Synchronous primary tumors of the kidney and the ovaries: Imaging findings

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ABSTRACT

The simultaneous presence of primary carcinomas in the same patient is uncommon and synchronous primary tumors involving the kidney and ovary are extremely rare. There are a few reports in the English literature of synchronous primary malignancies of the kidney and the ovaries, but no data regarding their imaging features. We present a case of an elderly woman, diagnosed with bilateral ovarian clear cell carcinomas and a simultaneous clear cell carcinoma of the right kidney, evaluated by multidetector CT and MR imaging.

CASE REPORT

Case Report:

An 81-year-old woman was referred to the Gynecologic Clinic with vaginal bleeding. Laboratory studies showed anemia and an increase of serum CA-125 level at 850 IU/ml.

Imaging findings

Multidetector CT (MDCT) was performed on a 16-row CT scanner, including scanning of the abdomen before and after the i.v. administration of iodinated contrast material (portal phase). The CT images revealed a large, partially cystic-solid right adnexal mass (Fig. 1), with contrast enhancement of the solid components in keeping with malignancy. A few small calcifications were seen within the tumor in the plain scan (Fig. 1a). The mass was in close proximity to the right pelvic wall and the fat stripe between the mass and the uterus was effaced, signs implying of invasion (Fig. 1b, c). A small enhancing umbilical nodule (Fig. 1d) was also detected, suggestive for the presence of metastasis.

MDCT revealed also the presence of a sharply demarcated, heterogeneously enhancing right renal mass (Fig. 2), associated with retroperitoneal lymhadenopathy. The dimensions of the lesion were 4.5 X 3 cm. The tumor was of soft tissue density (CT density: 30 HU, Fig. 2a) on the unenhanced scan, with a mean enhancement of 100 HU after contrast material administration (portal phase, Fig. 2b, c). The right renal vein and the inferior vena cava were patent. The patterns of enhancement of the renal mass were highly suggestive for the diagnosis of renal cell carcinoma (RCC).

MR imaging of the pelvis was followed on a 1.5 T magnet using a pelvic phased-array coil. MR protocol included T2-weighted images in the transverse, sagittal and coronal planes and transverse T1-weighted images, before and after the application of a fat saturation prepulse. Fat saturated T1-weigted images were repeated after the i.v. administration of gadolinium chelate compounds. MR imaging examination confirmed the malignant features of the pelvic mass (Fig. 3). A large partially cystic-solid mass, with solid parts enhancing was detected (Fig. 3f, g), associated with signs implying of invasion of neighboring organs (Fig. 3d) and the pelvic wall.

The patient underwent right radical nephrectomy for her renal cancer and optimal tumor cytoreductive surgery for the

ovarian cancer, consisting of total abdominal hysterectomy, bilateral salpingooophorectomy, pelvic and retroperitoneal lymphadenectomy and omenectomy. Pathologic analysis showed a grade III clear cell renal adenocarcinoma, confined to the kidney (Fig. 4) and a grade I-II mixed (serous and clear cell type) bilateral ovarian carcinoma (Fig. 5 and Fig. 6) of stage IIIC (due to the metastatic involvement of the umbilical nodule). The patient received two cycles of combined chemotherapy (cyclophosphamide and carboplatin) for her residual ovarian cancer. One year after surgery, no signs of macroscopic disease were seen on follow-up CT.

DISCUSSION

Multiple primary malignancies in the same patient represent 1,84 - 3,9 % of all cancers, but synchronous multiple primary tumors are extremely rare (1, 2). Most synchronous primary tumors involve the genitourinary and the gastrointestinal tract, followed by both breast and genitourinary tract and breast and gastrointestinal tract (1, 3). Among gynecologic malignancies synchronous primary carcinomas of the endometrium and the ovary are the commonest, with an incidence ranging from 5, 3% to 18, 6 % (1, 2, 4, 5). Synchronous primary neoplasms involving the kidney and the ovaries are extremely rare (1, 2, 3). As to our knowledge, three cases of synchronous double primary tumors involving the kidney and the ovaries have been reported in the English literature (1, 2, 6). Balat et al reported one case of papillary serous ovarian carcinoma, involving both ovaries, diagnosed simultaneously with a mixed (clear cell and granular cell type) renal cell carcinoma (1). Wong et al reported three cases of synchronous RCC and gynecologic malignancies, including one patient with a stage IV papillary serous ovarian adenocarcinoma. A case of three synchronous primary malignancies of stage I has been reported by Ringler et al, involving the ovary, kidney and lung (6). Four more cases of renal cell carcinoma occurring with ovarian carcinomas within a short interval (ranging from 12 to 46 months) have also been presented in the English-language literature (7, 8).

Our patient was pathologically diagnosed with synchronous right clear cell RCC and bilateral mixed (clear cell and serous type) ovarian carcinomas. Clear cell carcinoma of the ovary represents a distinct histologic subtype of epithelial malignancies comprising approximately 5% of ovarian carcinomas (9, 10). Ovarian clear cell carcinomas are similar to clear cell carcinomas of the endometrium, cervix, vagina or kidney (9, 10).

Imaging features suggesting of ovarian malignancy include large tumor size (diameter greater than 4 cm), presence of adnexal masses bilaterally, partly cystic-solid tumors, with solid parts enhancing after contrast material administration, cystic or solid-cystic lesions with thick and irregular walls or septa, of thickness more than 3 mm and/or with papillary projections (11, 12, 13, 14). The presence of secondary findings such as, pelvic organ or pelvic wall invasion, ascites and peritoneal metastases are considered as increasing the confidence in the diagnosis of malignancy (11, 12, 13, 14). Both multidetector CT and MR imaging detected a large, right adnexal cystic-solid mass, with solid components inhomogeneously enhancing, accompanied by signs suggesting the invasion of neighboring organs and pelvic wall, as well as the presence of a metastatic nodule involving the umbilicus (characterized as peritoneal metastasis pathologically). The above findings were strongly suggestive for the diagnosis of malignancy. Histologic examination showed the presence of microscopic disease in the contralateral ovary, but this was not appreciated on imaging. Detection of microscopic neoplastic involvement is a known limitation of imaging modalities (11, 12).

Renal cell carcinoma (RCC) is the most common malignancy of the kidney and accounts for 2 to 3% of all cancers (15). The widespread availability and use of cross-sectional imaging studies (sonography, computed tomography and magnetic resonance imaging) and their improvements in diagnostic capabilities has resulted in a markedly increased number of incidentally detected RCCs (15, 16, 17). More than 50% of surgically treated RCCs are reported to be discovered incidentally (17). Clear cell RCC, previously named as conventional RCC, is the commonest histologic subtype, accounting for 70% of all RCCs (18, 19).

The most important imaging criterion in differentiating renal masses is the determination of enhancement. Any enhancing solid renal mass should be considered a renal neoplasm (15, 17, 20, 21). Nevertheless, all enhancing renal masses do not always represent malignancies and benign tumors, like angiomyolipomas with minimal fat, oncocytomas and rare entities as hemangiomas should be included in the differential diagnosis.

Although the CT appearances of RCC vary considerably, most neoplasms are detected as solid masses with attenuation values of 20 HU or greater on plain images (15). Hypervascularity is the classical appearance of RCC on contrast-enhanced images, associated by some groups of investigators with the clear cell variety of RCC(15, 17, 18, 19). Multidetector CT examination in this case, showed the presence of a soft tissue density renal mass, strongly and inhomogeneously enhancing after contrast material administration, therefore suggestive for the diagnosis of RCC.

The pathologic stage for ovarian carcinoma in this case was FIGO IIIC, due to the presence of a metastatic nodule involving the umbilicus, proved peritoneal based on histology. Sister Mary Joseph nodule is the term used for the metastatic infiltration of the umbilicus (22, 23). Umbilical metastases are uncommon, accounting for less than 10% of all malignancies affecting the skin of the anterior abdominal wall (22). Adenocarcinomas originating from gastric and uterine neoplasms account for most umbilical metastases (22, 23). Less often primary tumors arising from the pancreas, the kidney or the ovaries, as in our patient may metastasize to the umbilicus (22, 23).

The etiology of multiple synchronous tumors seems to be the exposure to the same stimulus (1, 2, 3). The coexistence of RCC with primary ovarian epithelial malignancies has been reported to be hormonally dependent (1, 2, 3,). Estrogens can provoke or support tumor formation in laboratory animals at various locations, including the kidney (24). The effects of estrogens are mediated by receptors. Studies have shown that estrogen receptors are present in both normal kidney and neoplasms and may therefore play a role in carcinogenesis (24, 25, 26). In the development of ovarian epithelial cancer, hormonal factors have also been implicated, therefore the synchronicity with renal cell carcinoma may be explained.

TEACHING POINT

Synchronous double primary tumors involving the kidney and the ovaries are extremely rare. The presence of a cystic-solid adnexal mass, associated with signs of pelvic organ invasion and peritoneal/umbilical nodules and the coexistence of a strongly and inhomogeneously enhancing renal mass strongly suggested the diagnosis of epithelial ovarian malignancy and renal cell carcinoma, respectively in our case.

ABBREVIATIONS

MDCT: multidetector CT
RCC: renal cell carcinoma
MPRs: multiplanar reformatted images
MR: magnetic resonance
T: Tesla
i.v.: intravenous
H+E: Hematoxylin & Eosin

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FIGURES

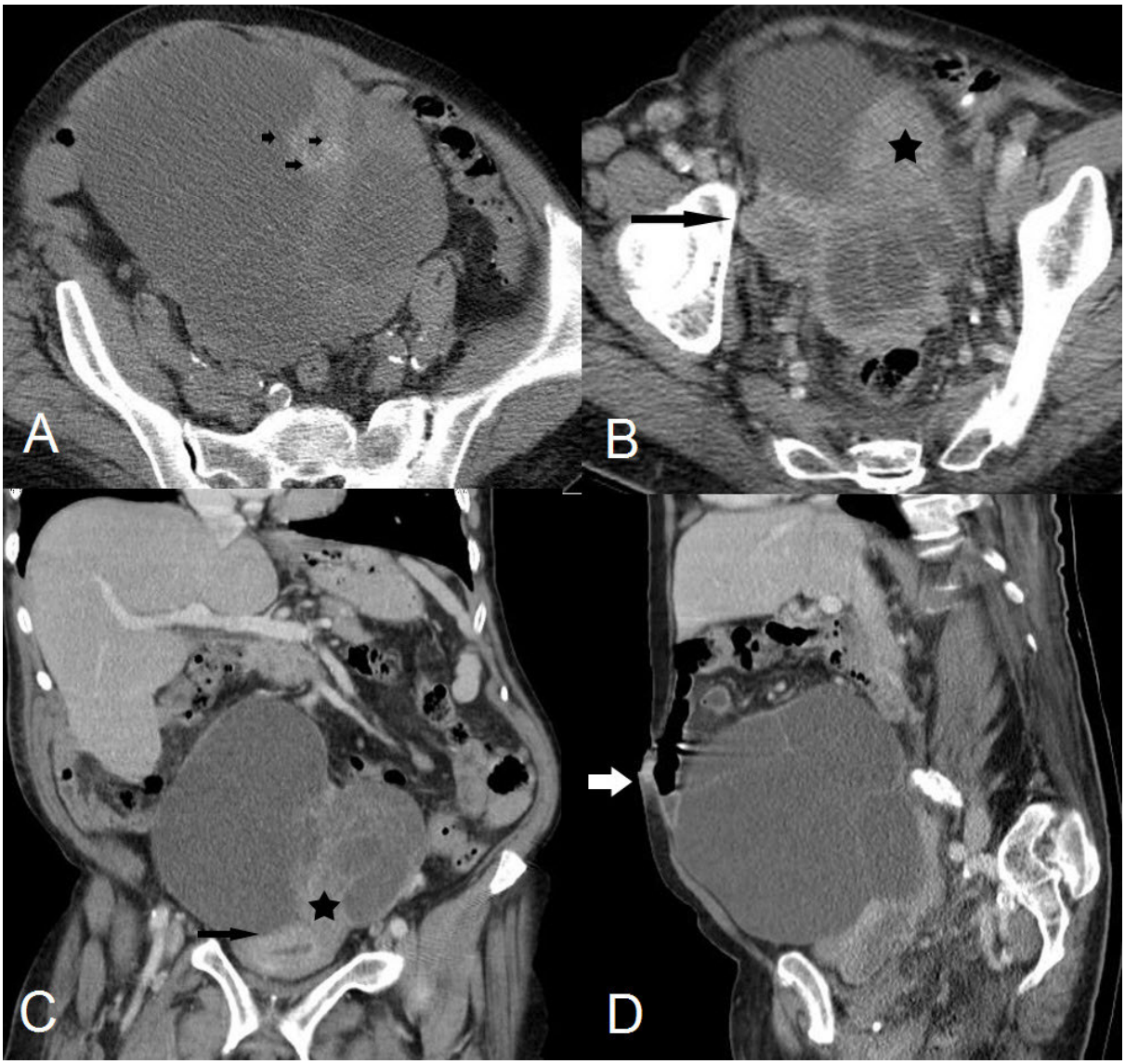

Figure 1: (a) Transverse plain CT image reveals a large, cystic-solid pelvic mass, with tiny calcifications (small arrows). (b) Transverse, (c) coronal and (d) sagittal multiplanar reformatted CT images (MPRs, portal phase) depict the tumor, with solid components (asterisk) enhancing after contrast material administration. The dimensions of the mass are 17 x 14 x 14 cm. The tumor is in close proximity to right pelvic wall (distance less than 3 mm, long arrow, b). The fat stripe between the tumor and the uterine corpus (long arrow, c) is effaced, a finding implying of invasion, which was confirmed on pathology. A small enhancing nodule (arrow, d) involving the umbilicus is revealed, proved to be metastatic on histology (sister's Mary-Joseph nodule).

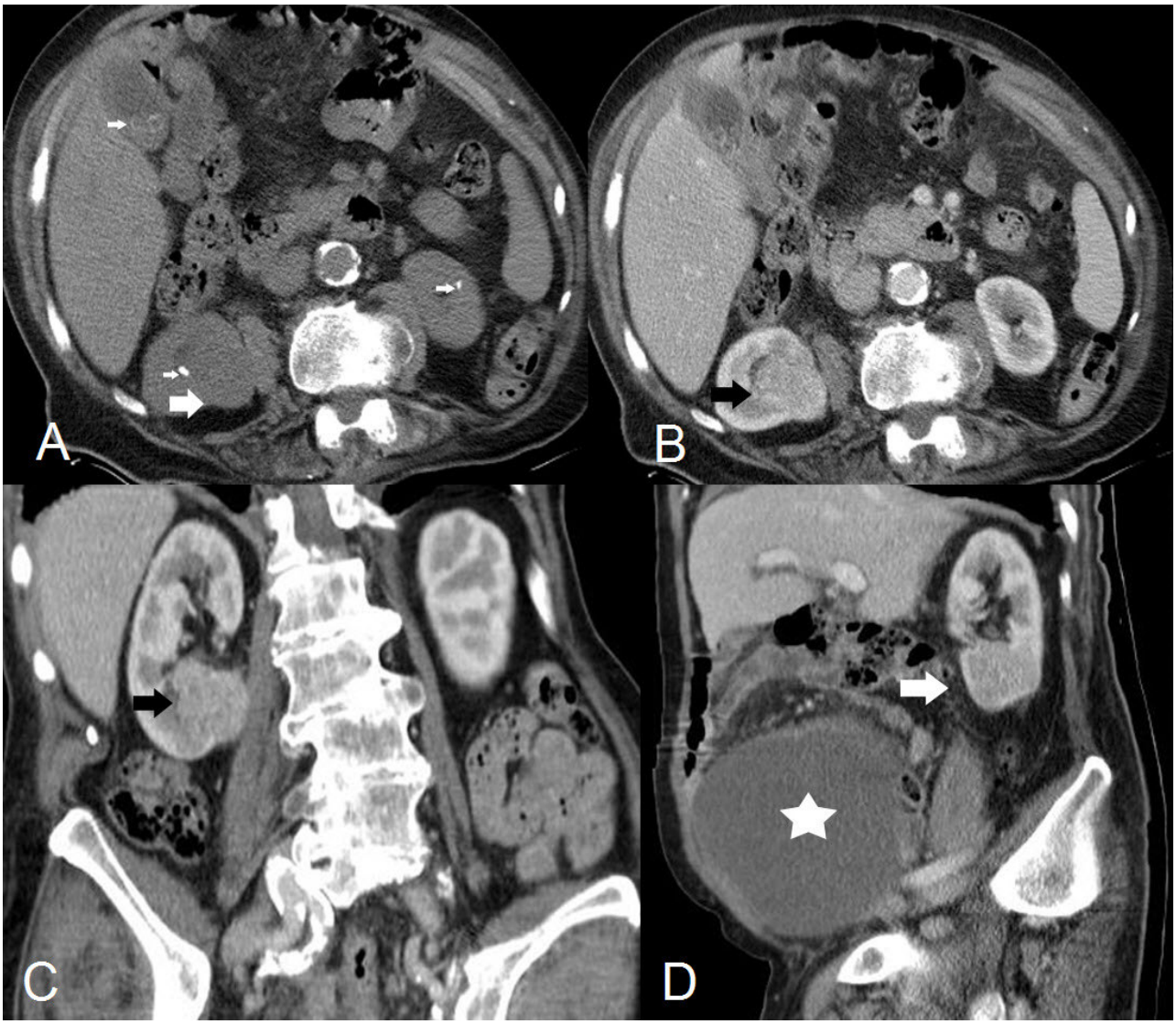

Figure 2: (a) Transverse plain CT image depicts a lower pole right renal mass (arrow). Renal stones and gall bladder stones (small arrows). (b) Transverse and (c) coronal reformatted CT images show the tumor strongly and inhomogeneously enhancing (arrow). (d) Sagittal MPR depicts both the renal (arrow) and the pelvic mass (asterisk).

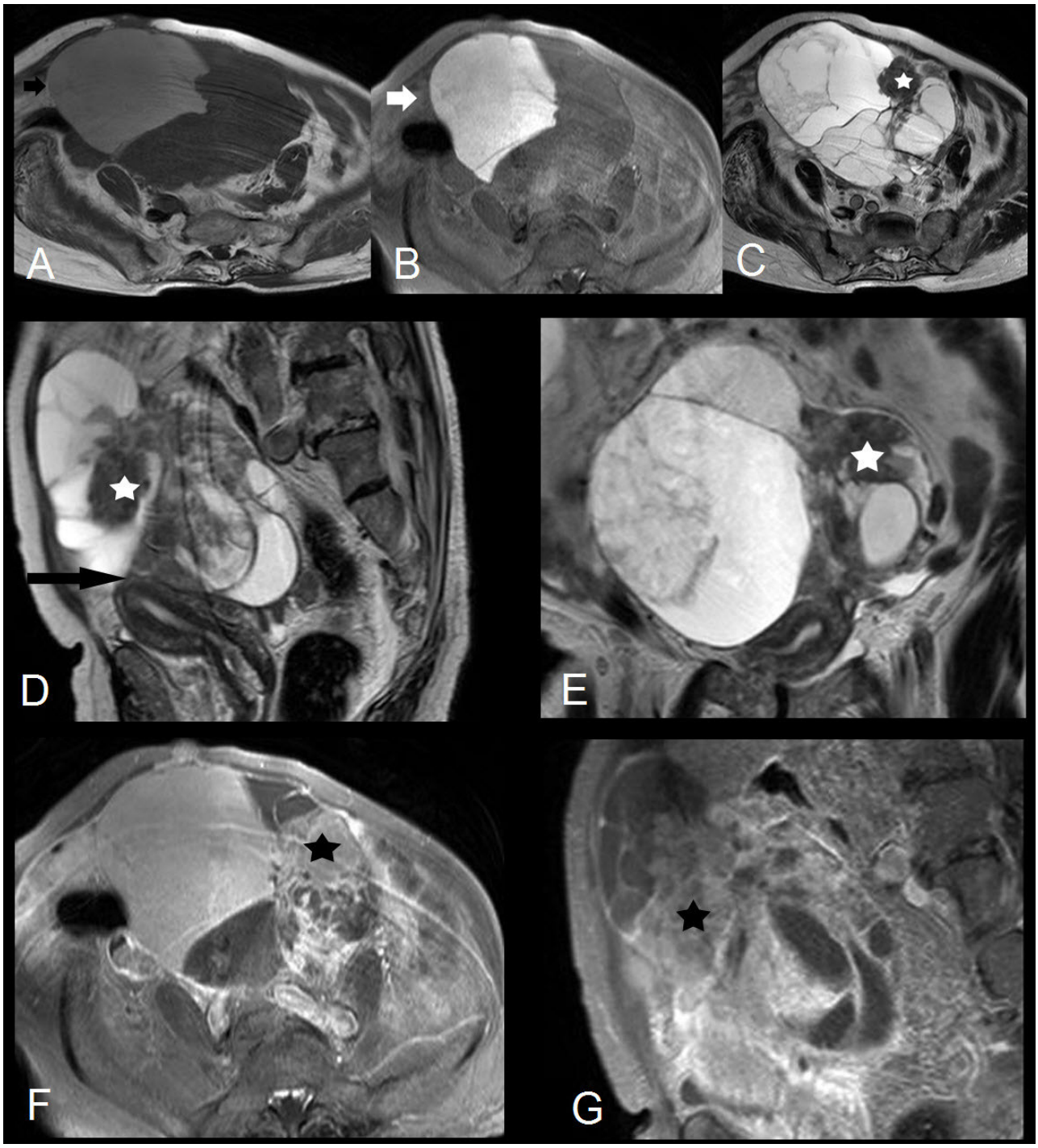

Figure 3: **(a)** Transverse T1 and **(b)** fat-suppressed T1-weighted images, **(c)** transverse, **(d)** sagittal and **(e)** coronal T2-weighted images, **(f)** transverse and **(e)** sagittal post-contrast fat-suppressed T1-weighted images depict the pelvic mass in close proximity to the uterus (long arrow), containing both cystic and solid parts, the latter contrast-enhancing (asterisk). Hyperintense parts (arrow) on T1-weigted images, proved to correspond to hemorrhagic content on pathology.

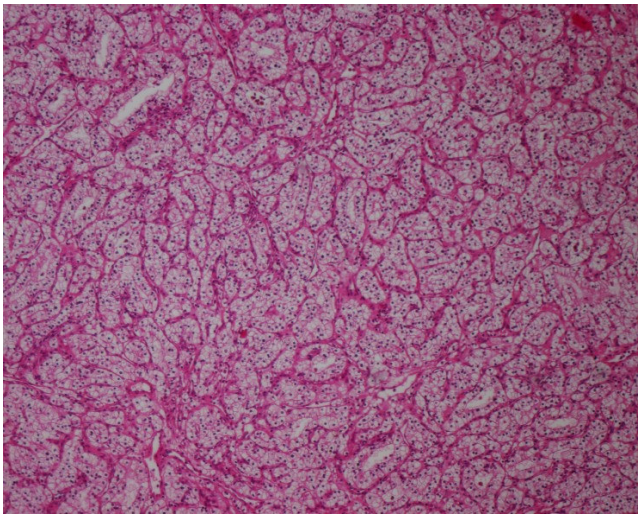

Figure 4: Grade III clear cell renal adenocarcinoma (H+E X40).

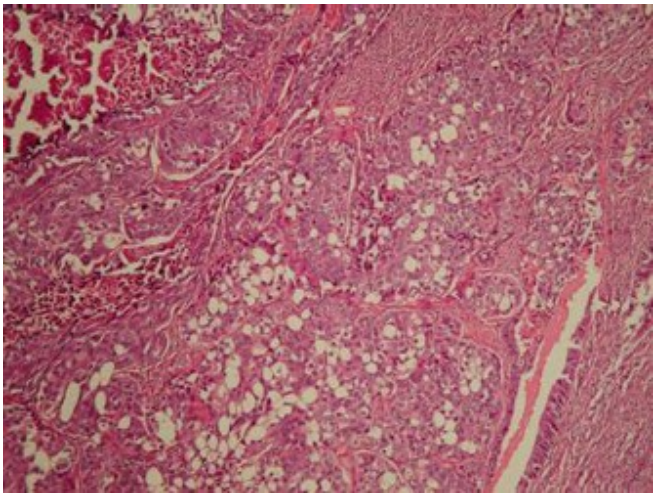

Figure 6: Right ovary. Histologic section (H+E X200): clear component of the tumor.

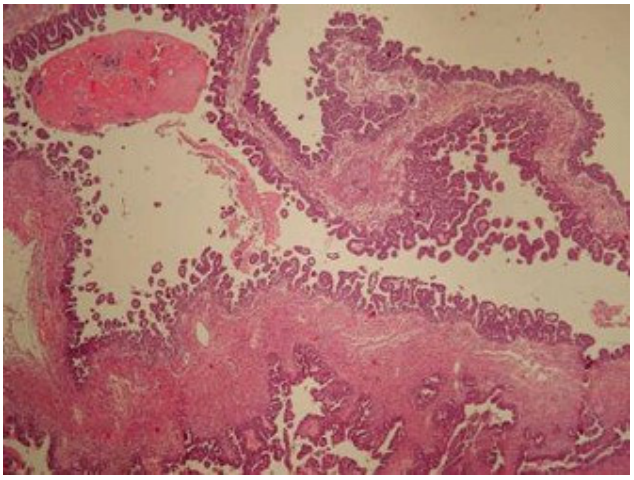

Figure 5: Right ovary. Histologic section (H+E X200): serous component of the tumor.

KEYWORDS

Ovarian neoplasms; kidney; kidney neoplasms; imaging

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