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Editorial Board Member of *World Journal of Gastrointestinal Surgery*, Shu-You Peng, FRCS (Gen Surg), FRCS (Hon), MD, Professor, Surgeon, General Surgery, The Second Affiliated Hospital, College of Medicine, Zhejiang University, Hangzhou 310009, Zhejiang Province, China

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Cystic low-grade collecting duct renal carcinoma with liver compression — A challenging diagnosis and therapy: A case report

Zsolt Zoltan Fulop, Simona Gurzu, Ioan Jung, Patricia Simu, Laura Bantias, Eموke Fulop, Eموke Dragus, Tivadar Jr Bara

ORCID number: Zsolt Zoltan Fulop (0000-0002-0854-5617); Simona Gurzu (0000-0003-3968-5118); Ioan Jung (0000-0001-6537-2807); Patricia Simu (0000-0001-5502-3101); Laura Bantias (0000-0002-2240-2540); Eموke Fulop (0000-0002-9973-0454); Eموke Dragus (0000-0002-3935-3300); Tivadar Jr Bara (0000-0002-8231-6310).

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Zsolt Zoltan Fulop, Tivadar Jr Bara, Department of Surgery, George Emil Palade University of Medicine, Pharmacy, Science and Technology, Targu Mures 540139, Romania

Simona Gurzu, Ioan Jung, Laura Bantias, Department of Pathology, George Emil Palade University of Medicine, Pharmacy, Science and Technology, Targu Mures 540139, Romania

Simona Gurzu, Eموke Fulop, Department of Pathology, Clinical County Emergency Hospital, Targu Mures 540067, Romania

Patricia Simu, Department of Radiology, George Emil Palade University of Medicine, Pharmacy, Science and Technology, Targu Mures 540139, Romania

Eموke Dragus, Department of Urology, Clinical County Hospital, Targu Mures 540167, Romania

Corresponding author: Simona Gurzu, MD, PhD, Chief Doctor, Full Professor, Research Fellow, Research Scientist, Consultant Pathologist, Director of Department of Pathology, Department of Pathology, George Emil Palade University of Medicine, Pharmacy, Science and Technology, 38 Gheorghe Marinescu Street, Targu Mures 540139, Romania.
simonagurzu@yahoo.com

Abstract

BACKGROUND

A collecting duct carcinoma is a very rare, malignant renal epithelial tumor. Distant metastases are present in one third of cases at the time of diagnosis. It is known to have a poor prognosis.

CASE SUMMARY

A 42-year-old male was sent to our surgery clinic for removal of a 119.2 mm × 108.3 mm encapsulated cystic mass, which was localized in the 8th segment of the right liver lobe. The lesion was first identified on ultrasonography. A computed tomography scan confirmed the presence of a Bosniak type III cystic lesion, which affected the liver and convexity of the right kidney. Surgical intervention involved a right nephrectomy, with removal of the cystic mass. The patient was mobilized on the first postoperative day and was discharged after 7 d. The histological and immunohistochemical examination revealed a low-grade collecting duct renal carcinoma, which is a rare variant of papillary carcinoma, with low malignant potential. The patient did not receive chemotherapy and after 21 mo of follow-up, a radiological examination and laboratory analyses showed

surgical treatment, the use of his personal data for scientific purposes, for photography and filming, respectively.

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normal aspects. No relapse or other complications were reported.

CONCLUSION

To manage renal tumors properly, a correct histopathological diagnosis is crucial, as is early diagnosis and correct surgical treatment.

Key words: Collecting duct renal carcinoma; Hydatid cyst; Immunohistochemistry; Case report; Kidney; Therapy

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Core tip: We present a patient with a rare histological variant of renal carcinoma. There are at least three particularities related to this tumor. Firstly, during imaging investigations, renal carcinoma mimics an encapsulated cyst. Secondly, the differential diagnosis was difficult and was finally established by immunohistochemical staining. Thirdly, although collecting duct carcinoma is known to have an aggressive behavior, the histological assessment indicated a low-grade carcinoma. The patient is still alive after 21 mo of regular follow-up, without postoperative oncological therapy.

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INTRODUCTION

Collecting duct carcinoma (CDC), also known as carcinoma of the collecting ducts of Bellini, comprises fewer than 1% of malignant renal tumors^[1,2]. It originates from the collecting duct epithelium, which is located in the renal medulla^[3]. CDC has distinct clinical and pathological characteristics, such as hematuria, weight loss, back or flank pain and a local mass, but also fatigue and fever^[2-6]. It mostly appears in middle-aged men (male-to-female ratio = 2:1), with a right-sided laterality predominance (> 2:1)^[2,6,7,8]. At the time of diagnosis, approximately one third of patients present with metastases in supraclavicular or cervical lymph nodes or distant metastases in the lungs, bones, liver or adrenal glands^[2,4,6,7,9].

The presumptive diagnosis is highlighted by computed tomography (CT) characteristics. CDC is characteristically described as having medullary localization, with renal sinus involvement, heterogeneous enhancement, infiltrative growth, and preserved renal curve^[7].

Microscopically, it has a tubular or tubulopapillary architecture^[4,4,10]. The World Health Organization established major criteria for diagnosing CDC, which is a diagnosis of exclusion. They include location in the medullary pyramid, irregular tubular architecture, without a component of urothelial carcinoma, with high nuclear grade, inflammatory desmoplastic stroma, which is accompanied by numerous neutrophils, together with immunohistochemical (IHC) reactivity to antibodies against high molecular weight cytokeratin and Ulex europaeus I (UEA1), respectively^[4,7].

In this study, we present a patient with a large cystic low-grade CDC. After surgical excision, without postoperative oncological treatment but a strict postoperative follow-up, the patient is still alive, without complications, 21 mo after surgery.

CASE PRESENTATION

Chief complaints

A 42-year-old male patient, with a body mass index of 28.75, was transferred from a regional hospital, to our University Surgery Clinic, due to right hypochondria pain and suspicion of a hydatid cyst of the liver.

History of present illness

The patient confirmed a one-month history of right hypochondria pain, without any other significant symptoms.

History of past illness

The patient was known to have chronic cholecystitis and mild hepatic steatosis. He declared himself a social drinker.

Personal and family history

No significant diseases or other information were confirmed.

Physical examination upon admission

During physical examination a large abdominal mass was palpated in the right hypochondria and the inferior edge of the liver, located 2.5 cm below the rib cage.

Laboratory examinations

The serum lymphocyte level was 16.4%, with a neutrophil-to-lymphocyte ratio (NLR) of 4.42. The serum levels of tumor-specific markers such as α -fetoprotein, carcinoembryonic antigen, and human chorionic gonadotropin were not evaluated but their positivity was denied by IHC staining.

Imaging examinations

The primary imaging investigation included ultrasonography, which described a non-homogeneous round mass 119.2 mm \times 108.3 mm in size, with increased echogenicity. The encapsulated mass was located in the 8th segment of the right liver. Based on the patient's personal history, the presumptive diagnosis was a hepatic cyst, associated with hepatosplenomegaly and hepatic steatosis. A right renal malrotation, with the right kidney localized in the epigastrium, was also suspected. The ureteral jet from the right side of the bladder was not visible.

A CT scan was also carried out. The scan confirmed the hepatomegaly and presence of a well-defined 126 mm \times 121 mm \times 146 mm macronodular encapsulated cystic lesion. The wall thickness was estimated to be approximately 6 mm. The fluid content was estimated to be clear, with a density of 10 HU. The cystic mass was thought to involve the convex side of the right kidney, with the upper limit at the visceral face of the liver, the lateral limit at the abdominal wall and the inferior limit at the bifurcation of the abdominal aorta. It displaced the right kidney in the anterior and medial direction (Figures 1-3). Hydronephrosis or signs of disorders of secretion or excretion of the right kidney were not described, neither were modified lymph nodes. Free abdominal fluid was observed. As the cystic lesion was classified as Bosniak type III, with a 50% potential of malignancy, surgical excision was planned.

Postoperative histopathological assessment

Macroscopic examination confirmed the presence of the encapsulated cystic mass, which involved the renal specimen. On the cut section, a blackish-brown appearance was evident.

The microscopic findings revealed the presence of tubular and papillary-like structures. The nuclei predominantly showed Fuhrman grade 2; the stroma did not show obvious desmoplastic areas, although it was infiltrated with neutrophils (Figure 4). Based on histological findings, a papillary carcinoma was initially diagnosed. As foamy macrophages were seen within the fibrovascular core, a variant of CDC was taken into account, for differential diagnosis. The tumor extended into both the cortical and medullary area, exceeded the renal capsule and infiltrated the perirenal adipose tissue (pT3 stage). No lymph nodes were identified in the surgical specimen. No clear cells or sarcomatoid dedifferentiation was identified.

Immunohistochemical profile

Tumor cells showed diffuse positivity for CD15 (clone: Carb-3, Dako) CTK AE1/AE3 (clone AE1/AE3, ImmunoLogic), alpha-methylacyl-CoA racemase (AMACR clone 13H4, Dako), and vimentin (clone V9, Leica Biosystems), focal positivity for CTK7 (clone OV-TL 12/30, A. Menarini Diagnostics) and CTK19 (clone RCK 108, Dako). No positivity was revealed for antibodies CD10 (clone Ab-2 56C6, Thermo Fisher Scientific), HER-2 (clone c-erbB-2, Dako), inhibin (clone Inhibin A, Leica), CD68 (clone KP1, ImmunoLogic; it marked the foamy macrophages within the fibrovascular core), Melan-A (clone A103, Cell Marque), Calretinin (clone Dak-Calret 1, Dako), human chorionic gonadotropin (polyclonal, Dako), carcinoembryonic antigen (polyclonal, Dako) or α -fetoprotein (polyclonal, Dako). The Ki67 (clone Mib-1, Dako) index was below 5% (Figure 5).

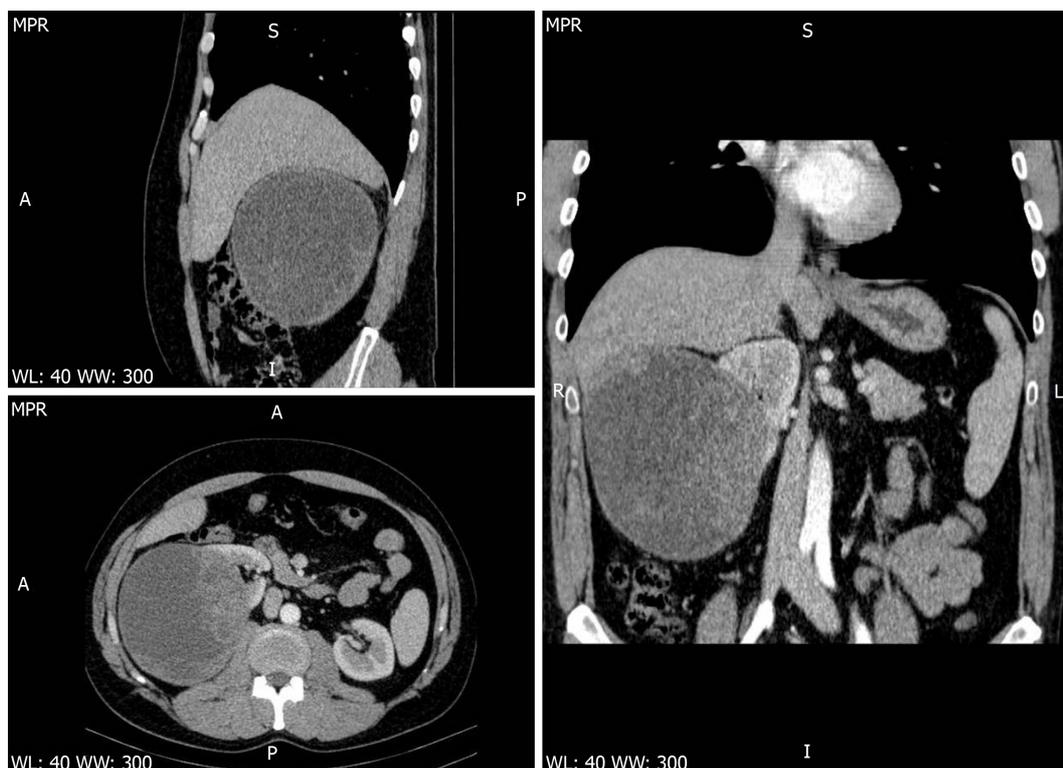


Figure 1 Computed tomography images. Contrast-enhanced abdominal computed tomography scan thin multiplanar reconstruction, in nephrographic phase, shows a large well-defined predominantly cystic right renal mass, distorting the major calyces, with many solid enhancing intracystic areas, consistent with Bosniak type III renal cyst. No signs of right renal vein or inferior vena cava thrombosis (upper left-sagittal view, lower left-axial view, right-coronal view).

FINAL DIAGNOSIS

Based on the histological findings and immunoprofile of the tumor cells, the final diagnosis was established as pT3Nx-stage low-grade carcinoma of the collecting ducts of Bellini.

TREATMENT

After antibiotic prophylaxis, with second-generation cephalosporins, and thromboembolic prophylaxis with low molecular weight heparin, surgical intervention was carried out. The POSSUM predicted morbidity rate was estimated to be 29.3%, with a POSSUM predicted mortality rate of 5.3%.

Exploratory laparoscopy was initiated, followed by conversion to open surgery. Intraoperatively, involvement of the right kidney was observed and a histological examination confirmed the malignant potential. Based on this fact, a right nephrectomy, with tumorectomy, was performed. Due to diligent hemostasis, the surgical intervention lasted 150 min.

OUTCOME AND FOLLOW-UP

The patient was mobilized on the first postoperative day. Presenting favorable evolution, he was discharged 7 d after surgery. Postoperatively the patient's health conditions were assessed by phone at 3 mo, 6 mo, and 12 mo after discharge.

He did not receive postoperative oncological treatment, but in the first year following the surgical intervention, he attended oncological control examinations once every 3 mo. During the course of the first 12 mo, two ultrasonographies and one CT scan were performed, which described normal kidney function on the left side, without any suspicion of relapse on the right side. From the second postoperative year, control examinations were performed every 6 mo. After 18 mo, the laboratory investigations showed normal values and ultrasonography excluded any sign of relapse. The patient presents regularly at the nephrology clinic for evaluation of left-sided renal activity, which shows normal function. The patient states that he is in



Figure 2 Image of thin maximum intensity projection coronal view contrast-enhanced excretory phase. The image shows a mass effect of the cystic tumor, with distortion of the major superior and inferior right kidney calyces.

good general health, without any complaints 21 mo after surgery.

DISCUSSION

CDC is a rare but threatening genitourinary malignancy^[9,10]. It usually presents as a locally advanced, high-grade carcinoma, with bone metastases^[9]. In rare cases, these tumors can be large with a cystic appearance, such as in this case^[3,11].

Due to its histological rarity, the optimal postoperative therapy requires elucidation^[10]. It should be based on a correct estimation of malignancy grade. As CDC is considered to show highly malignant behavior, the identification of low-grade cases, as an exclusion diagnosis, might be crucial for a thorough follow-up. Recent studies proposed using inflammation-related parameters for estimation of prognosis^[12,13]. An NLR ≥ 4 is considered an indicator of poor prognosis^[12,14-16]. In this case, although the value of the NLR was 4.42, the patient had a favorable prognosis, 21 mo after diagnosis.

Current relevant literature is dominated mostly by case reports from small institutional cohort studies (Table 1)^[3,11,17-27]. The reported survival rate is controversial, being mostly reported as a median survival of 13-22 mo after diagnosis^[5,9]. The overall survival rate at 1 year and 3 years, for all stages, is reported to be 69% and 45%, respectively^[2,5]. A survival benefit of 4-5 mo only, is predicted with chemoradiotherapy^[9]. To date, there is no standardized treatment for metastatic CDC^[8]. In locally advanced cases, no chemotherapy is indicated after standard nephrectomy. It is recommended that the evolution of patients is followed, and if metastases appear, the histological examination and immunoprofile of the metastasis are necessary for individualized therapy^[2]. As HER-2 may be overexpressed^[10], HER-2/neu amplifications can be indicators of anti-HER-2 medications. In metastatic CDCs, tumor regression was reported after targeted therapy with sunitinib or sorafenib^[2,8].

Although there is a tendency for a detailed imaging diagnosis, in this particular case, a hepatic cyst was suspected on ultrasonography. CDC usually presents as a central medullary renal mass, showing minimal contrast capture; in rare cases, cortically situated satellite nodes are also described^[2]. Cystic renal masses are easily diagnosed on CT scans, if they belong to Bosniak type I or type IV. Bosniak type II and III cysts^[3] may present a diagnostic challenge.

The diagnosis in our patient was difficult based on histological assessment, and supplementary IHC staining was carried out. As CDC is an exclusion diagnosis, the differential diagnosis should include papillary carcinoma, renal medullary carcinoma, and gland-forming urothelial carcinoma^[3]. Suspicion of CDC should be confirmed by Hematoxylin-Eosin staining and positivity for UEA I and a large spectrum of keratins, such as CKHMW, CK AE1/AE3, CK7, and CK19, associated with positivity for CD15. CDC is negative for CD10, CK20 and villin and might display vimentin and HER-2 expression^[1,3,5,6]. HER-2 positivity, which was not identified in this case, is considered an indicator of poor prognosis^[10]. CDC also presents loss of heterozygosity and deletion of 1q32.1-32.2 and monosomy of chromosomes 1q, 6p, 8p, 14, 18, and 22^[1,2].

Multicenter studies and clinical trials, based on the genetic profile of the tumor cells, need to be conducted to establish an effective adjuvant therapy.



Figure 3 Three-dimensional volume rendering technique of the contrast-enhanced excretory phase. The image shows distortion of the right kidney major calyces.

CONCLUSION

In patients with rare variants of renal carcinomas, such as CDC, an estimation of tumor grade is mandatory for an appropriate follow-up. The LNR cannot be used as a prognostic parameter. In metastatic cases, targeted therapy should focus on the genetic profile of tumor cells.

Table 1 Clinicopathological characteristics of cystic renal lesions previously reported in the English literature

Ref.	Publication year	Histological type	Mimicking	Tumor localization	Tumor diameter, (cm)	Tumor stage
Kumar <i>et al</i> ^[3]	2018	Collecting duct carcinoma	Hydatid cyst	Right kidney	3.5	Not specified
Uçar <i>et al</i> ^[11]	2016	Renal hydatid cyst	Renal tumor	Right kidney	3.2	Not specified
Dwivedi and Mourya ^[17]	2018	Renal cell carcinoma with disseminated intraperitoneal and retroperitoneal cystic metastases	Systemic hydatidosis	Right kidney	Not specified	Not specified
Kheir <i>et al</i> ^[18]	2017	Multicystic nephroma	Hydatid cyst	Right kidney	13	Not specified
Bhat <i>et al</i> ^[19]	2015	Renal hydatid cyst	Cystic renal cell carcinoma	Left kidney	7	Not specified
Nayyar <i>et al</i> ^[20]	2011	Cystic schwannoma	Simple renal cyst	Right kidney	12	Not specified
Straus and Osipov ^[21]	2006	Renal cell carcinoma, clear cell type	Epithelium lined cyst of the liver	Left kidney	6.6	Not specified
Mai <i>et al</i> ^[22]	1996	Papillary transitional cell carcinoma	Renal cyst	Right kidney	8.5	Not specified
Qadri <i>et al</i> ^[23]	2015	Renal cystic echinococcosis	Renal cell carcinoma	Right kidney	Not specified	Not specified
Sidani <i>et al</i> ^[24]	2015	Renal hydatid cyst	Renal cell carcinoma	Left kidney	7.9	Not specified
Anshu <i>et al</i> ^[25]	2012	Renal hydatid cyst	Renal cell carcinoma	Right kidney	17	Not specified
Liang <i>et al</i> ^[26]	2019	Recurrent renal cell carcinoma	Polycystic liver disease	Right kidney	Not specified	Not specified
Ahmet <i>et al</i> ^[27]	2019	Hydatid cyst	Kidney tumor	Left kidney	13	Not specified
Our study	2020	Collecting duct carcinoma	Hydatid cyst	Right kidney	12.6	T3

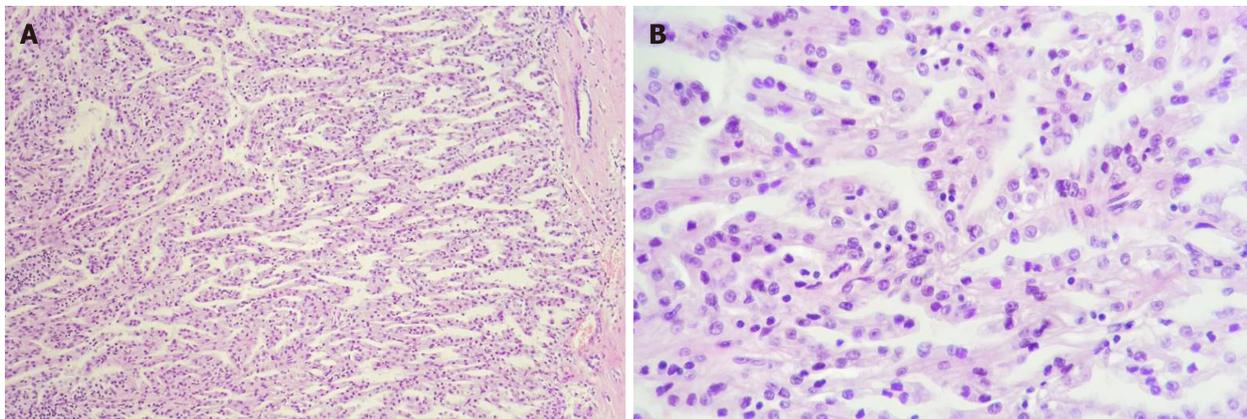


Figure 4 Histological features of the collecting duct carcinoma. A: Papillary architecture (hematoxylin and eosin, magnification 10 ×); B: Fibrovascular cores lined by one layer of tumor cells, with Fuhrman nuclear grade 2 (hematoxylin and eosin, magnification 20 ×).

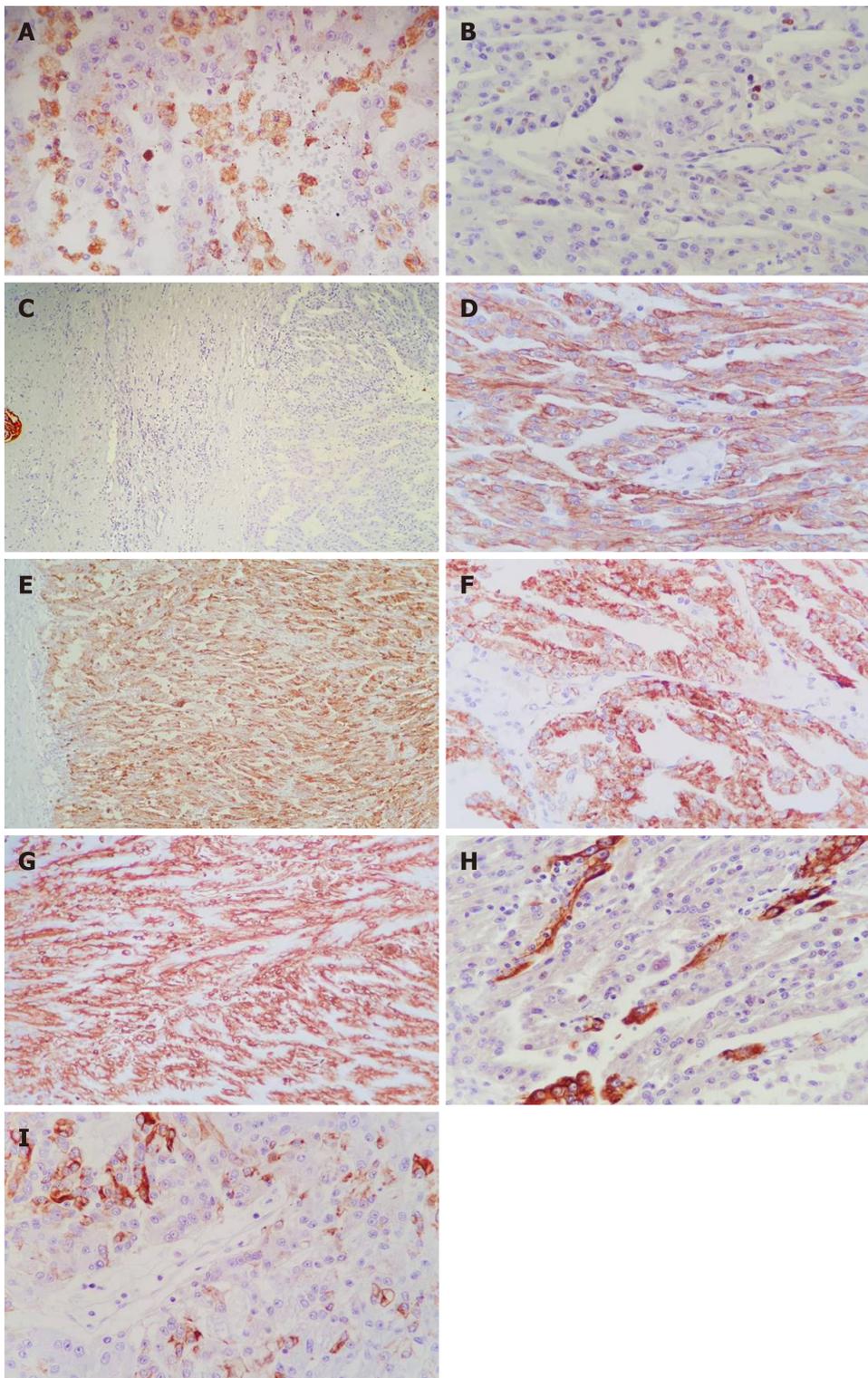


Figure 5 Immunohistochemical profile of the collecting duct carcinoma. A: Tumor papillae containing CD68-positive foamy macrophages (magnification 20 ×); B: Proliferation index Ki67 < 5% (magnification 20 ×); C: CD10 – no expression on the tumor cells, with positive internal control on the left (magnification 4 ×); D: CK AE1/AE3 – diffuse positivity (magnification 20 ×); E: CD15 – diffuse positivity (magnification 10 ×); F: AMACR – diffuse positivity (magnification 10 ×); G: Vimentin – diffuse positivity (magnification 10 ×); H: CK19 – focal expression (magnification 20 ×); I: CK7 – focal expression (magnification 20 ×).

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