

Eosinophilic Solid and Cystic Type Renal Cell Carcinoma

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Abstract

Eosinophilic solid and cystic type renal cell carcinoma (ESC-RCC) is a rare variant of RCC, which has garnered increasing recognition amongst the medical community. This case explores ESC-RCC diagnosed in a 59-year-old male with a history of diabetes mellitus.

Introduction

ESC-RCC was only recognized by the World Health Organization as of 2022 under the category of “other renal tumors” [1]. Currently, the documented instances of ESC-RCC are estimated to be fewer than 125 cases, positioning it as an emerging subtype that is thought to constitute

0.07-0.2% of all RCC diagnosis [2-4]. With approximately 123 known cases, including the case discussed here, and no previously characterized clinical presentation, these are rare tumors with unique morphological and immunohistochemical features that are now being elucidated and reclassified with advancements in molecular pathology [1-4]. ESC-RCC is generally observed to have a higher incidence in women, and studies have stated ages anywhere from 14-75 years old [5-7]. Tumors are generally characterized as indolent but have rarely been shown to metastasize to locations including the lymph nodes, liver, lung, and bones [2,5-6]. ESC-RCC is usually sporadic with distinguishing genetic alterations in TSC1/2; however, clinical characteristics of tuberous sclerosis complex (TSC) are often absent [2-4,6,8-13].

Case Presentation

Clinical History:

A 59-year-old male with a history of diabetes mellitus presented with a renal mass. The abdominopelvic CT with and without contrast revealed a heterogeneous enhancing exophytic mass originating from the right inferior renal pole. The mass showed areas of internal hypoattenuation, possibly indicating necrosis, and measured approximately 10.0 x 9.0 x 9.6 cm, previously 9.9 x 9.2 x 9.5 cm. As a result of the findings, the patient underwent a right robotic radical nephrectomy. Gross examination of the resected kidney displayed a yellow-grayish, solitary, non-encapsulated neoplasm with features of circumscribed pushing borders and multiple cystic lesions [Figure 1]. Additionally, cystic lesions were noted throughout [Figure 1]. Microscopy revealed cells with pleomorphic, oval-shaped nuclei and a clear cell appearance due to cytoplasmic vacuolization [Figure 2A]. Sheets of eosinophil staining epithelial cells appeared in a compact, nested pattern [Figure 2B]. In addition, eosinophilic stained cytoplasm with leishmania-like bodies was observed [Figure 2C]. Immunohistochemistry (IHC) yielded: PAX8+ (strong, clear, diffuse) [Figure 3], AMACR+, CD10+ [Figure 4], SDHB+ [Figure 5], CK20+ [Figure 6], CAIX-, CK7-, CD117-, ALK-1-. Upon histopathological analysis, the neoplasm was diagnosed as ESC-RCC.

Structures

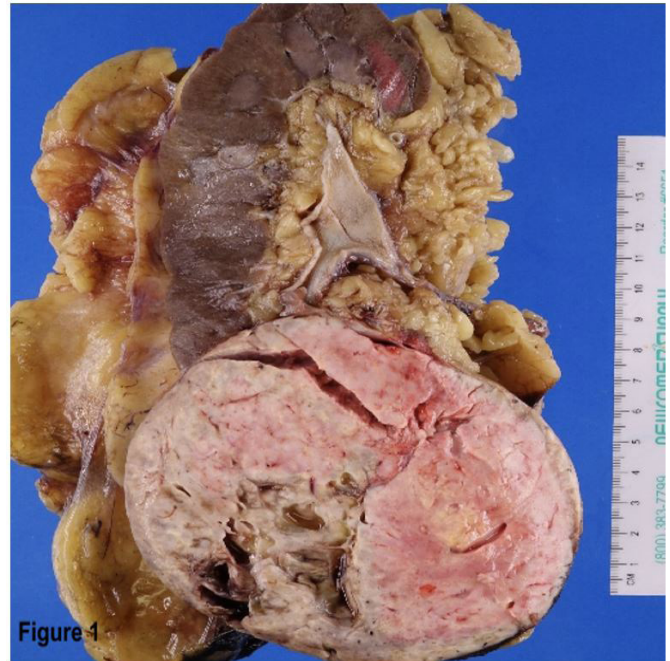


Figure 1

Figure 1: Gross specimen from radical nephrectomy of the right kidney measuring 10.0 x 9.0 x 9.6 cm.

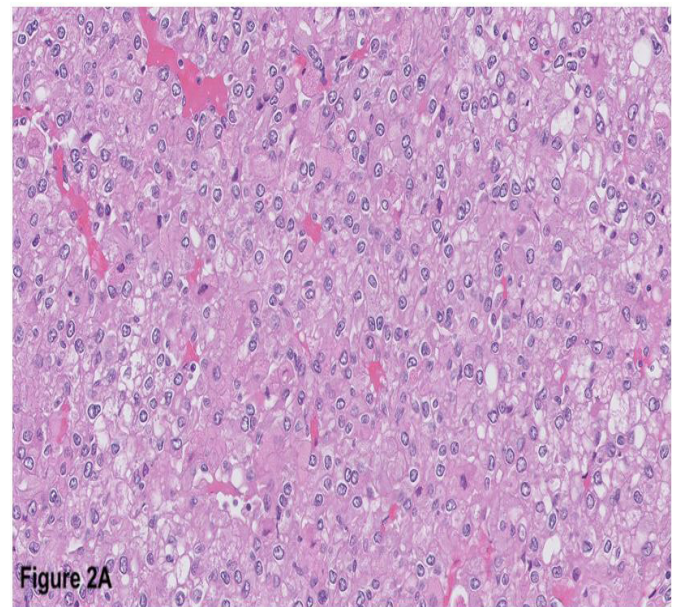


Figure 2A

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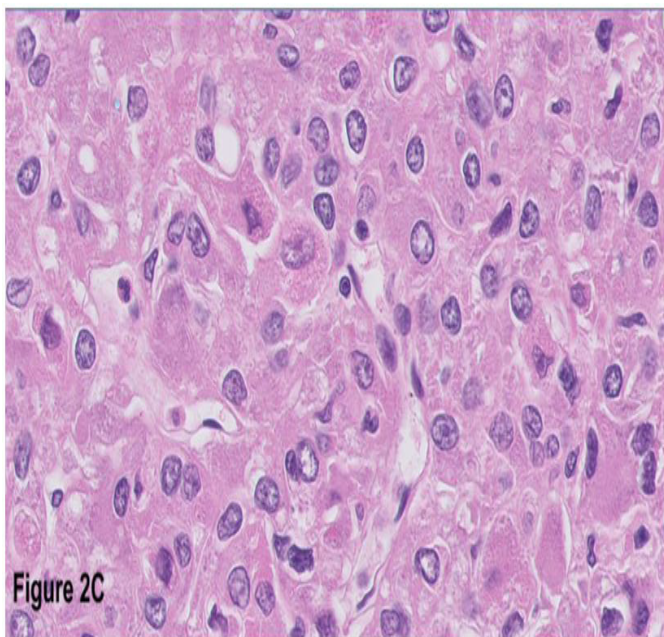
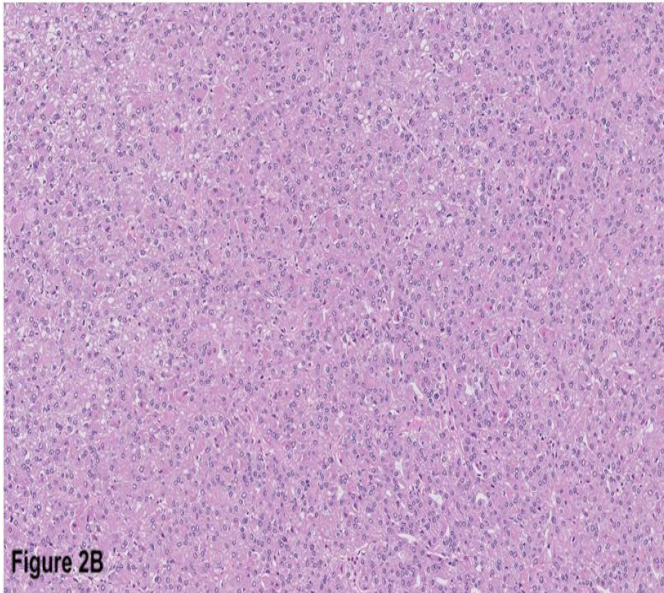


Figure 2A, 2B, 2C: Hematoxylin and Eosin-stains displaying pleomorphic, oval shaped nuclei with cytoplasmic vacuolization (A); sheets of eosinophilic epithelial cells with a somewhat compact, nested pattern (B); and eosinophilic stained cytoplasm with leishmania-like bodies (C).

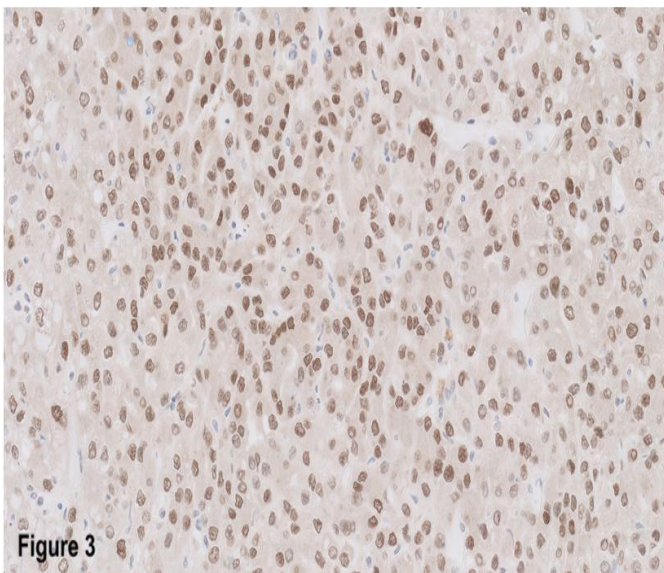


Figure 3: PAX8+; strong, clear, diffuse reactivity.

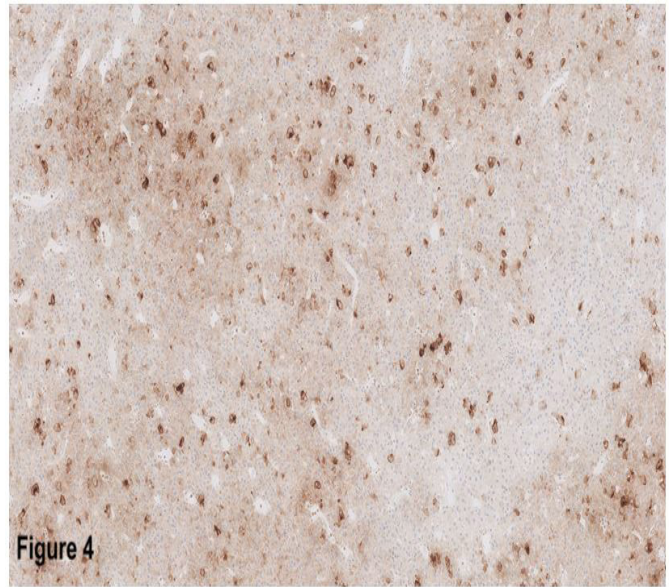


Figure 4: CD10+ staining.

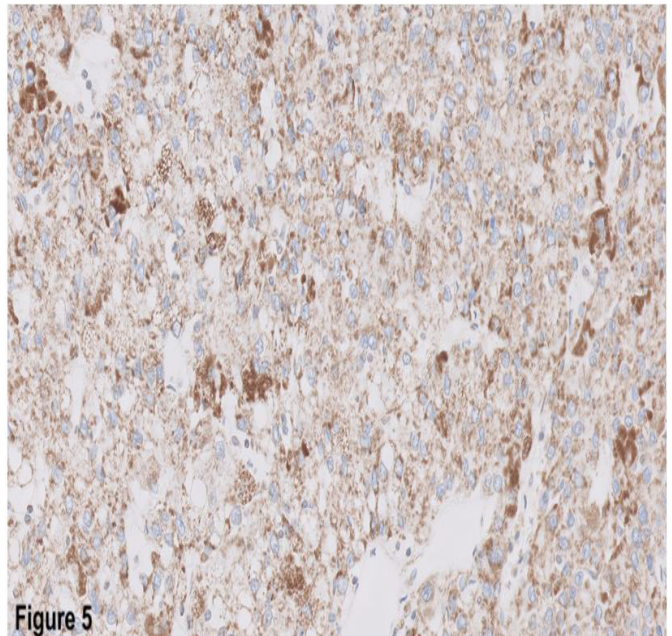


Figure 5: SDHB+ staining.

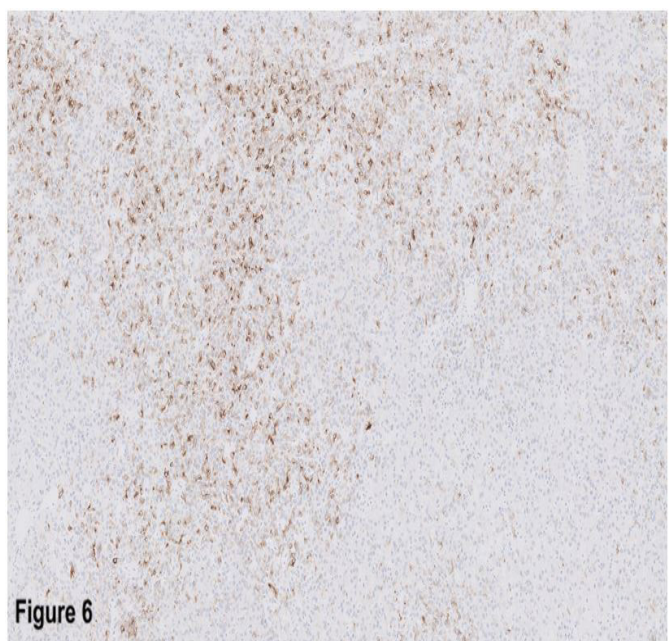


Figure 6: CK20+ staining.

Discussion

ESC-RCC is a recently recognized subtype of RCC that bears histological similarities to RCC observed in individuals with mutations in TSC [1-13]. Such resemblance is hypothesized to be due to the fact that genomic sequencing of many ESC-RCC cases has displayed sporadic TSC1 or TSC2 mutations, possibly eliciting the activation of the mTOR pathway [1-2,4,6,10,12-13].

The majority of ESC-RCC cases have been reported as unilateral and slow-growing neoplasms with a median age of around 55 years at the time of diagnosis [2-7]. ESC-RCC is primarily seen in females [2,4-6,10]. Patients with ESC-RCC typically presented with non-specific abdominal pain, with a subset of patients found to have hematuria, palpable abdominal masses, or radiating back pain [2-4,6,9]. Workup in most cases included a urinalysis and imaging, followed by biopsy and histopathological diagnosis [2-4,6,9]. Current treatment options for ESC-RCC are either partial resection of the affected area or radical nephrectomy, both of which have been shown to be curative depending on the extent of invasion by the tumor [2-6,9]. Currently, there are no associated comorbidities established with ESC-RCC [5-6,9].

Gross examinations of reported cases have consistently revealed yellow-tan neoplasms with varying-sized cystic lesions scattered throughout [2-7,9-10]. Studies noted non-encapsulated tumors with pushing borders [2-7,9-10].

Histologically, cases exhibited cystic regions lined by neoplastic cells that display a distinctive hobnail pattern interspersed within sheets of eosinophilic epithelial cells [1-13]. These cells often exhibited cytoplasmic vacuolization and featured semi-round, pleomorphic nuclei [1-13]. A prominent feature observed was the presence of intracytoplasmic granular basophilic stippling inclusions reminiscent of globules seen in leishmaniasis [1-7,9-13]. Additionally, some cases have reported the visualization of foamy macrophages [3-6,9-10,12].

While the specifics of the immunohistochemistry (IHC) panels varied across cases, a consistent pattern emerged among the majority of instances. Notably, PAX8+ (strong, clear, diffuse); AMACR+; CK20+; CD10+; MelanA+; SDHB+; Cathepsin K+; CAIX-; CK7-; CD117-; ALK-1-, TFE-; HMB45- [1-13].

In summary, the macroscopic and histologic findings, along with the results of the IHC panel observed in our case, align with the predominant trends seen in other cases [1-13]. Given the scarcity of documented ESC-RCC instances, we hope this case contributes to the expanding reservoir of insights concerning this uncommon RCC subtype. This contribution, in turn, holds the potential to enhance future identification and understanding. Doing so can open the door to future research on TSC mutations and lead to the possible development of individualized therapy and earlier detection of TSC-associated diseases.

Conclusion

In regards to RCC, the discovery of ESC-RCC has introduced a remarkable dimension of scientific inquiry. The parallelism between this newly characterized subtype and RCC in the context of TSC mutations provides an opportunity to comprehend the intricate dynamics of related tumorigenesis. As this contribution finds its place in the growing repository of insights into ESC-RCC, continued studies focusing on the genetic connection of ESC-RCC to TSC and other related genes yield possibilities to refine and better our understanding of RCC diagnostics and treatment.

Reference

1. Moch H, Amin MB, Berney DM, et al. The 2022 World Health Organization Classification of Tumors of the Urinary System and Male Genital Organs—Part A: Renal, Penile, and Testicular Tumors. *European Urology*. 2022;82(5). doi:<https://doi.org/10.1016/j.eururo.2022.06.016>.

2. Yi M, Wang S, Wang P, Wang Z, Lu J, Liu Y. Eosinophilic solid and cystic renal cell carcinoma: a review of literature focused on radiological findings and differential diagnosis. *Abdominal Radiology*. 2022;48(1):350-357. doi:<https://doi.org/10.1007/s00261-022-03694-z>.
3. He X, Chen Y, Tang H, et al. Eosinophilic solid and cystic renal cell carcinoma with TSC2 mutation: a case report and literature review. *Diagnostic Pathology*. 2023;18(1). doi:<https://doi.org/10.1186/s13000-023-01341-9>.
4. Pathak NJ, Singh AG, Jain PS, et al. Eosinophilic solid and cystic renal cell carcinoma: a single Indian tertiary center experience of three cases of a newly described entity. *African Journal of Urology*. 2022;28(48).
5. Palsgrove D, Argani P. Kidney tumor Adult renal cell carcinoma - rare eosinophilic, solid and cystic. www.pathologyoutlines.com. Published May 25, 2021. Accessed August 14, 2023. <https://www.pathologyoutlines.com/topic/kidneytumoresccr.html>.
6. Palsgrove DN, Li Y, Pratils CA, et al. Eosinophilic Solid and Cystic (ESC) Renal Cell Carcinomas Harbor TSC Mutations: Molecular Analysis Supports an Expanding Clinicopathologic Spectrum. *The American Journal of Surgical Pathology*. 2018;42(9):1166-1181. doi:<https://doi.org/10.1097/PAS.0000000000001111>.
7. Trpkov K, Abou-Ouf H, Hes O, et al. Eosinophilic Solid and Cystic Renal Cell Carcinoma (ESC RCC): Further Morphologic and Molecular Characterization of ESC RCC as a Distinct Entity. *The American Journal of Surgical Pathology*. 2017;41(10):1299-1308. doi:<https://doi.org/10.1097/PAS.0000000000000838>.
8. Lobo J, Rechsteiner M, Helmchen B, Rupp NJ, Weber A, Moch H. Eosinophilic solid and cystic renal cell carcinoma and renal cell carcinomas with TFEB alterations: a comparative study. *Histopathology*. 2022;81(1):32-43. doi:<https://doi.org/10.1111/his.14663>.
9. Mohaghegh Poor SM, Mathur S, Kassier K, et al. Two Cases of Sporadic Eosinophilic Solid and Cystic Renal Cell Carcinoma in Manitoba Population. *International Journal of Surgical Pathology*. 2021;29(7):747-751. doi:<https://doi.org/10.1177/1066896921993229>.
10. Siadat F, Trpkov K. ESC, ALK, HOT and LOT: Three Letter Acronyms of Emerging Renal Entities Knocking on the Door of the WHO Classification. *Cancers*. 2020;12(1):168. doi:<https://doi.org/10.3390/cancers12010168>.
11. Parilla M, Kadri S, Patil SA, et al. Are Sporadic Eosinophilic Solid and Cystic Renal Cell Carcinomas Characterized by Somatic Tuberosus Sclerosis Gene Mutations? *American Journal of Surgical Pathology*. 2018;42(7):911-917. doi:<https://doi.org/10.1097/pas.0000000000001067>.
12. Enrico Munari, Settanni G, Calì A, et al. TSC loss is a clonal event in eosinophilic solid and cystic renal cell carcinoma: a multiregional tumor sampling study. *Modern Pathology*. 2022;35(3):376-385. doi:<https://doi.org/10.1038/s41379-021-00816-8>.
13. Mehra R, Pankaj Vats, Cao X, et al. Somatic Bi-allelic Loss of TSC Genes in Eosinophilic Solid and Cystic Renal Cell Carcinoma. *European Urology*. 2018;74(4):483-486. doi:<https://doi.org/10.1016/j.eururo.2018.06.007>.