BMC Women's Health

CASE REPORT

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A case report on renal metastasis as an unusual presentation of choriocarcinoma

Meimei Huang[1] and Yu Ma[2*]

Abstract

Background Choriocarcinoma is an aggressively invasive neoplasm, characterized by its rapid proliferation and propensity for metastasis to distant organs via hematogenous dissemination. Lungs (80%), vagina (30%), pelvis (20%), liver (10%), and brain (10%) are the most frequently metastasized organs. Renal metastases are very rare. The clinical manifestations of choriocarcinoma varies depending on the site of disease, making diagnosis challenging. In this report, we provide a clinical case of choriocarcinoma with metastases to the renal and pulmonary systems, displaying symptoms akin to those observed in ectopic pregnancy.

Case presentation A 27-year-old female, G2P1, with a previous history of full-term pregnancy in 2018, presented to the hospital with the onset of vaginal bleeding and accompanying abdominal aches. Investigations uncovered a left adnexal mass with a human chorionic gonadotropin (hCG) level of 77,4 mIU/mL and a left pulmonary nodule measuring 31 mm x 21 mm. Laparoscopy was performed due to the high suspicion of an ectopic pregnancy. However, no visible villi were identified during the surgery, and postoperative blood hCG levels continued to rise. A diagnostic curettage also failed to reveal any villi, maintaining the suspicion of a persistent ectopic pregnancy. Following two ineffective courses of methotrexate therapy, the patient was referred to our facility. Prior to her referral, an ultrasound had indicated a mass in the right kidney. However, upon arrival at our hospital, subsequent ultrasonography failed to detect any renal masses. Despite two months of outpatient monitoring, there was a sudden and significant increase in her serum hCG levels. An emergency laparoscopy was performed, revealing no pregnancy-related lesion. After surgery, the patient's hCG levels dropped dramatically to less than one-tenth of the original amount. Multisite enhanced computed tomography(CT)revealed suspicious lesions in both the renal and pulmonary regions. Upon thorough multidisciplinary consultation, a diagnosis of choriocarcinoma was entertained. Consequently, the patient successfully underwent eight cycles of chemotherapy and has remained recurrence-free for the past year.

Conclusions This case underscores the potential for choriocarcinoma in women of reproductive age who exhibit radiological signs of renal masses. Early and accurate diagnosis, followed by prompt intervention, is essential to prevent needless surgery procedures.

Keywords Ectopic pregnancy, Kidney metastases, Choriocarcinoma

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Background

Gestational choriocarcinoma (GCC) and non-GCC (NGC) are two subtypes of choriocarcinoma, a rare, aggressive, malignant trophoblastic tumor. These two subtypes exhibit distinct biological behaviors and prognostic outcomes [1, 2]. The prevalence of GCC is 1:40,000–50,000 and it typically emerges subsequent to various types of gestational events, with the majority of cases developing after hydatidiform mole (50%) and term or preterm delivery (25%), ectopic pregnancy, or abortion (25%) [3–6]. Its histological characteristics are patchy trophoblastic infiltration, necrotic bleeding, and the absence of villous structures [1, 7, 8]. Distant metastases can occur by hematogenous spread even in the early stages due to the affinity of trophoblasts for blood vessels [7]. Lungs (80%), vagina (30%), pelvis (20%), liver (10%), and brain (10%) are the most frequently metastasized organs [9]. Renal metastases are rare, and primary renal choriocarcinoma is much less frequent [10]. Histological examination remains the gold standard for diagnosis; however, choriocarcinoma can be identified through a combination of clinical history, elevated hCG levels, and characteristic imaging findings, even in the absence of histological confirmation. This aggressive tumor type is notably responsive to chemotherapy, with a remarkable cure rate approaching 90%, even when confronted with widespread metastasis [11–14]. However, because extrauterine choriocarcinomas present clinical signs similar to those of ectopic pregnancies, achieving an accurate diagnosis before initiating treatment is challenging [15]. We present a compelling case where, after two laparoscopic examinations, it was determined that choriocarcinoma had metastasized to the lung and kidney. This report aims to aid in identifying and treating such rare cases in the future, given the low incidence and limited clinical expertise. It also serves as a reminder for clinicians to conduct thorough assessments to prevent misdiagnoses and missed diagnoses.

Case presentation

A 27-year-old woman, gravida 2, para 1, experienced a full-term pregnancy culminating in a natural delivery in 2018. The patient arrived at a hospital with complaints of vaginal bleeding for several days and abdominal aches for one day. After a transvaginal ultrasound, no intrauterine sac or embryo was detected, and the uterus appeared normal with a thin endometrium. An inhomogeneous, slightly hyperechoic area measuring approximately 19 mm×10 mm was detected near the left ovary. In the left adnexal region, an echogenic mass measuring 35 mm×29 mm was observed. Additionally, an echogenic area with a maximum depth of 12 mm was identified in the uterorectal fossa. The serum β-hCG level was 774mIU/mL. A chest CT scan revealed an irregular 31 mm×21 mm lesion in the anterior segment of the left upper lobe, which raised suspicion of a lung malignancy. Given the clinical suspicion of an ectopic tubal pregnancy, the patient was promptly subjected to an emergency laparoscopic procedure for further investigation and management. Hemoperitoneum was present, and approximately 50 mL of blood was aspirated. Upon suctioning the blood clots and exposing the pelvic cavity, a slightly enlarged uterus was observed. Blood clots, approximately 20 mm in diameter, were found on the surface of the left fallopian tube umbilicus. Additionally, the left ovary exhibited cystic hyperplasia, with a luteal cyst present on its surface, measuring 20mmx20mm in diameter. Laparoscopy exploration was then shifted to the removal of the left fallopian tubal ectopic pregnancy lesion. Although the operation proceeded properly, postoperative dynamic observation showed an increase in blood hCG levels. The postoperative pathology report for the left fallopian tube lesion revealed no villi structure or trophoblast cells. Following a diagnostic curettage, the postoperative pathology again showed no villi or trophoblast cells. Consequently, she received two 50 mg intramuscular methotrexate injections due to a suspected persistent ectopic pregnancy. On the eighth postoperative day, the hCG level was 1504.2 mIU/mL. Meanwhile, an ultrasound indicated a generally healthy uterus, both adnexa, and a mass in the right kidney. Detailed description: Irregular and slightly strong echoes, measuring 19 mm×15 mm, were seen in the upper part of the right kidney, with a 5 mm×4 mm anechoic area within.

The patient was referred to our emergency department on the same day. However, the emergency urological ultrasonography at our hospital revealed no abnormalities. After being treated with traditional Chinese medicine, she underwent dynamic follow-up for one month. During this period, her serum β-hCG level gradually decreased to 423.3 mIU/mL. Concurrently, each ultrasound examination revealed a gradually increasing 10 mm echo near the left ovary. After an additional four weeks, the beta-hCG levels rose to 14,719.1 mIU/mL. Vaginal ultrasonography revealed distinctively robust echoes within the upper uterine cavity, measuring 9mmx 6mmx8mm, as well as in the left ovary, with dimensions of 13 mm x 9 mm x 8 mm, and adjacent to it, another echo was observed, sized at 2 mm x 7 mm x 11 mm. The patient was previously in good health, exhibiting no indications of chronic illnesses or any other underlying medical conditions. Her medical history includes a full-term pregnancy five years prior and an earlier instance of miscarriage. Notably, she was not taking any medications at the time and had no reported allergies to drugs. Furthermore, she did not utilize hormonal contraceptives and had no history of dysmenorrhoea or any other gynecological concerns. The patient, suspected of having a

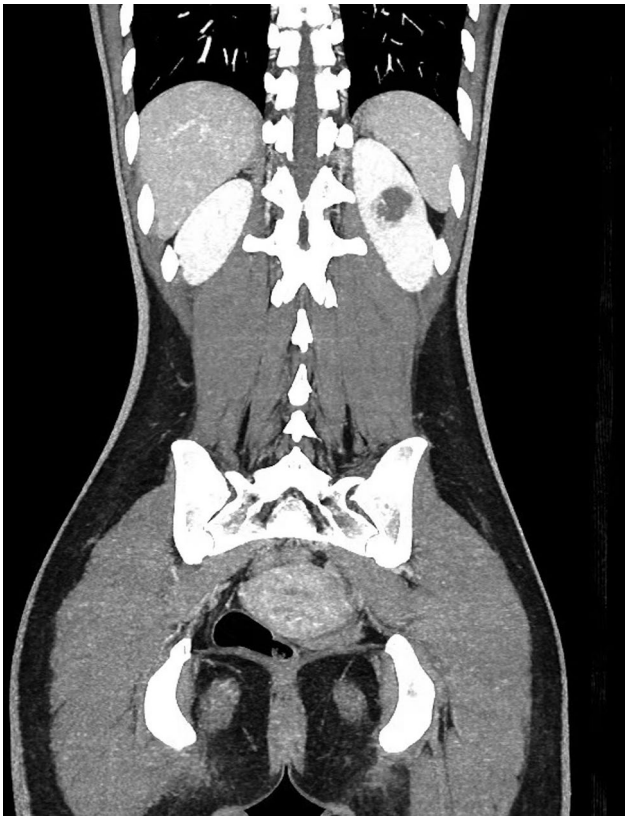

Fig. 1 A computed tomography of the abdomen revealed a 24 mm×20 mm low-density lesion in the left kidney with abundant blood supply, suggesting gestational trophoblastic tumor to be ruled out

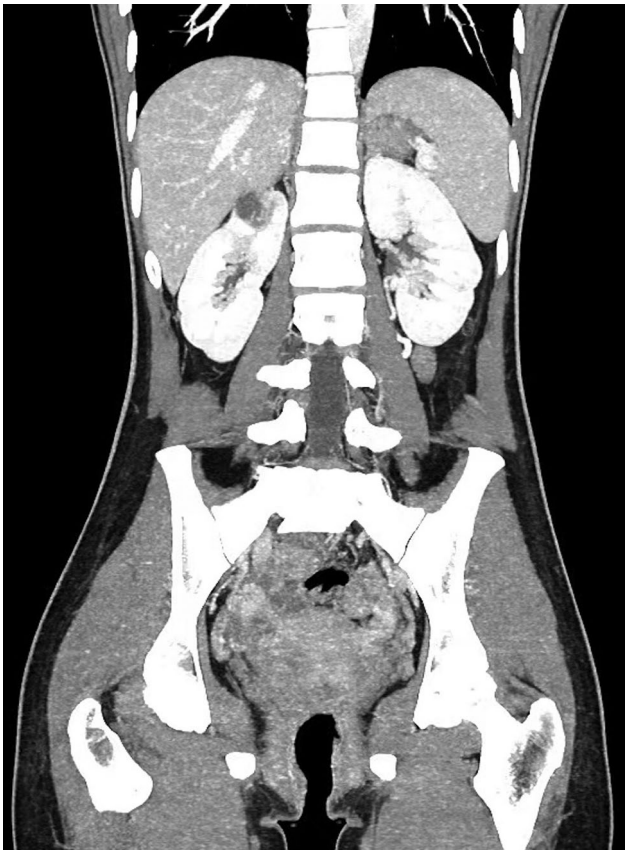

Fig. 2 A computed tomography of the abdomen revealed a 26 mm×25 mm low-density lesion in the right kidney with rich blood supply, suggesting pregnancy trophoblastic tumor to be ruled out

persistent ectopic pregnancy, was promptly admitted for emergency laparoscopy and hysterosuction. During the procedure, a distinct yellowish-white nodule, measuring approximately 10 millimeters in diameter, was noted on the surface of the left ovary. However, a subsequent pelvic examination failed to pinpoint the exact location of the pregnancy. To further clarify the situation, an intraoperative bedside ultrasound was performed, which thoroughly examined both ovaries but revealed no significant ectopic pregnancy lesions within the pelvic cavity. Postoperative Pathology Report: (left ovary biopsy tissue): extensive regions of hemorrhagic and necrotic tissue were observed, accompanied by focal areas displaying fibrous tissue hyperplasia along with notable inflammatory cell infiltration; (intrauterine tissue): the analysis revealed the presence of endometrial polyps.

On the first day post-surgery, the patient's serial hCG level was measured at 1164.9mIU/mL. However, by the third postoperative day, instead of declining, the serum hCG level unexpectedly surged to 1507.0mIU/mL. The surgical operation did not reveal any pregnancy-related lesions, yet the significant disparity in hCG levels before and after the procedure garnered the attention of the medical team. To comprehensively evaluate and rule out the possibility of systemic metastasis of a tumor, enhanced CT scans of the abdomen, chest, and head were performed. The results were concerning, revealing a 24 mm×20 mm low-density lesion in the left kidney (Fig. 1), accompanied by another 26 mm×25 mm low-density lesion detected in the right kidney (Fig. 2), and additionally, a 40 mm×33 mm foliated soft tissue mass was identified in the left lung (Fig. 3). These findings strongly suggest the presence of gestational trophoblastic neoplasia (GTN). Drawing upon the aforementioned data, we conclusively diagnosed the patient with a Federation International of Gynecology and Obstetrics (FIGO) stage IV illness. According to the World Health Organization (WHO) classification system, she was categorized as high-risk. Consequently, she underwent eight cycles of EMA-CO (consisting of etoposide, methotrexate, cyclophosphamide, and vincristine) therapy and exhibited a favorable response. A CT scan performed subsequent to the completion of chemotherapy revealed a marked decrease in the dimensions of both pulmonary and renal masses (Figs. 4, 5 and 6). Furthermore, monthly monitoring of the patient's β-hCG levels for a year following

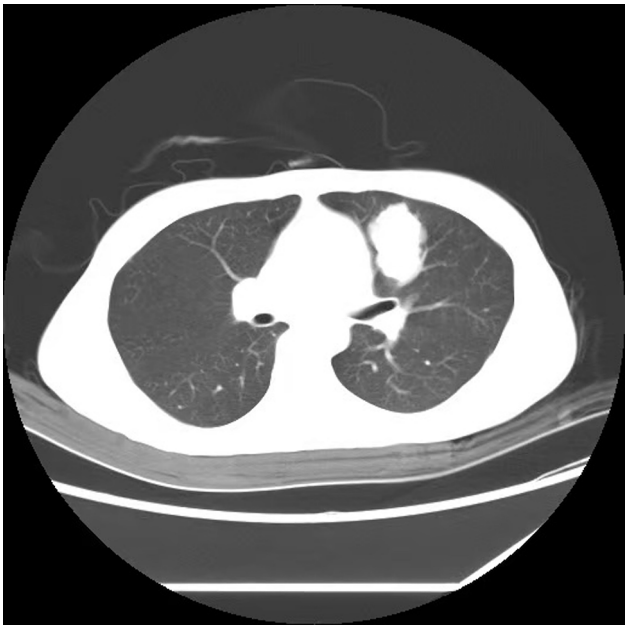

Fig. 3 A computed tomography scan of the chest revealed malignant tumors, approximately 40mmx33mm in size, located in the left lung, raising the possibility of lung metastases

her final chemotherapy session indicated no evidence of recurrence.

Discussion

Gestational choriocarcinoma is normally derived from the uterus [16], whereas non-gestational choriocarcinoma originates from the gonads or, in rare cases, extragonadal germ cells. The prognosis and sensitivity to chemotherapy depend on whether the tumor is of gestational or non-gestational origin. Histology, immunohistochemistry, and clinical symptoms cannot differentiate between these two diseases in women who have previously engaged in sexual activity. DNA analysis aids in determining the source of the tumor. Multiplex short tandem repeat (STR) genotyping of tumor DNA is frequently employed to detect whether choriocarcinoma cancers are of germ cell (e.g., ovarian) or gestational origin [17]. Specifically, the detection of a paternal Y chromosome in tumor cells indicates a gestational choriocarcinoma [18]. Hayashi et al. have pointed out that β2-microglobulin (BMG) in tumor cells can serve as a valuable serum marker or be utilized in immunohistochemical analysis to differentiate between gestational and non-gestational trophoblastic tumors [19]. Their observation is based on the fact that BMG antibodies exhibit histchemically positive staining. Although the identification remains a subject of debate [20].

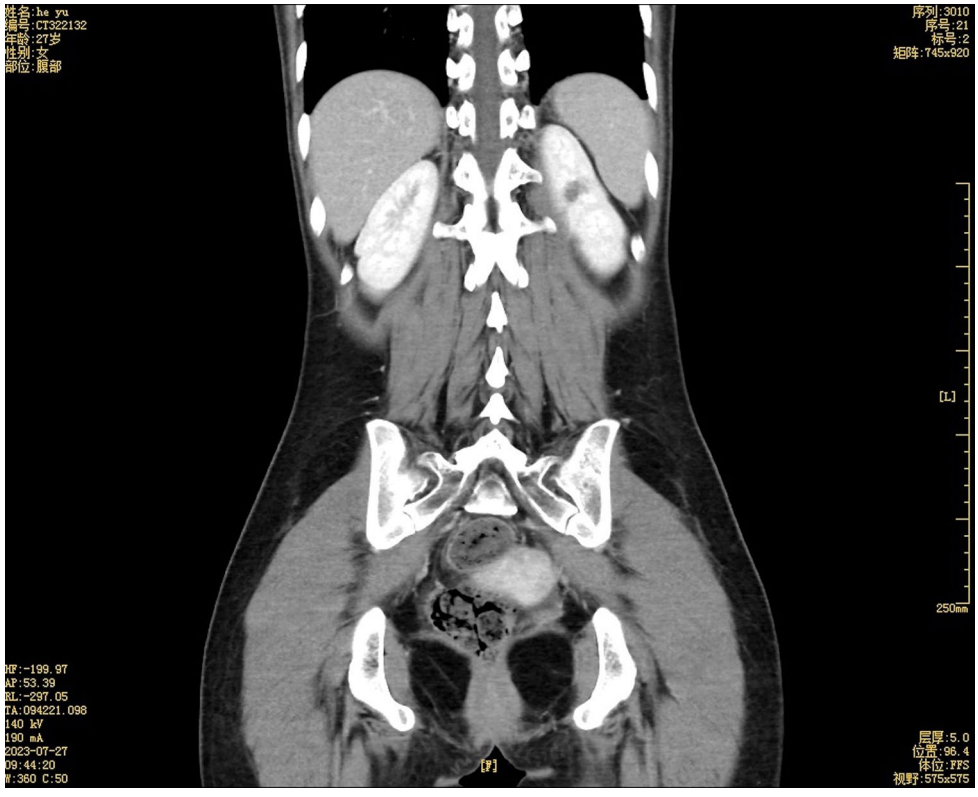

Fig. 4 A computed tomography of the abdomen revealed 15 mm×8 mm low-density lesion in the left kidney

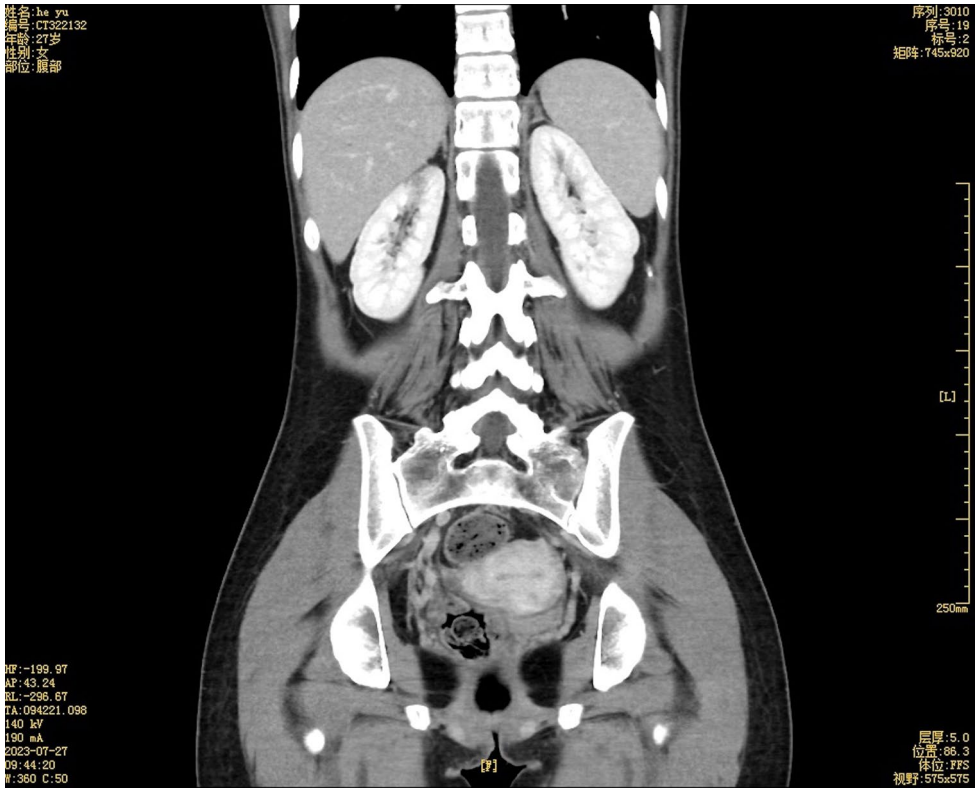

Fig. 5 A computed tomography of the abdomen revealed a 10 mm×9 mm low-density lesion in the right kidney

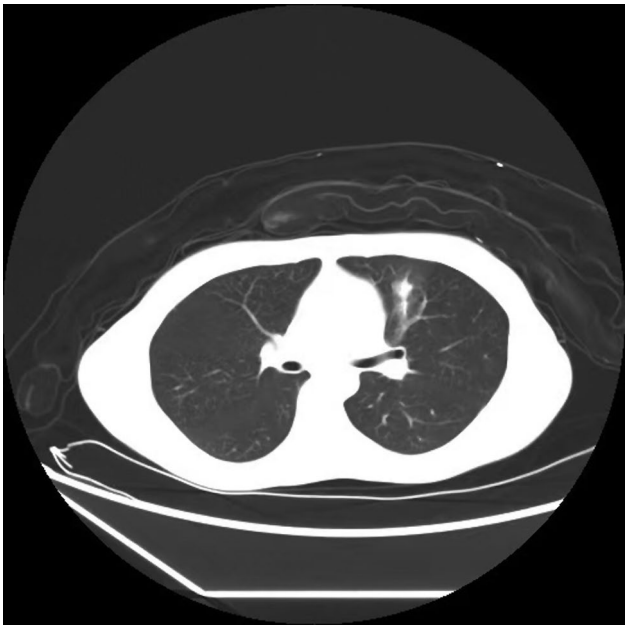

Fig. 6 A computed tomography scan of the chest revealed a 10 mm×7 mm low-density lesion and an 8 mm×7 mm low-density lesion in the left lung

Gestational choriocarcinoma is thought to originate from an abnormal, unchecked proliferation of trophoblastic cells that are typically associated with pregnancy. However, its exact etiology remains elusive and can occur years after the initial pregnancy-related event. In our patient's case, the presence of both a full-term pregnancy 5 years ago and an earlier miscarriage raises the possibility that one or both of these events could have contributed to the development of choriocarcinoma. However, without definitive histological confirmation through biopsy of the metastases, we cannot conclusively determine the specific triggering event in this individual case. Given the temporal association between the patient's history of pregnancy and the diagnosis of choriocarcinoma, it is plausible to hypothesize that the tumor's origin may be linked to either the full-term pregnancy or the earlier miscarriage, particularly given the latency period observed in some cases of GTN. Nevertheless, the possibility of non-gestational choriocarcinoma, albeit less common, cannot be entirely excluded without further investigation.

Approximately 30% of patients initially present with distant metastases [21]. A systematic review reported that 52% of intraplacental choriocarcinomas undergo metastasis, with lung metastases being the most common, followed by vaginal sites [22]. In contrast, metastases to kidneys, spleen, intestines, and lymph nodes are

relatively uncommon [23]. Renal metastases, specifically, are extremely rare occurrences, with incidence rates varying from approximately 12%, as reported by Ikeda et al. [24, 25], down to 6.9%, as reported by Wang et al. [26]. In autopsy cases, Meitei et al. [27] observed an incidence ranging from 1.8 to 11.8%. The most prominent warning symptom is vaginal bleeding, yet there are also instances where metastases, particularly those affecting the vagina, lungs, and brain, dominate the clinical picture. More frequently, choriocarcinoma is diagnosed at an advanced stage, when metastases have already occurred [28]. Our patient also had history of gynecologic complaints. Renal metastases typically exhibit a lack of early symptoms and are often discovered incidentally through imaging in patients with choriocarcinoma. While some patients may experience abdominal pain, hematuria, or oliguria, massive retroperitoneal hemorrhage resulting from rupture of renal parenchymal tumors is exceedingly rare. Our patient presented with bilateral renal and lung metastases. While it is generally considered that renal metastases from choriocarcinoma arise as arterial metastases, suggesting a potential spread from circulating tumor cells originating in initial lung metastases [26], our specific case exhibits renal and lung metastasis without identifiable primary foci. This observation aligns more closely with the "burned out" hypothesis, which posits that the primary tumor may have regressed or become undetectable while metastatic lesions persist. This phenomenon is commonly referred to as spontaneous necrosis or regression of the initial tumor lesion, accompanied by extrauterine metastases [29]. Additionally, another theory that accounts for the potential origin of progenitor cells outside the uterus involves primordial germ cells during embryonic development, or the transdifferentiation theory, which suggests a transformation of one cell type into another [18]. The inability to locate the primary lesion significantly complicates the initial diagnosis of choriocarcinoma. Due to the potential non-specificity of presenting symptoms, the process of differential diagnosis may become protracted, thereby delaying the definitive identification of choriocarcinoma. Histological confirmation of choriocarcinoma can be obtained through various methods, including curettage, hysteroscopy, hysterectomy, and removal of specimens from metastatic sites [8]. However, treatment can be initiated as soon as choriocarcinoma is diagnosed, even without definitive histological confirmation in certain cases [4, 30].

This case presents five salient features that significantly impeded prompt diagnosis. Firstly, the initial clinical manifestations closely resembled those of an ectopic pregnancy, leading to a potential misdiagnosis and delay in exploring alternative diagnostic avenues. This underscores the importance of maintaining a broad differential diagnosis and considering atypical presentations. Secondly, a notable finding on CT examination prior to the first laparoscopic surgery was the presence of a left lung nodule measuring 31 mm×21 mm. Unfortunately, this significant radiological abnormality failed to elicit adequate attention or further investigation. The oversight highlights the need for meticulous review of all imaging studies and proactive follow-up on any abnormal findings, regardless of their perceived relevance to the primary presenting complaint. Thirdly, initially, the color Doppler ultrasound of the urinary system conducted at the first hospital revealed the presence of right renal nodules. However, upon further examination at our hospital, no abnormalities were detected in the same region. This inconsistency between the two results raises concerns that the possibility of a renal mass may have been inadvertently overlooked. Fourthly, laparoscopic exploration failed to reveal any obvious pregnancy tissue, and the primary lesion remained undetected. Additionally, the absence of a biopsy on the lung or kidney mass resulted in a lack of histological confirmation, which is crucial for definitive diagnosis. Fifthly, although hCG levels initially appeared to rise and then fall after methotrexate treatment, an unexpectedly large spike was observed two months later, reaching 147,19.1 mIU/mL. This was followed by a sharp drop to less than one-tenth of the peak value immediately after the second laparoscopic exploration. Remarkably, no pregnancy abnormalities were detected during this procedure. Considering these factors, there is a high probability that the sudden surge in numerical values was erroneous.A key deficiency in this case lies in the potential avoidance of a second laparoscopy had the relevant factors been more comprehensively addressed. Specifically, the presence of elevated beta-hCG levels and radiographic evidence indicating lung and kidney metastases could have strengthened the clinical diagnosis of choriocarcinoma, thereby potentially eliminating the need for further invasive procedures such as a second laparoscopy. It is important to note that choriocarcinoma is primarily diagnosed clinically, rendering a histological study non-essential in most cases.

With the sharing of the patient's complete medical history in this report, which includes details of surgery, chemotherapy, and relevant imaging data, we hope that professionals will gain knowledge not only from this experience but also from each other. It is crucial to note that in cases where the diagnosis of lung and kidney masses is unknown, we should consider the diagnosis in depth preoperatively and rule out a germ-cell neoplasm as a first step.

The prognosis for choriocarcinoma is extremely favorable, contingent upon prompt referral to a tertiary care center and the initiation of an appropriate chemotherapy regimen without delay [31]. The survival rates for low-risk patients (score 6 or less) and high-risk patients (score

7 or more) with gestational choriocarcinoma are almost 100% and 94%, respectively [32–34]. Patients with non-metastatic (stage I) and low-risk metastatic (stages II and III, score<7) GTN undergo single-agent chemotherapy, whereas high-risk patients with metastatic illness (stage IV and stage II or III, score 7) are usually treated with multi-agent chemotherapy, sometimes in combination with adjuvant radiation therapy or surgery, to achieve a higher cure rate [7].

Multiagent chemotherapy utilizing EMA-CO has been reported to achieve a remission rate of 91% in patients [35]. For those at very high risk with significant disease burden, administering 1–2 cycles of low-dose induction etoposide chemotherapy prior to initiating EMA-CO therapy has been shown to effectively reduce early mortality from 7.2–0.7% [36, 37]. Nevertheless, it is important to note that some patients exhibit resistance to initial chemotherapy, posing a challenge in their treatment course [38]. he utilization of immune checkpoint inhibitors, particularly anti-programmed death ligand 1 (PD-L1) agents, has emerged as a potentially effective novel treatment strategy for chemotherapy-resistant cases [38]. A notable example is pembrolizumab, an anti-PD-L1 therapy that has achieved complete responses in approximately 80% of patients who have failed to respond to chemotherapy [39, 40]. Nevertheless, the precise role of immunotherapy in the management of GTN remains an area requiring further investigation and exploration [39]. Surgical intervention may be necessary in cases where gestational trophoblastic tumors exhibit resistance to chemotherapy or when bleeding needs to be controlled. This can involve procedures such as hysterectomy for uterine involvement and pneumonectomy for isolated lung metastases. For renal metastases, radical nephrectomy is considered the definitive treatment option. Notably, a previous case report has documented a similar instance of gestational choriocarcinoma with metastases to both the kidneys and lungs [20]. The patients referenced by Hao-Ming Li et al. were of reproductive age and had been diagnosed with high-risk metastatic illness, necessitating nephrectomy followed by postoperative chemotherapy. However, in these cases, the initial single-agent chemotherapy regimen proved ineffective. Consequently, a shift was made from single-agent to multi-agent therapy.

Choriocarcinoma is characterized by secretion of beta-hCG, which serves as the tumor marker. Generally speaking, serum hCG levels indicate both tumor activity and tumor burden [41]. Therefore, it is necessary to monitor beta-hCG levels every month for 12 months post-treatment. This monitoring is critical, as recurrence rates range from 8 to 10%, depending on the initial stage [42].

Choriocarcinoma poses a significant challenge due to its remarkable ability to camouflage [43], as each case manifests uniquely and unusually. Consequently, diagnostic dilemmas have consistently arisen in the majority of reported cases. When confronted with such a rare disease lacking typical symptoms, clinicians may inadvertently overlook the diagnosis in clinical practice. This oversight often leads to delayed treatment and potentially grave consequences.

Our aim is to review this case as a reminder that patients with renal and pulmonary masses should consistently monitored for potential reproductive system tumors, either through physical examination, tests, or examinations. If necessary, multidisciplinary consultation should be sought. Of course, a lack of knowledge about rare diseases is a common reason for clinicians to miss a diagnosis, especially if it falls outside their area of expertise. In cases where the diagnosis remains uncertain, a multidisciplinary consultation becomes imperative to minimize the likelihood of underdiagnosis.

Abbreviations

hCG	human Chorionic Gonadotripin
CT	Computed tomography
GCC	gestational choriocarcinoma
NGC	non-gestational choriocarcinoma
GTN	Gestational trophoblastic neoplasia
FIGO	Federation International of Gynecology and Obstetrics
WHO	World Health Organization
EMA-CO	Etoposide, Methotrexate, Dactinomycin D, Cyclophosphamide, Vincristine
STR	Short tandem repeats
BMG	β2-microglobulin
PD-L1	anti-programmed death ligand 1

Acknowledgements
The authors thank the patient for agreeing to participate in her report and for providing her detailed medical history.

Author contributions
M. H. (first author) and Y.M. (corresponding author) were responsible for manuscript drafting. All authors contributed to and approved of the final version of the manuscript.

Funding
No funding.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Ethical approval and patient consent were acquired and recorded in the patient medical record with witness signature. All ethical approval and consent procedures were approved by the Medical Ethical Committee of West China Xiamen Hospital, Sichuan University.

Consent for publication
Consent was informed and written consent to publish this information was obtained from the patient.

Competing interests
The authors declare no competing interests.

Received: 5 August 2024 / Accepted: 1 October 2024
Published online: 21 October 2024

References

1. Bishop BN, Edemekong PF. *Choriocarcinoma*, in *StatPearls*. 2024, StatPearls Publishing Copyright ©. StatPearls Publishing LLC. Treasure Island (FL); 2024.
2. Hui P. Gestational trophoblastic tumors: a Timely Review of Diagnostic Pathology. Arch Pathol Lab Med. 2019;143(1):65–74.
3. Yuksel D, et al. Clinical features of gestational choriocarcinoma: a retrospective bicentric study. Asia Pac J Clin Oncol. 2024;20(2):292–8.
4. Korbeľ M, et al. Results of treatment of gestational trophoblastic neoplasia in the Slovak Republic in the years 1993–2017. Ceska Gynekol. 2021;86(2):94–101.
5. Mao TL, et al. Immunohistochemistry of choriocarcinoma: an aid in differential diagnosis and in elucidating pathogenesis. Am J Surg Pathol. 2007;31(11):1726–32.
6. Lurain JR. Gestational trophoblastic disease I: epidemiology, pathology, clinical presentation and diagnosis of gestational trophoblastic disease, and management of hydatidiform mole. Am J Obstet Gynecol. 2010;203(6):531–9.
7. Lurain JR. Gestational trophoblastic disease II: classification and management of gestational trophoblastic neoplasia. Am J Obstet Gynecol. 2011;204(1):11–8.
8. Ngan HYS, et al. Update on the diagnosis and management of gestational trophoblastic disease. Int J Gynaecol Obstet. 2018;143(Suppl 2):79–85.
9. Zhao L, et al. Surgical treatment of lung metastasis in patients with refractory gestational trophoblastic neoplasia: a retrospective study. Gynecol Oncol. 2022;167(1):37–41.
10. Kheradmand A. Choriocarcinoma presenting as bilateral renal tumor: a case report. Urol J. 2005;2(1):52–3.
11. Tarney CM, et al. Relative effects of Age, Race, and stage on Mortality in Gestational Choriocarcinoma. Int J Gynecol Cancer. 2018;28(2):338–45.
12. Goto S, et al. Survival rates of patients with choriocarcinoma treated with chemotherapy without hysterectomy: effects of anticancer agents on subsequent births. Gynecol Oncol. 2004;93(2):529–35.
13. Strohl AE, Lurain JR. Nonmetastatic excised gestational choriocarcinoma: to treat or not to treat. Gynecol Oncol. 2018;148(2):237–8.
14. Li J, et al. Clinical characteristics and prognosis of 272 postterm choriocarcinoma patients at Peking Union Medical College Hospital: a retrospective cohort study. BMC Cancer. 2016;16:347.
15. Han V, Kaye S. A rare case of gestational Choriocarcinoma presenting as Cornual ectopic pregnancy. J Obstet Gynaecol Can. 2018;40(3):351–3.
16. Lurain JR, Singh DK, Schink JC. Role of surgery in the management of high-risk gestational trophoblastic neoplasia. J Reprod Med. 2006;51(10):773–6.
17. Bolze PA, Slim R. Circulating Tumor DNA: a potential Novel Diagnostic Approach in Gestational Trophoblastic Neoplasia. EBioMedicine. 2016;4:11–2.
18. Vereczkey I, et al. Renal choriocarcinoma: gestational or germ cell origin? Int J Surg Pathol. 2012;20(6):623–8.
19. Hayashi S, et al. Primary non-gestational pure choriocarcinoma arising in the ovary: a case report and literature review. Oncol Lett. 2015;9(5):2109–11.
20. Li HM, et al. Gestational choriocarcinoma with renal and pulmonary metastases lacking a primary uterine origin. Taiwan J Obstet Gynecol. 2016;55(6):881–5.
21. Bekele FS, et al. Choriocarcinoma metastatic to both kidneys presenting with spontaneous renal hemorrhage: Case report. Int J Surg Case Rep. 2024;119:109649.
22. Jiao L, et al. Intraplacental choriocarcinoma: systematic review and management guidance. Gynecol Oncol. 2016;141(3):624–31.
23. Yu P, Diao W, Jiang X. A successfully treated metastatic Choriocarcinoma Coexistent with pregnancy: a Case Report of a 4-Year Follow-Up. Med (Baltim). 2016;95(21):e3505.
24. Ikeda I, et al. Metastatic choriocarcinoma of the kidney discovered by refractory hematuria. Hinyokika Kiyo. 1996;42(6):447–9.
25. Kutcher R, et al. Renal choriocarcinoma metastasis: a vascular lesion. AJR Am J Roentgenol. 1977;128(6):1046–8.
26. Wang YE, et al. Renal metastases of choriocarcinoma. A clinicopathological study of 31 cases. Chin Med J (Engl). 1991;104(9):716–20.
27. Meitei K et al. Isolated relapse of choriocarcinoma in kidneys. J Med Soc. 2013;27(2).
28. de Moura Q. Donor Choriocarcinoma Transmission from Solid Organ transplantation: a Case Report. Transpl Proc. 2021;53(4):1345–9.
29. Iijima Y, et al. Solitary lung metastasis from gestational choriocarcinoma resected six years after hydatidiform mole: a case report. Int J Surg Case Rep. 2016;28:231–3.
30. Agha RA, et al. The SCARE 2020 Guideline: updating Consensus Surgical CAse REport (SCARE) Guidelines. Int J Surg. 2020;84:226–30.
31. Katsanevakis E, Oatham A, Mathew D. Choriocarcinoma after full-term pregnancy: a Case Report and Review of the literature. Cureus. 2022;14(2):e22200.
32. Seckl MJ, Sebire NJ, Berkowitz RS. Gestation Trophoblastic Disease Lancet. 2010;376(9742):717–29.
33. Seckl MJ, et al. Gestational trophoblastic disease: ESMO Clinical Practice guidelines for diagnosis, treatment and follow-up. Ann Oncol. 2013;24:vi39–50.
34. Soper JT. Gestational trophoblastic disease: current evaluation and management. Obstet Gynecol. 2021;137(2):355–70.
35. Singh K, et al. M-EA (methotrexate, etoposide, dactinomycin) and EMA-CO (methotrexate, etoposide, dactinomycin / cyclophosphamide, vincristine) regimens as first-line treatment of high-risk gestational trophoblastic neoplasia. Int J Cancer. 2021;148(9):2335–44.
36. Alifrangis C, et al. EMA/CO for high-risk gestational trophoblastic neoplasia: good outcomes with induction low-dose etoposide-cisplatin and genetic analysis. J Clin Oncol. 2013;31(2):280–6.
37. Santaballa A, et al. SEOM clinical guidelines in gestational trophoblastic disease (2017). Clin Transl Oncol. 2018;20(1):38–46.
38. Jafari-Nozad AM, Jahani N. Pulmonary metastatic gestational choriocarcinoma following an uncomplicated term pregnancy: a case report. J Med Case Rep. 2024;18(1):298.
39. Mangili G et al. Current evidence on Immunotherapy for gestational trophoblastic neoplasia (GTN). Cancers (Basel). 2022;14(11).
40. Choi MC, Oh J, Lee C. Effective anti-programmed cell death 1 treatment for chemoresistant gestational trophoblastic neoplasia. Eur J Cancer. 2019;121:94–7.
41. Zhong B, et al. Case report: a case with atypical presentation oftesticular choriocarcinoma. Front Oncol. 2024;14:1223873.
42. Sakurai S, et al. A rare case of gestational ovarian choriocarcinoma coexistent with intrauterine pregnancy. Taiwan J Obstet Gynecol. 2022;61(4):708–12.
43. Mangla M, et al. Unusual clinical presentations of choriocarcinoma: a systematic review of case reports. Taiwan J Obstet Gynecol. 2017;56(1):1–8.

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