms • Typically involve corpora cavernosa
Squamous cell carcinoma of penis	<ul style="list-style-type: none"> • MRI: hypointense signal on T1-and T2-weighted sequences and enhances less than the corporal bodies 	<ul style="list-style-type: none"> • Presents with painless palpable nodule with or without ulceration • Commonly seen at glans penis
Primary penile sarcoma	<ul style="list-style-type: none"> • MRI: hyperintense signal on T2-weighted sequence, often heterogeneous due to internal hemorrhage and necrosis and enhances avidly 	<ul style="list-style-type: none"> • Presents with focal induration or palpable mass
Anterior urethral carcinoma	<ul style="list-style-type: none"> • MRI: hypointense mass relative to the corpora on T1-and T2-weight imaging 	<ul style="list-style-type: none"> • Presents commonly with a palpable penile mass and can also present with urethral stricture, bleeding, perineal pain, fistula, periurethral abscess, urethral discharge or urinary symptoms • Involves the corpus spongiosum and corpus cavernosum
Primary lymphoma of penis	<ul style="list-style-type: none"> • MRI: homogeneously isointense on T1-and T2-weighted sequences and shows minimal enhancement • ¹⁸F-FDG-PET/CT: avid uptake 	<ul style="list-style-type: none"> • Presents with non-healing ulcer, palpable nodule, urethral stricture or peri-urethral abscess. • Commonly involves the corporal bodies followed by glans penis
Peyronie's disease	<ul style="list-style-type: none"> • MRI: hypointense areas of thickening in the tunica albuginea on T1- and T2-weighted sequences. Presence of enhancement indicates active inflammation 	<ul style="list-style-type: none"> • Presents with focal induration, curvature of penis and/or pain

Table 2: Differential diagnosis table for Solitary Metastasis to the Penis from Prostate Adenocarcinoma

ABBREVIATIONS

CT = Computed tomography
18F-FDG-PET/CT = 18Fluorine-fluorodeoxyglucose-positron emission tomography/ computed tomography
MRI = Magnetic resonance imaging
SCC = Squamous cell carcinoma
US = Ultrasound

KEYWORDS

Prostate adenocarcinoma; metastasis; magnetic resonance imaging; ultrasound; penis

ACKNOWLEDGEMENTS

Dr Teoh Wey Chyi and Dr Victor Ng Weng Leong

Online access

This publication is online available at:
www.radiologycases.com/index.php/radiologycases/article/view/3846

Peer discussion

Discuss this manuscript in our protected discussion forum at:
www.radiolopolis.com/forums/JRCR

Interactivity

This publication is available as an interactive article with scroll, window/level, magnify and more features.
Available online at www.RadiologyCases.com

Published by EduRad



www.EduRad.org