Case - Caval thrombectomy for metastatic breast cancer

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Cite as: Wong R, Smith M, Inman BA, et al. Case - Caval thrombectomy for metastatic breast cancer. *Can Urol Assoc J* 2026 May 4; Epub ahead of print. http://dx.doi.org/10.5489/cuaj.9551

Published online May 4, 2026

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INTRODUCTION

Breast cancers can metastasize via lymphatic or hematogenous spread. Breast cancer metastases are most commonly found in regional axillary lymph nodes, though bone, lung, brain, and liver are also common sites.[1] Breast cancer metastasis to the kidney is rare and fewer than 20 cases of breast-to-kidney metastases have been documented.[2] Reports involving an inferior vena cava (IVC) tumour thrombus are exceptionally uncommon.[3] The radiologic differentiation of a breast metastasis from a primary renal lesion can be difficult.[4] To our knowledge, this case represents the first breast-to-renal metastasis with an IVC tumour thrombus that has been successfully resected surgically.

Case report

We report a 62-year-old woman with a history of T2N1M0, stage IIB, invasive ductal carcinoma of the right breast with associated ductal carcinoma in situ, diagnosed in 2018. The tumour was positive for human epidermal factor receptor 2 (HER2) and negative for hormone receptors (ER and PR). Notably, HER2+/ER-/PR- breast cancers have been found to be a variant with high metastatic potential.[5] The tumour was initially managed with bilateral mastectomy and adjuvant chemotherapy and HER2 targeted therapy including fluorouracil, epirubicin, cyclophosphamide, docetaxel, and trastuzumab.

In 2020 she developed a cerebellar metastasis, treated with resection, radiotherapy to the postoperative cavity, and systemic trastuzumab, pertuzumab, and paclitaxel. Shortly after, a 2.9 cm solid lobulated left lung metastasis was identified on computed tomography (CT) imaging and treated with radiotherapy and adjuvant trastuzumab and pertuzumab. In 2022, she developed a mediastinal nodal recurrence causing a left atrial thrombus, treated with radiotherapy while continuing trastuzumab maintenance therapy until 2024.

A surveillance CT in June 2024 revealed a new, heterogeneous 2.5 x 2.0 cm interpolar-to-lower pole renal mass (Figure 1A), enlarging to 3.4 x 3.0 cm three months later. Prior imaging in February 2024 did not identify a renal mass. Despite a radiological appearance consistent with renal cell carcinoma (RCC), suspicion for metastasis was high given her history and the rate of progression. A CT-guided biopsy was performed in December 2024 and later confirmed high-grade carcinoma with similar morphology to her previous breast tumour, histologically favouring breast or urothelial origin.

By early 2025, the renal lesion had grown to 7.6 x 7.0 cm (Figure 1B) and was now invading the renal pelvis and associated with a tumour thrombus. The thrombus was located below in the infrahepatic IVC (Mayo level 2) and occupied 50% of its lumen (Figures 2A and 2B). After multidisciplinary discussion between her local urologist, medical oncologist, and radiation oncologist, she was referred to our tertiary care centre for consideration of surgical management. An MRI was performed for pre-operative planning and confirmed further growth to 8.5 x 8.1 cm with the IVC thrombus now measuring 3.9 cm in diameter and extending up to the hepatic veins (Mayo level 3, Figures 3A and 3B).

The patient underwent open radical right nephrectomy, en bloc adrenalectomy, en bloc tumor thrombectomy, and interaortocaval and paracaval node dissection. A chevron approach was used to gain access to the kidneys and IVC. The plane between the liver and upper pole of the kidney was dissected carefully, as it was very adherent. One of our colleagues from the hepatobiliary surgery team helped to mobilize part of the liver to gain maximal exposure of the infrahepatic IVC, and the short hepatic veins were ligated. There was also a fair bit of neovascularization in the perinephric tissues, and many of these vessels were secured with clips. To remove the tumour thrombus, the IVC was sharply entered just lateral to the insertion of the right renal vein and the thrombus was extracted out, and dissected off the wall of the IVC, then removed en bloc with the kidney. The thrombus itself was not adherent to the vessel wall, and there was no visible residual thrombus on the wall of the IVC following removal. There were no perioperative complications. Post-operative pathology of the tumour showed a high-grade carcinoma consistent with a breast cancer metastasis from a breast cancer primary tumour with negative margins. Biomarker analysis showed HER2+/ER-/PR-. One of 15 nodes was positive for metastatic carcinoma. The patient continues palliative trastuzumab, and recent imaging shows a new 4 mm right lung nodule.

DISCUSSION

Metastasis of breast cancer to the kidney is exceedingly rare, and the occurrence of an associated IVC tumour thrombus secondary to metastatic breast cancer is even rarer.[2,3,6] The majority of clinical knowledge regarding IVC tumour thrombi is extrapolated from RCC.[7,8]

Primary RCCs can vary widely in their appearances on radiographic imaging, which can make them difficult to distinguish from metastases. RCCs often enhance heterogeneously due to areas of necrosis, cystic growth, or hemorrhage.[9,10] Our patient's renal mass was also found to be

a heterogeneously contrast enhancing solid-cystic mass. Despite being a metastasis of breast origin, the radiologic appearance could easily have been confused with RCC. Others have found that it can be difficult to distinguish between primary and metastatic renal tumours. For instance, Gilbert et al., reported on metastatic tumours to the kidney that had similar contrast enhancement to a primary urothelial cancer on CT.[2] Similarly, Ahmed et al., reported on breast metastases in the kidney with heterogenous features that imitated primary renal tumours on ultrasound and CT.[6] Moreover, Nagata et al., found a hypovascular lesion on CT that they felt was consistent with papillary RCC or chromophobe cell carcinoma, which also turned out to be a breast cancer primary.[3] These similarities in tumour appearances may therefore make it difficult to distinguish primary from secondary tumours in the kidney. Image-guided needle biopsy can be used to help make a diagnosis and determine if the mass is a primary renal malignancy or not in a patient with other known or possible malignancy.[8] Given our patient's history of prior metastases a renal biopsy was obtained prior to committing to surgical resection.

There is a paucity of data guiding the management of IVC tumour thrombi caused by metastases, but 5-year survival rate following IVC thrombectomy in such patients is generally considered poor and varies by the primary tumour type.[11] IVC thrombectomy should be considered in select patients since complete resection may allow for long-term survival in locally advanced cases if there is no widespread metastatic disease. Even without long-term cure, local disease control might delay the need for systemic therapy or prolong survival. Five-year survival for patients without metastases is >50% in RCC thrombus cases.[11]

This is the first case to our knowledge showing breast-to-renal metastasis with an IVC tumour thrombus that has been treated surgically. Nagata et al., reported on a similar case; however, the tumour thrombus in their patient had grown to the level of the diaphragm before being discovered and deemed to be unresectable. The patient was instead offered chemotherapy and died 6 months later from metastatic progression.[3] In our case, the IVC tumour thrombus extended just below the hepatic veins. Given our patient's good performance status and subsequent disease course that was slow and stable, surgical resection was felt to be a reasonable management option.

CONCLUSIONS

This case underscores the diagnostic complexity when patients with other cancers present with a renal mass with features highly suggestive of RCC, including concomitant IVC tumor thrombus. The clinical context and histopathologic confirmation with image-guided biopsy are critical in distinguishing metastatic cancer from primary RCC.[12,13] While the prognosis of patients with renal metastases with tumor thrombus is poor, individualized and multidisciplinary decision-making is important for deciding what is best for any individual patient.

REFERENCES

1. Patanaphan V, Salazar OM, Risco R. Breast cancer: Metastatic patterns and their prognosis. *South Med J* 1988J;81:1109-12. https://doi.org/10.1097/00007611-198809000-00011
2. Gilbert B, Cordova LZ, Eaton A. Metastatic breast cancer masquerading as a renal malignancy: A literature review and case report. *Urol Case Rep* 2019;24:100859. https://doi.org/10.1016/j.eucr.2019.100859
3. Nagata A, Shinden Y, Nomoto Y, et al. Metastasis of breast cancer to the right kidney with a tumor thrombus in the inferior vena cava: A case report. S*urg Case Rep* 2022;8:13. https://doi.org/10.1186/s40792-022-01364-2
4. Choyke PL, White EM, Zeman RK, et al. Renal metastases: Clinicopathologic and radiologic correlation. *Radiology* 1987;162:359-63. https://doi.org/10.1148/radiology.162.2.3797648
5. Guo Y, Arciero C, Jiang R, et al. Different breast cancer subtypes show different metastatic patterns: A study from a large public database. *Asian Pac J Cancer Prev* 2020;21:3587-93. https://doi.org/10.31557/APJCP.2020.21.12.3587
6. Ahmed Y, Aynaou M, El Houmaidi A, et al. Breast cancer metastatic to the kidney: Case report. *Urol Case Rep* 2020;33:101302. https://doi.org/10.1016/j.eucr.2020.101302
7. Tathireddy H, Rice D, Martens K, et al. Breaking down tumor thrombus: Current strategies for medical management. *Thromb Res* 2023;230:144-51. https://doi.org/10.1016/j.thromres.2023.09.004
8. Balaz P, Whitley A, Heinola I, et al. Surgical management of tumours invading the inferior vena cava: A delphi consensus document. *Eur J Vasc Endovasc Surg* 2025;70:389-99. https://doi.org/10.1016/j.ejvs.2025.03.034
9. Kim JK, Kim TK, Ahn HJ, et al. Differentiation of subtypes of renal cell carcinoma on helical CT scans. *AJR Am J Roentgenol* 2002;178:1499-506. https://doi.org/10.2214/ajr.178.6.1781499
10. Sheth S, Scatarige JC, Horton KM, et al. Current concepts in the diagnosis and management of renal cell carcinoma: Role of multidetector CT and three-dimensional CT. *RadioGraphics* 2001;21:S237-54. https://doi.org/10.1148/radiographics.21.suppl_1.g01oc18s237
11. Vergho DC, Loeser A, Kocot A, et al. Tumor thrombus of inferior vena cava in patients with renal cell carcinoma - clinical and oncological outcome of 50 patients after surgery. *BMC Res Notes* 2012;5:264. https://doi.org/10.1186/1756-0500-5-264
12. Anik Sahni V. REVIEW: Biopsy of renal masses: When and why. *Cancer Imaging* 2009;9:44-55. https://doi.org/10.1102/1470-7330.2009.0005
13. Zhou C, Urbauer DL, Fellman BM, et al. Metastases to the kidney: A comprehensive analysis of 151 patients from a tertiary referral centre. *BJU Int* 2016;117:775-82. https://doi.org/10.1111/bju.13194

FIGURES AND TABLES

Figure 1. Axial computed tomography images of the abdomen with intravenous contrast displaying (A) a 2.5 x 2 cm heterogenous interpolar to lower pole mass of the right kidney with (B) evolution to 7.6 x 7.0 cm 7 months later.

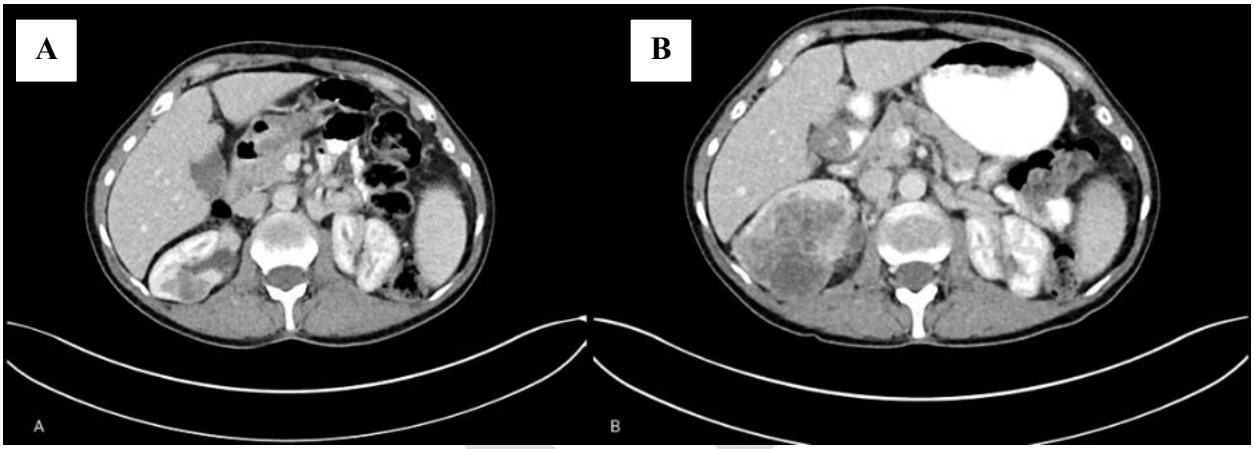

Figure 2. (A) Axial and (B) coronal computed tomography images of the abdomen and pelvis with intravenous contrast displaying tumor invasion within the renal pelvis, right renal vein, and inferior vena cava with 50% luminal diameter narrowing.

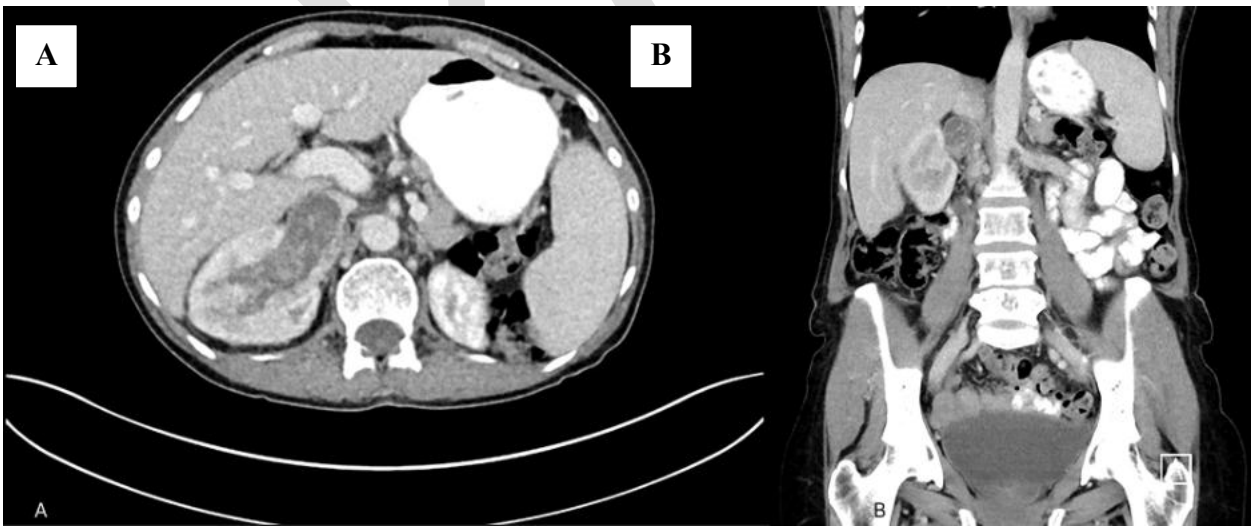

Figure 3. (A) Axial and (B) coronal T1 FS VIBE magnetic resonance images with gadolinium demonstrating an 8.5 x 8.1cm interpolar to lower pole right renal mass with an inferior vena cava tumor thrombus.