

A Review of Metastatic Tumours of the Kidney with Literature: A Single Centre Experience

Ganime Çoban¹, Özlem Toluk², Abdullah İlktaç³

¹Department of Pathology, Faculty of Medicine, Bezmialem Vakif University, Istanbul, Türkiye

²Department of Biostatistics and Medical Informatics, Bezmialem Vakif University Faculty of Medicine, Istanbul, Türkiye

³Department of Urology, Faculty of Medicine, Bezmialem Vakif University, Istanbul, Türkiye

Submitted: 2024-07-19

Accepted: 2024-10-21

Corresponding Author;

Ganime Çoban, MD

Department of Pathology, Faculty of Medicine, Bezmialem Vakif University,

Adnan Menderes Blv., Vatan Street, 34093, Fatih, Istanbul, Türkiye

E-mail: dr'gcoban@hotmail.com

ORCID

G.Ç. [0000-0002-5779-6797](https://orcid.org/0000-0002-5779-6797)

Ö.T. [0000-0001-6495-0839](https://orcid.org/0000-0001-6495-0839)

A.İ. [0000-0002-0599-5436](https://orcid.org/0000-0002-0599-5436)

Abstract

Objective: Metastatic tumors of the kidney are quite rare. In this study, we aimed to increase awareness by discussing the clinicopathological data of our cases in the context of the literature.

Material and Methods: A total of 760 cases, subjected to trucut biopsy or resection, were examined. The primary diagnoses, clinical, and histopathological features of the cases were investigated.

Results: The study included 60 trucut and 700 partial/radical nephrectomy cases, with metastasis to the kidney detected in 24 cases. The most common primary organ was the lung, with less frequent cases from lymph nodes, skin, breast, nasal sinus, gall bladder, pleura, prostate, colon, esophagus, stomach, and ovary. Most tumors were of epithelial origin. The majority of the cases were solitary and endophytic in appearance. Kidney metastasis occurred at a median of 36 (2-123) months after the primary diagnosis. The median survival time after kidney metastasis was 8 (1-90) months.

Conclusion: In this study, detailed demographic and pathological data of cases metastasizing to the kidney were documented. Although the rate of metastatic tumors in the kidney is low, even in solitary and endophytic appearances, the possibility of metastasis should be considered, especially in elderly patients, and confirmed with histopathological findings.

Keywords: metastasis, kidney, prognosis, lung, solitary, nephrectomy

INTRODUCTION

Metastatic tumors of the kidney are quite rare, ranking 12th among organs that can be metastasized. In autopsy series, the incidence of tumors metastasizing to the kidney varies, reaching up to 12.6% (1,2,3). Increased imaging techniques and the distinction between primary and secondary tumors

radiologically have also increased the detection rate of metastasis not only in autopsy series but also routinely. In more than half of the cases, kidney metastasis is not detected at the time of primary tumor diagnosis. While kidney metastasis may be seen years after the treatment of the primary tumor, rarely, kidney metastasis diagnosis can be made before the

Cite; Coban G, Toluk O, Ilktac A. A Review of Metastatic Tumours of the Kidney with Literature: A Single Centre Experience. New J Urol. 2024;19(3):110-114. doi: <https://doi.org/10.33719/nju1518955>

primary diagnosis (4). When kidney metastasis is detected, metastases are often present in other organs as well (5). Clinical signs include flank pain and hematuria, but most cases are incidentally detected during imaging (5). Compared to the primary tumor, metastases are more likely to be bilateral, multifocal, solitary, and endophytic.

Metastatic tumors in the kidney include lung, colon, breast, soft tissue, and thyroid metastases (5). Cases are generally asymptomatic and detected incidentally through imaging (6).

In this study, we aimed to highlight and increase awareness of these rare tumors by comparing the histopathological diagnoses of tumors metastasizing to the kidney in patients who underwent needle biopsy or surgery (partial/radical nephrectomy) due to a kidney mass with radiological and clinical findings.

MATERIALS AND METHODS

This retrospective study was approved by Bezmialem Vakif University Rectorate Technology Transfer Office Ethics Committees Unit. (Decision No: 333, Date: 22.11.2023). A total of 760 biopsies performed due to kidney masses (tru-cut or partial/radical nephrectomy) between January 2012 and January 2024 at Bezmialem Vakif University were evaluated. Archive materials and hospital information systems were scanned to record the diagnoses of primary and metastatic tumors. Cases with histopathologically and immunohistochemical confirmed metastasis were included in the study, while tumors directly invading the kidney were excluded. The frequency, bilaterality, endophytic/exophytic nature, multifocality, locations of metastatic tumors, presence of metastases in other organs at the time of kidney metastasis, the time between primary diagnosis and metastasis, and average survival time after kidney metastasis were recorded. The available data were discussed in light of current literature findings.

RESULTS

The study included 760 cases, 700 of which underwent partial/radical nephrectomy and 60 trucut biopsy. Metastasis was detected in 19 (76%) of the trucut biopsies and 6 (24%) of the resection materials. In total, 25 cases of kidney metastasis were present. The average age of metastatic cases was 62.2 (21-84) years. The most common symptom was abdominal/flank pain, followed by hematuria, with multiple symptoms present in other cases. In one case, adenocarcinoma of lung origin was detected by trucut biopsy due to acute kidney failure without a kidney mass. Metastases were located in the left kidney in 14

(56%) cases, the right kidney in 5 (20%) cases, and bilaterally in 6 (24%) cases. Nineteen (76%) cases were endophytic, and 6 (24%) were exophytic (Table 1). Eighteen (72%) cases had unifocal, and 7 (28%) had multifocal tumors.

Table 1. Demographic and clinical findings of the cases

	Number (n, %)
Case number	25
Age (mean ±Std. Deviation)	62.2(±16.78)
Gender	
Female	9(36)
Male	16(64)
Biopsy type	
Trucut	19(76)
Partial/radical nephrectomy	6(24)
Localization	
Right	5(20)
Left	14(56)
Bilateral	6(24)
Number of tumors	
Unifocal	18(72)
Multifocal	7(28)

In 21 (84%) cases with kidney metastasis, the primary site of the tumor was known, while in 1 (4%) case, it was unknown, and in 3 (12%) cases, the diagnosis was made simultaneously with kidney metastasis. After the diagnosis in one case, a systemic search found the primary focus. The most common primary organ was the lung (8 cases, 32%), followed by lymph nodes (5 cases, 20%) and skin (2 cases, 8%), with one case each in the breast, nasal sinus, gall bladder, pleura, prostate, colon, esophagus, stomach, and ovary. Twelve (48%) tumors were adenocarcinomas, 7 (28%) were lymphomas, 2 (8%) were small cell carcinomas, 2 (8%) were sarcomas, 1 (4%) was melanoma, and 1 (4%) was squamous cell carcinoma. Six (85.7%) of the seven lymphoma cases were B-cell, and one (14.3%) was T-cell lymphoma. Of the lung metastases, seven (87.5%) were adenocarcinomas, and one (12.5%) was small cell carcinoma (Figure 1). In 8 (32%) cases, metastasis was only to the kidney, while in 17 (68%), there were metastases to other organs as well.

The median survival time for the cases was 36 (2-123) months, and the median time after kidney metastasis was 8 (1-90) months. Nineteen (76%) cases had died, and six (24%) were alive. There was a statistically significant difference in survival

times between the group with only kidney metastasis and the group with metastasis to another organ as well ($p=0.048$). The median survival time for those with only kidney metastasis was 93.00 ± 26.35 months, while for those with metastasis to another organ as well, it was 18.00 ± 9.60 months.

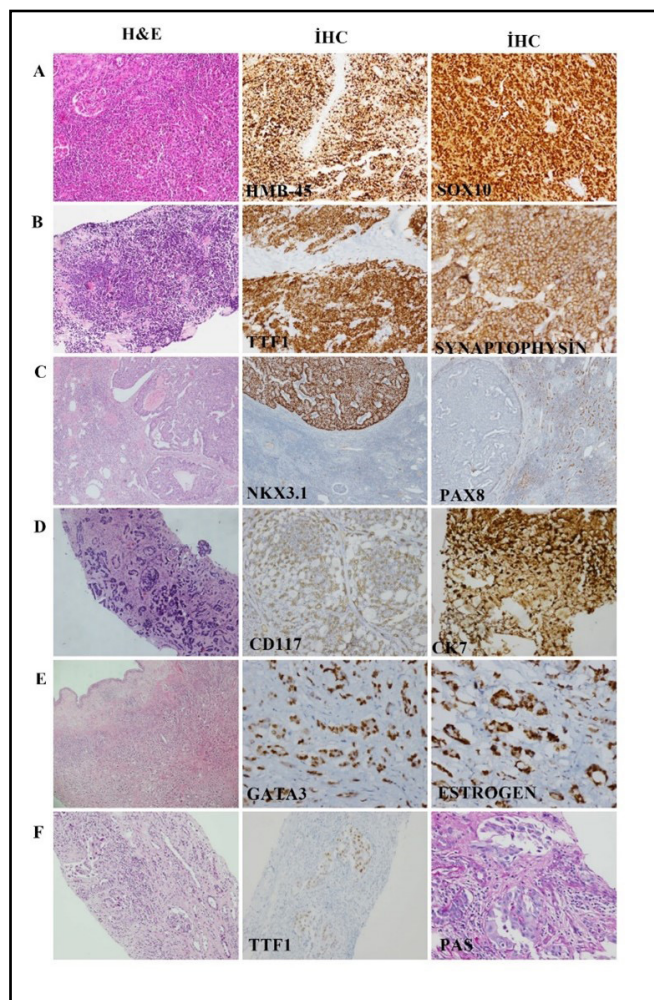


Figure 1. Histopathological and immunohistochemical findings of some tumors metastasizing to the kidney.

- A. Malignant melanoma, HMB45 and SOX 10 immunohistochemical staining required for diagnosis .
- B. Small cell carcinoma, TTF 1 and Synaptophysin immunohistochemical staining required for diagnosis and primary focus.
- C. Prostatic adenocarcinoma, Immunohistochemical staining required to show prostate origin is NKX3.1 positivity and PAX8 negativity, which is positive in kidney tumors.
- D. Immunohistochemical CD117 and CK7 positivity in our patient with adenoid cystic carcinoma forming solid and cribriform structures,
- E. Immunohistochemical GATA3 and Estrogen positivity

in our case of breast carcinoma forming solid groups under urothelial epithelium,

F. Lung adenocarcinoma, Immunohistochemical TTF1 positivity and histochemical PAS positivity for adenocarcinoma metastasis forming glandular structures in the interstitium and tubules and tumour origin. (H&E and IHC , x100)

H&E: Hematoxylin&Eosin,
IHC: immunohistochemistry

DISCUSSION

Metastatic tumors of the kidney pose a diagnostic challenge due to their varied origins and clinical and radiological appearances. Early and accurate diagnosis is considered as critical for optimal treatment planning. In cases with isolated kidney masses of unknown primary origin, the radiological distinction may not be possible, increasing the rate of unnecessary resections. While the standard treatment for renal cell carcinoma is surgery, there are no clear guidelines for metastases. However, studies indicate that curative surgical resection in oligometastasis can improve survival. Autopsy series showing incidental detection rates of 2.36-12.6% highlight the high rate of incidental findings (1,2,5). Similar to primary tumors, metastatic tumors can cause symptoms like flank pain and hematuria, and rarely, acute kidney failure. The most common primary sites were the lung, lymph nodes, gastrointestinal system, and skin, similar to other series where the lung, breast, and gastrointestinal system were predominant (7), Zhou et al. reported a series of 151 cases of lung (43.7%), colorectal (10.6%), head and neck (6%), breast (5.3%), soft tissue (5.3%), and thyroid (5.3%), while Chen et al. reported lung (60%), colon (8.6%), esophagus (5.7%), breast (5.7%), ovary (5.7%), and liver, endometrium, thyroid, parotid, and melanoma at 2.9% each (5,8). Additionally, rare metastases such as cervix and Merkel cell carcinoma have been described (9,10). Our cases also included notable metastases from the nasal sinus, prostate, and gall bladder, which are rare in the literature.

While a tumor can metastasize to any organ, it is often multifocal or bilateral. Interestingly, most kidney metastases are solitary (5,8,11,12,13). Additionally, rare cases of extensive metastasis resembling primary renal cell carcinoma have been reported, such as breast metastasis presenting as a single mass with vena cava inferior thrombus, and esophageal squamous cell carcinoma infiltrating the entire kidney, including the pelvis and adrenal gland (14,15). In our study, most cases

were solitary and endophytic. Primary kidney tumors can be recognized radiologically even when multifocal (e.g., Burt Hugg-Dube syndrome, Von Hippel-Lindau syndrome). However, metastases are less common than primary tumors, leading to cases misdiagnosed as primary tumors. Therefore, the possibility of metastasis should always be considered, especially in known primary tumor cases.

Among the metastatic tumors of the kidney, epithelial tumors are the most common (5). Additionally, melanoma, lymphoma, and mesenchymal tumors can metastasize to the kidney. As in our study, adenocarcinoma is the most common epithelial tumor in the literature, with the lung being the most common primary site. Among our lung primary cases, seven were adenocarcinomas and one was small cell carcinoma. Lian et al. found a series of six cases with lung primary metastasizing to the kidney similar results, with adenocarcinoma being the most common (four cases), followed by one case each of squamous cell carcinoma and small cell carcinoma (16). To support lung adenocarcinoma metastasis, clinical history, morphological findings, and immunohistochemical stains (TTF1, Napsin A, CK7) were positive in our cases (16). For squamous cell carcinoma metastasis, when the primary site is unknown, distinguishing it from a primary renal pelvis squamous cell carcinoma without dysplastic epithelium favors metastasis. Among our cases, we had an adenoid cystic carcinoma metastasis, a rare metastatic tumor of the kidney. The primary site was the nasal sinus, with lung metastasis preceding kidney metastasis. Although less common, mesenchymal tumors can also metastasize to the kidney, including osteosarcoma and synovial sarcoma in the literature (5). We did not encounter mesenchymal tumors in our study. Lymphomas, although less common, can also metastasize to the kidney, with diffuse large B-cell lymphoma being the most common type, as in our study.

The longest time from primary diagnosis to kidney metastasis in the literature was 156 months in Chen et al.'s study, with a diagnosis of kidney metastasis from breast cancer (8). In our study, the longest time was 84 months for nasal sinus adenoid cystic carcinoma. Seventeen cases had metastases to other organs before kidney metastasis. Additionally, the median survival times of the cases significantly decreased after kidney metastasis. Similarly, Zhou et al. reported shorter survival times after kidney metastasis (5).

We could not reach the survival times of patients diagnosed in our hospital that is limitation of this study, but it is followed

up in other centers. Our number of cases may be lower compared to the literature, but it is higher in terms of case diversity.

CONCLUSION

By increasing use of molecular examinations, organ-specific treatments are also increasing. Although the rate of metastatic tumors in the kidney is low, the possibility of metastasis should be considered, especially in elderly patients, and confirmed with systemic and radiological findings. In addition, metastasis should be kept in mind when histopathological morphology is different from the classical tumours of the kidney. There are very few series of renal metastases in the literature, and they are usually described as case reports. New studies with large series are needed to determine the true incidence of renal metastases.

Ethics Committee Report: This retrospective study was approved by Bezmialem Vakıf University Rectorate Technology Transfer Office Ethics Committees Unit. Protocol: Decision No: 333, Date: 22.11.2023.

REFERENCES

1. Abrams HL, Spiro R, Goldstein N. Metastases in carcinoma; analysis of 1000 autopsied cases. *Cancer* 1950;3(1):74-85. [https://doi.org/10.1002/1097-0142\(1950\)3:1](https://doi.org/10.1002/1097-0142(1950)3:1)
2. Bracken RB, Chica G, Johnson DE, Luna M. Secondary renal neoplasms: an autopsy study. *South Med J*. 1979;72(7):806-7. <https://doi.org/10.1097/00007611-197907000-00013>
3. Klinger ME. Secondary tumors of the genito-urinary tract. *J Urol*. 1951;65(1):144-53. [https://doi.org/10.1016/S0022-5347\(17\)68470-2](https://doi.org/10.1016/S0022-5347(17)68470-2)
4. Gao Y, Deng W, Chen Y, Fan Y, Guo Z. Renal metastases as the initial presentation of papillary thyroid carcinoma: A case report and literature review. *Mol Clin Oncol*. 2017;6(6):821-824. <https://doi.org/10.3892/mco.2017.1243>
5. Zhou C, Urbauer DL, Fellman BM, Tamboli P, Zhang M, Matin SF, et al. Metastases to the kidney: a comprehensive analysis of 151 patients from a tertiary referral centre. *BJU Int*. 2016;117(5):775-82. <https://doi.org/10.1111/bju.13194>
6. Wang J, Wang L, Long L, Tao Q, Xu F, Luo F. Solitary renal

- metastasis from squamous cell carcinoma of the lung: a case report. *Medicine (Baltimore)*. 2019;98(5):e14310. <https://doi.org/10.1097/MD.00000000000014310>
7. Adamy A, Von Bodman C, Ghoneim T, Favaretto RL, Bernstein M, Russo P. Solitary, isolated metastatic disease to the kidney: Memorial Sloan-Kettering Cancer Center experience. *BJU Int*. 2011;108(3):338-42. <https://doi.org/10.1111/j.1464-410X.2010.09771.x>
 8. Chen J, Qi N, Zhu S. Metastases to the Kidney: An Analysis of 35 Cases and a Review of Literature. *Front Oncol*. 2021;19:10:632221. <https://doi.org/10.3389/fonc.2020.632221>
 9. Bazine A, Zniber HO, Ghaouti M, Bazine A, Baydada A, Sifat H. An Uncommon Case of Renal Metastasis from Cervical Cancer. *Cureus*. 2017 Dec 13;9(12):e1941. <https://doi.org/10.7759/cureus.1941>
 10. Anastasiou A, Moulavasilis N, Leotsakos I, Nerantzis CE, Anastasiou I. Merkel cell carcinoma with kidney metastasis in a 81-year-old man. A rare case report. *Arch Ital Urol Androl*. 2019 Jul 2;91(2). <https://doi.org/10.4081/aiua.2019.2.133>
 11. Wu A, Mehra R, Hafez K, Wolf JS, Jr SW, Kunju LP. Metastases to the kidney: a clinicopathological study of 43 cases with an emphasis on deceptive features. *Histopathology*. 2015;66(4):587-97. <https://doi.org/10.1111/his.12524>
 12. Pagani JJ. Solid renal mass in the cancer patient: second primary renal cell carcinoma versus renal metastasis. *J Comput Assist Tomogr*. 1983;7(3):444-8. <https://doi.org/10.1097/00004728-198306000-00011>
 13. Hietala SO, Wahlqvist L. Metastatic tumors to the kidney. A postmortem, radiologic and clinical investigation. *Acta Radiol Diagn (Stockh)*. 1982;23(6):585-91. <https://doi.org/10.1177/028418518202300610>
 14. Nagata A, Shinden Y, Nomoto Y, Saho H, Nakajo A, Minami K, Kumagae Y, et al. Metastasis of breast cancer to the right kidney with a tumor thrombus in the inferior vena cava: a case report. *Surg Case Rep*. 2022 Jan 17;8(1):13. <https://doi.org/10.1186/s40792-022-01364-2>
 15. Chang K, Huang C, Chang H. Solitary renal metastasis of esophageal squamous cell carcinoma mimicking primary renal neoplasm – A case report and literature review. *Biomedicine (Taipei)*. 2016 Mar;6(1):6. <https://doi.org/10.7603/s40681-016-0006-4>
 16. Lian H, Pan X, Hong B, Min J, Huang F. Metastases to the kidney from primary lung cancer: clinicopathological analysis of six cases in a single center. *Lian et al. Diagn Pathol*. 2023 May 9;18(1):60. <https://doi.org/10.1186/s13000-023-01344-6>