

MRI features of primary and metastatic mucinous ovarian tumors

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Learning objectives

The purpose of our educational exhibit is to:

1. Learn MRI features of primary and metastatic mucinous ovarian tumors
2. Describe the diagnostic criteria to differentiate primary and metastatic mucinous tumors

Background

Ovarian tumors containing mucin may have two origins: as mucinous epithelial tumors or as much of ovarian metastases

1. Mucinous epithelial tumors

Mucinous ovarian epithelial tumors represent 10-20% of all ovarian tumors [1]. These tumors are called mucinous because their coating secretes mucin. According to the histological grade of malignancy, mucinous epithelial tumors are either benign cystadenomas (85%), borderline types (10%), or mucinous cystadenocarcinoma (5%).

2. Ovarian metastases

Ovarian metastases represent between 5 and 15% of malignant ovarian tumors. The ovaries are a common site of metastatic localization. The imaging and macroscopic appearance of these lesions is variable depending on the primary tumor. Two subtypes of ovarian metastasis need to be distinguished: ovarian metastases with a solid majority component and metastases with a predominant cystic component.

Metastases with a solid majority component correspond to Krukenberg tumors and will not be detailed here [2]. In fact, their MRI features are only rarely a problem of differential diagnosis with mucinous epithelial tumors. The main cancers producing Krukenberg tumors are those of the stomach, colon, and breast [3,4].

Metastases with a predominantly cystic component correspond to metastatic mucinous tumors. Primitive carcinomas which secrete mucin are mainly found in the appendix, colon, pancreas, gall bladder, and stomach [4]. Their MRI features are often similar to epithelial mucinous tumors.

Findings and procedure details

1. Mucinous epithelial tumors

The typical MRI appearance of a mucinous cystadenoma is a large ovarian lesion that is cystic, multilocular, and with loculi of varying intensity on T1 and T2 weighted images, depending on the richness in mucin (Figure 1) [5]. These loculi are roughly grouped and sometimes give the shape of "honeycomb" [6,7]. The criteria guiding the definition of a benign lesion is the absence of solid component [8]. Vegetations are rare and, when present, they are very small and hardly visible [9].

The appearance of a borderline mucinous cystadenoma in MRI is very similar to benign mucinous cystadenoma: a large cystic mass, with loculi varying intensity with on T1 and T2 weighted image, depending on the richness of the mucin (Figure 2). It is the presence of irregularities or grouped vegetations which provides the borderline diagnosis of a mucinous lesion [6]. The high number of loculi can also refer to the borderline type [10].

The typical appearance of a mucinous cystadenocarcinoma is a large cystic mass that is multilocular, and contains a solid component of intermediate intensity with a weight approximate to T2 (Figure 3). The mass is enhanced according to a type 3 curve with the sequences of perfusion and an enhancement curve type 3 (pre-shift relative to the myometrium curve) [11]. The extension distance (lymph node or peritoneal) is also an argument for a malignant lesion.

Their MRI features are summarized in Table 1.

Type	MRI features
Mucinous cystadenoma (figure 1)	Multilocular tumor with different signal intensities No solid component No irregular septa
Mucinous borderline tumor	Irregular septa Papillary projections (rare)

Mucinous cystadenocarcinoma (figure 2) Solid component :
Intermediate signal on T2-weighted images
DCE-MRI Type 3 curve

Table 1: MRI features of primary (epithelial) mucinous tumors

2. Ovarian metastases with a predominantly cystic component

Ovarian metastases from gastro-intestinal adenocarcinoma can mimic mucinous epithelial lesions. Ovarian metastases secrete mucin appear on MRI imaging as a ovarian mass, multilocular, with loculi varying in intensity with weights between T1 and T2 depending on the richness in mucin. Enhanced solid components can be observed, but they are not systematic (Figure 4) [12]. If the solid portion is absent, its MRI appearance may be quite similar to a benign mucinous cystadenoma (Figure 5).

The main objective of the radiologist is to differentiate mucinous epithelial ovarian tumor from metastasis of digestive tract cancer. The two main criteria mentioned in the literature are the size of lesions and the unilateral or bilateral nature of the ovarian mass [13]. Epithelial malignant mucinous tumors are generally larger and frequently unilateral (> 80 %). Some authors have classified metastatic ovarian tumors as bilateral lesions or smaller than 10cm while marking primitive epithelial ovarian tumors as unilateral lesions greater than 10 cm [14]. But some studies challenge these criteria. If a very large unilateral lesion is primarily a mucinous lesion, we recommended that one should always keep in mind the possibility of a secondary lesion [15]. In cases of cystic multilocular ovarian lesions, the radiologist should therefore pay attention to the lymph node or peritoneal involvement, particularly on diffusion sequences, for secondary locations. Potential primitive sites (appendix, stomach, colon) must also be carefully considered [12]. An exploratory CT may also help the radiologist look for a secondary origin.

Images for this section:

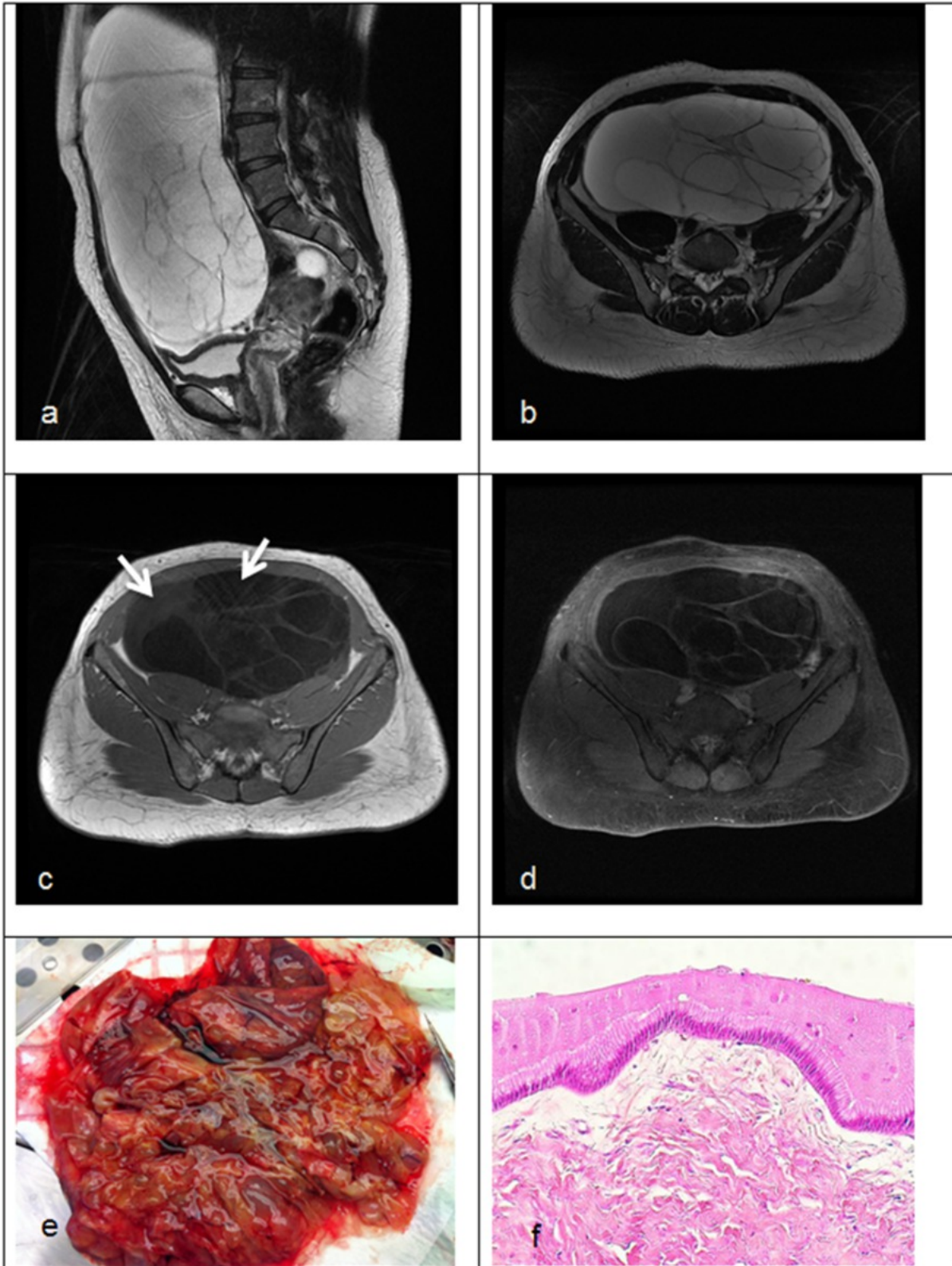


Fig. 1: Figure 1: Mucinous cystadenoma; unilateral multilocular ovarian mass without solid component or irregular septas. T2-weighted sagittal sequence (a), T2-weighted

axial sequence (b), T1-weighted axial sequence (c), T1-weighted fat sat axial sequence after gadolinium injection (d). Note loculi of varying intensity on T1-weighted sequence (arrowheads). Macroscopic view (e) of the ovarian mass: multilocular cystic tumor. Histological appearance x20 magnification (f): single layer of columnar cells without cytonuclear atypia.

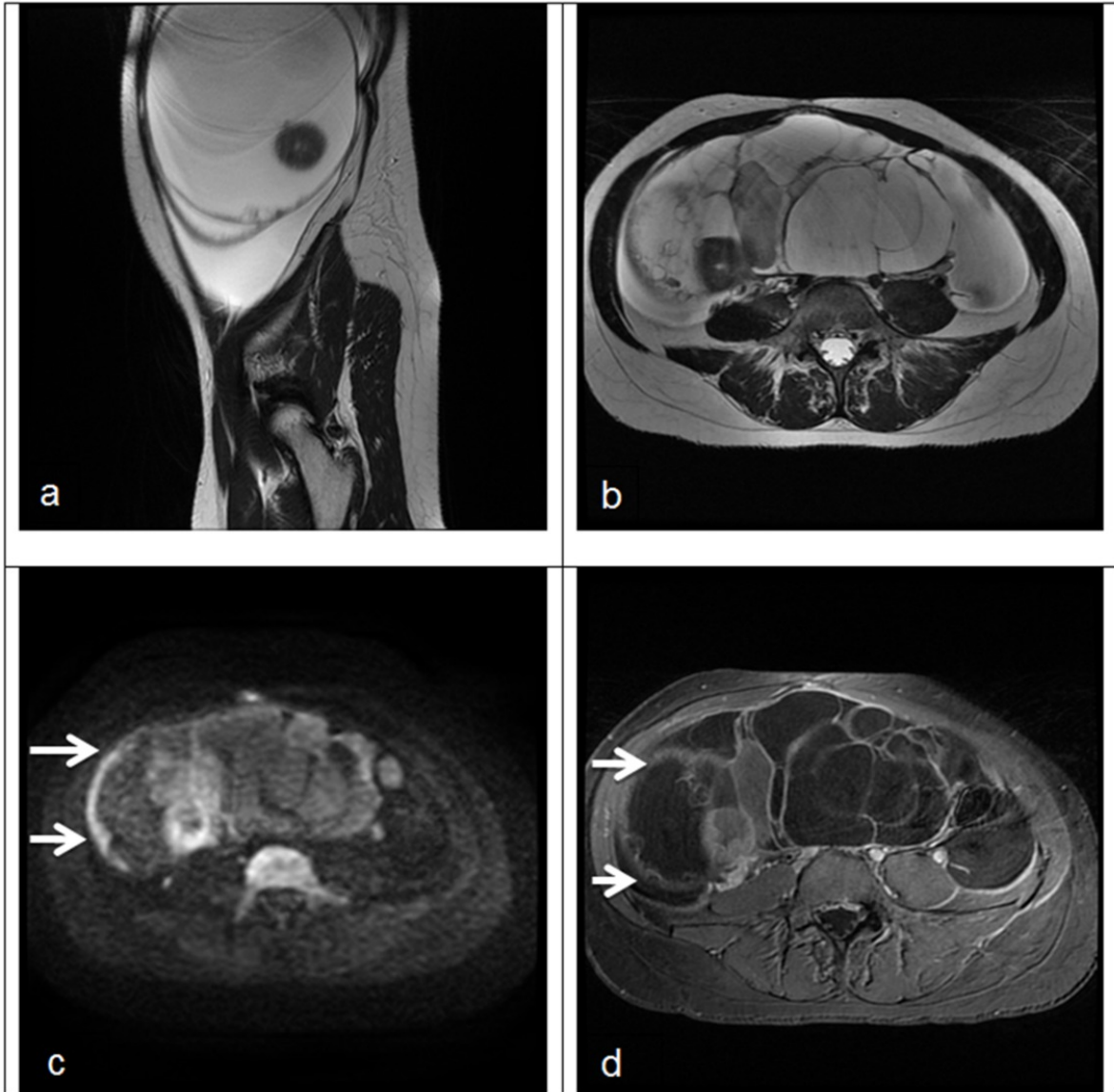


Fig. 2: Figure 2 : Borderline mucinous cystadenoma; T2-weighted sagittal sequence (a), T2-weighted axial sequence (b), diffusion-weighted axial sequence b1000 (c), T1-weighted fat sat axial sequence after gadolinium injection (d). Note the papillary projections (arrows).

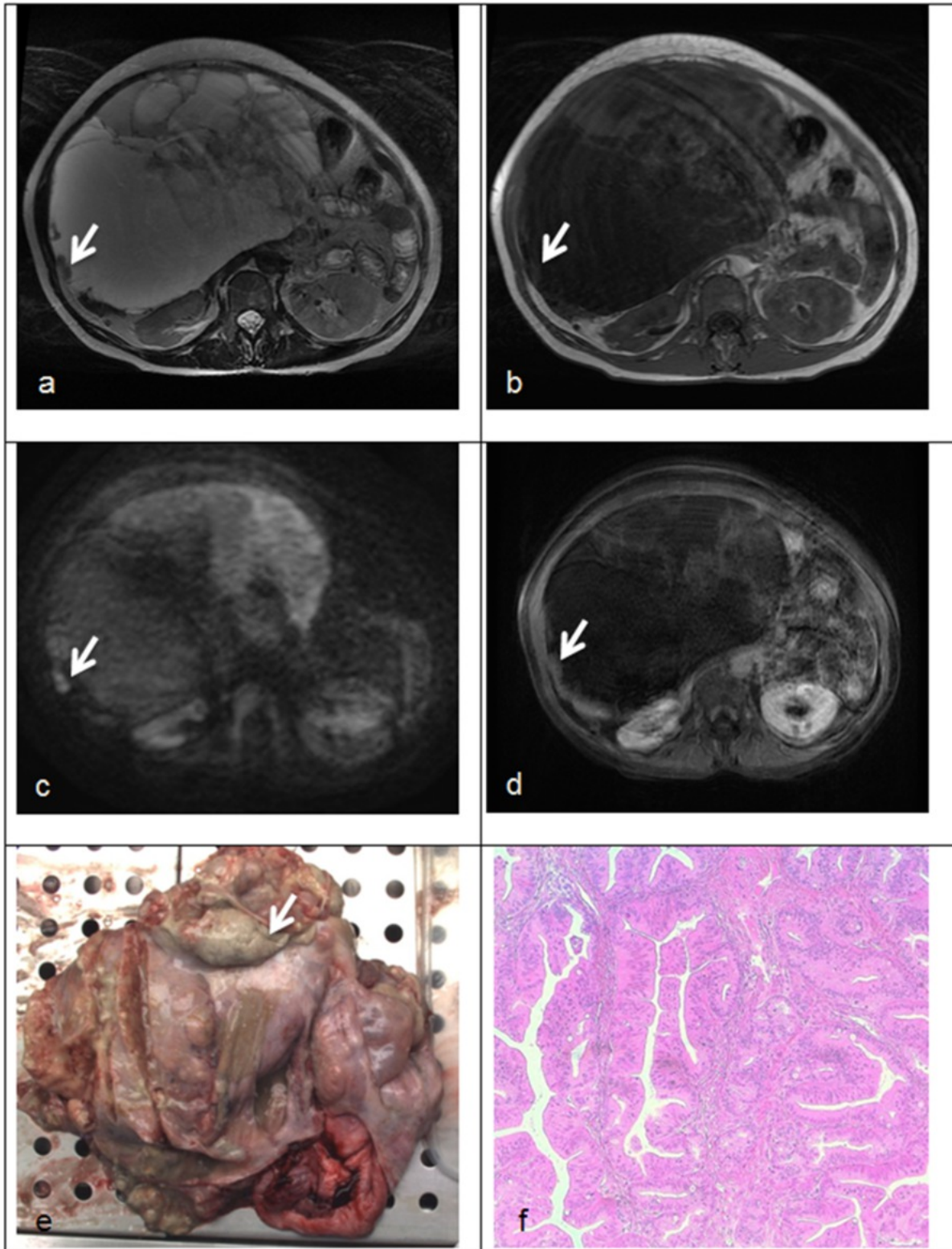


Fig. 3: Figure 3: Mucinous cystadenocarcinoma; Unilateral multilocular ovarian mass with solid portion (arrow). T2-weighted axial sequence (a), T1-weighted axial sequence (b), diffusion-weighted axial sequence b1000 (c), T1-weighted fat sat axial sequence after

gadolinium injection (d). Macroscopic view (e) of the ovarian mass: multilocular cystic tumor with solid component (arrow). Histological appearance x10 magnification (f): tumor proliferation with stromal invasion and cytonuclear atypia.

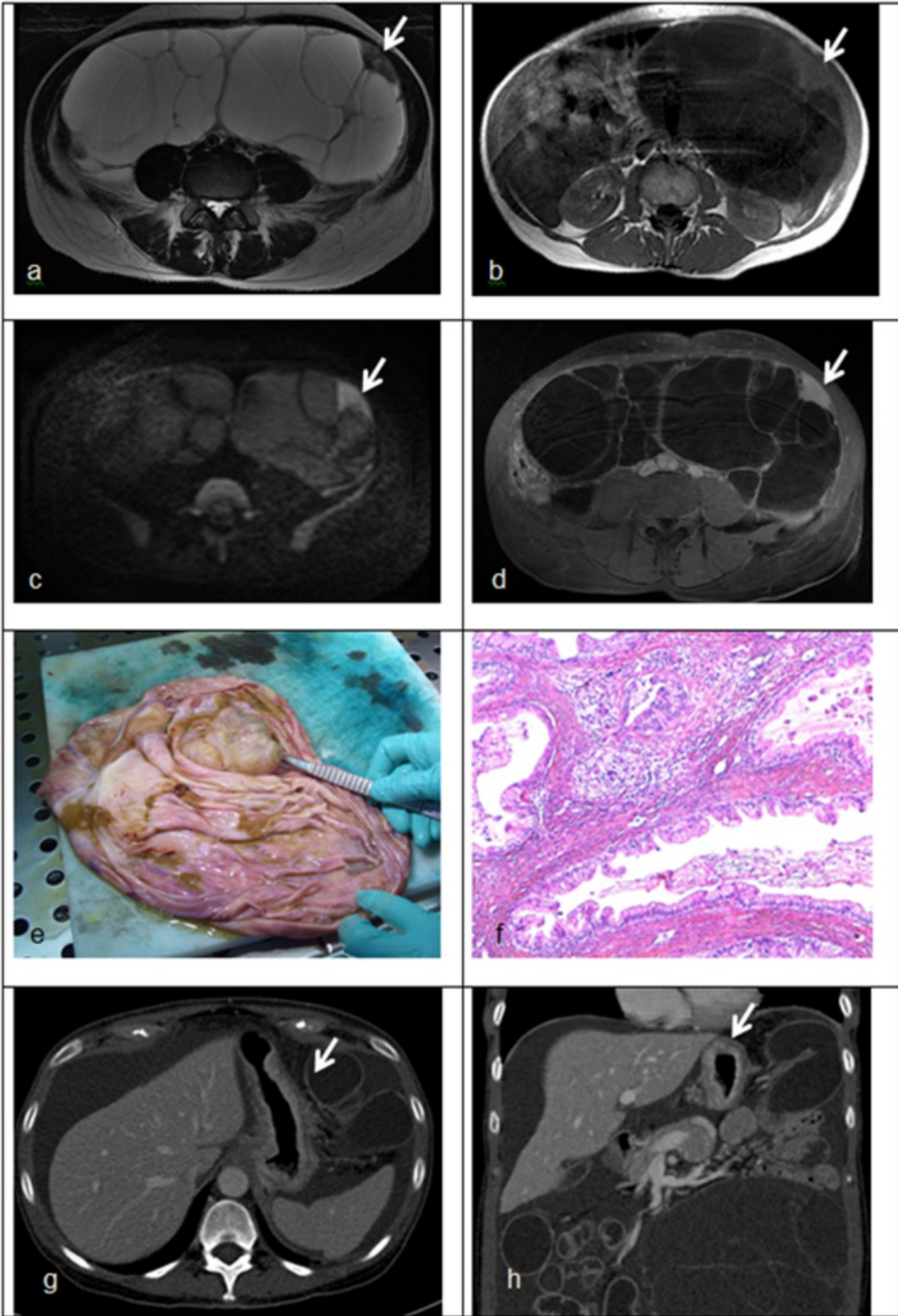


Fig. 4: Figure 4: Mucinous metastasis of a gastric cancer: Bilateral multilocular ovarian masses with a solid component on the left (arrow): T2 weighted axial sequence (a), T1-weighted axial sequence (b), diffusion-weighted axial sequence (c), T1-weighted fat sat axial sequence after gadolinium injection (d). Macroscopic view (e) of the left ovarian mass: forceps indicates the solid component. Histological appearance x20 magnification (f): moderately differentiated adenocarcinomatous proliferation. Abdominal CT scan: axial (g) and (h) coronal MPR: thickening (arrows) of the gastric wall linked to gastric adenocarcinoma.

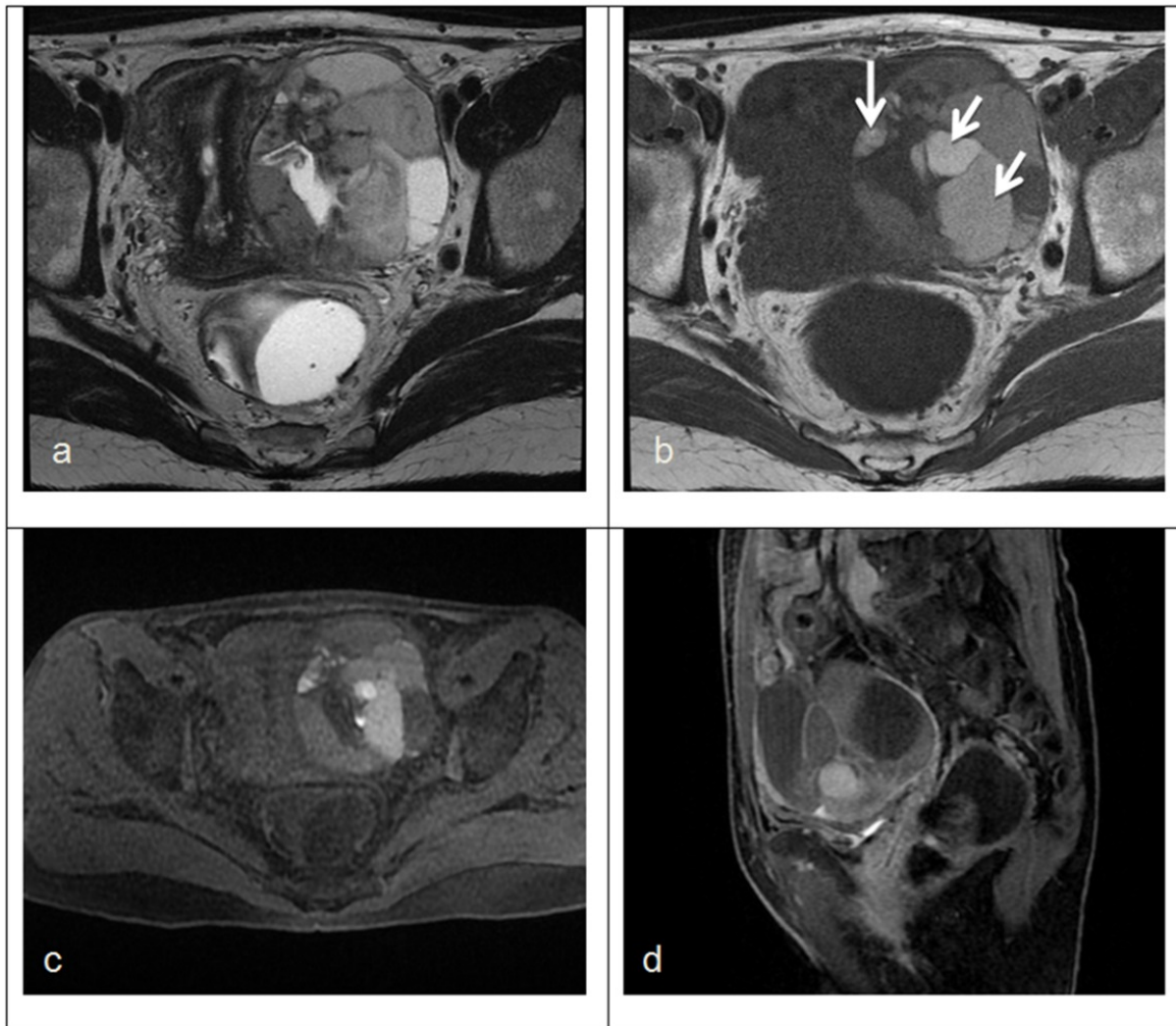


Fig. 5: Figure 5: Cystic metastasis of colorectal adenocarcinoma; T2-weighted axial sequence (a), T1-weighted axial sequence (b), diffusion-weighted axial sequence b1000 (c), T1-weighted fat sat sagittal sequence after gadolinium injection (d). Note loculi of varying intensity on T1-weighted sequence (arrows); and the lack of solid component.

Conclusion

In the case of ovarian multilocular cystic masses, an MRI can provide elements to distinguish the primary and metastatic mucinous tumor, particularly tumor laterality, but a differential diagnosis is tricky. The possibility of metastases should always be kept in mind: a primary carcinoma, especially gastro-intestinal cancer, must be sought on MRI or on CT.

Personal information

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