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Radiological approach for malignant ovarian lesions

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Abstract

Background: Malignant ovarian lesions are common female reproductive system tumors, they represent the second most common gynecological tumor and the sixth most frequent tumor in female patients, most of the ovarian malignant lesions are epithelial in origin representing about 90% of cases, the rest 10% are originate from germ cells, sex cords and the stroma of ovary.

Malignant ovarian lesion can be unilateral or bilateral, with or without peritoneal deposits (omental cake), regional or distant lymph nodes metastasis or another organ metastasis.

Aim: To evaluate the radiological characteristics of different malignant ovarian lesions and to assess presence of local, regional or distant metastasis.

Method: Our study will collect radiology findings and reports of female patients with Malignant ovarian lesions at radiology department at royal medical services during the 2023-2024 period.

Keywords: Ovary, malignant ovarian lesion, metastasis

Introduction

Ovarian malignancy is the second most common gynecological malignancy worldwide, patients usually presented in advance stage of the disease due to delay in diagnosis because of non-specific clinical examination. until nowadays there is no imaging modality used as a screening for the ovarian malignancy. The first modality in patients with suspicion of malignant ovarian lesions is usually the ultrasound (US), if mass lesion is detected then Magnetic resonance imaging (MRI) is the next step, MRI gives details about the origin of the mass lesion if ovarian or adenxial, if the lesion is looking benign or malignant. If malignant nature confirmed in the MRI scan then the staging chest/abdomen and pelvis CT scan with the IV contrast is recommended.

Materials and methods

This is retrospective study included 87 female patients, with ages between 10-89 years, presented with ovarian mass lesions during 2023-2024 at radiology department at King Hussein Medical city. Abdomen and pelvic ultrasound study and Pelvic MRI with IV contrast and/or Abdomen and pelvic CT scans with IV contrast were done. benign looking ovarian lesions were excluded from the study. Patients preparation included kidney function test prior to the CT scans and MRI scans. Images were viewed at the PACS station and Multiplanar reconstruction reformat was applied for all patients. Then patients' images were reviewed by two body imaging radiologists, after that the results were analyzed by simple statistical methods.

Results

This study included 87 patients, all female, the ages ranged between 10-89 years with median age of 49.5 years. the most common symptom was abdominal pain seen in 42 (48.2%) patients, followed by weight loss in 17 (19.5%) patients, Menstrual irregularities seen in 15 (17.2%) patients, 13 patients (14.9%) were presented with other or mixed symptoms (such as painful intercourse, change in bowel habits, lower back pain). The most common histological malignant ovarian lesion found was epithelial in origin seen in 80 patients (91.9%) the rest of the cases were non-epithelial in origin, the most common epithelial type was serous subtype which is seen in 49 patients (61.2%), while the mucinous subtype seen in 26 (32.5%) patients, 5 patients (6.2%) showed endometrioid tumor.

Discussion

Histologically more than 95% of ovarian malignancies are epithelial in origin, while the rest are germ cell tumor, sex cord tumor and metastasis. Risk factors for developing ovarian malignancy including nulliparity, smoking, obesity, endometriosis, history of Lynch syndrome and genetic factors such as BRCA type I and II.

In patients with malignant ovarian malignancy the clinical symptoms are non specific and including vague abdominal or flank pain with discomfort, abdominal distension, vaginal bleeding, lymphadenopthy and bowel obstruction, ultrasound is the initial modality of investigation because of its availability and lack of radiation effect in the female patients, if suspicious mass seen in the pelvis, the next step will be MRI for assess the origin of the mass lesion, and to characterize if the mass lesion is benign or behaving as a malignant tumor, blood samples for serum tumor marker can be also taken, the Cancer Antigen 125 or (CA 125) will show elevation in cases of epithelial ovarian malignancy, while Alfa Feto Protein (AFP), Beta Human Chorionic Gonadotropin (Beta HCG) and Lactate Dehydrogenase (LDH) levels will be elevated in cases of non epithelial ovarian malignancies.

Malignant features of malignant ovarian lesions in the initial ultrasound examination includes presence of multiple papillary projections, multilocular cystic lesions with solid component which exhibit color flow in doppler ultrasound,

or presence of solid lesion with irregular margin, secondary findings that may rise the possibility of malignancy includes presence of ascites or peritoneal nodules. If malignancy is confirmed then next step will be chest, abdomen and pelvic CT scans with IV contrast for staging.

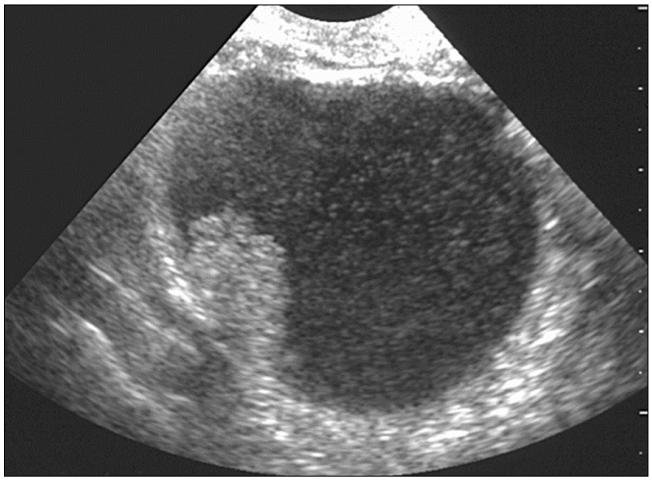

Fig 1: Ultrasound pelvic image showing large cystic mass lesion with intra cystic papillary projection.

If the mass lesion in the initial ultrasound examination showed large unilocular cyst more than 10 cm or showed solid lesion with smooth margin or few papillary projections then the mass will be called low or intermediate risk lesion, the next step will be pelvic MRI with IV contrast for better evaluation. If the mass lesion showed pure benign features such as unilocular cyst measures less than 10 cm with smooth wall, no solid component and no papillary projection it will be considered as benign lesion, the next step will be following up, sometimes pelvic MRI is done for reassurance and better evaluation of the ovarian lesion.

The Magnetic resonance imaging (MRI) is considered superior to ultrasound and CT scans in cases of malignant ovarian lesions, T1 and T2 sequences used for assessment of the pelvic anatomy and tissue characterization, Fat-saturated T1 sequence is used to suppress signal from fat tissue and used to differentiate between fatty lesion and hemorrhagic lesion, post contrast T1 sequence is helpful to differentiation between cystic and solid lesions and can used to rule out peritoneal and omental implants.

Both cystic and solid lesions will show low signal in T1 and high signal in T2, in post contrast images the solid lesion will show enhancement while the cystic lesion will not show enhancement, most of benign epithelial ovarian lesion will be predominantly cystic while the malignant epithelial ovarian lesion will show combined cystic and solid component. Fatty lesions, hemorrhagic lesions and mucin rich lesions will show high signal intensity in T1 sequence, the use of Fat saturated sequence can suppress signal in fatty lesions such as mature cystic teratoma also known as Dermoid lesion, while hemorrhagic lesion such as endometriosis, hemorrhagic cyst and adenomyosis hemorrhagic foci will maintain the signal in Fat saturated sequence, mucin rich lesions will show high signal in T2 as in T1 sequence.

Leiomyoma and other fibroid lesions such as fibroma, Brenner tumors will show low or intermediate signal in T1 and low signal in T2 sequence.

The post contrast sequences used for detection of solid component, presence of papillary projection, and to detect necrosis within the ovarian lesions.

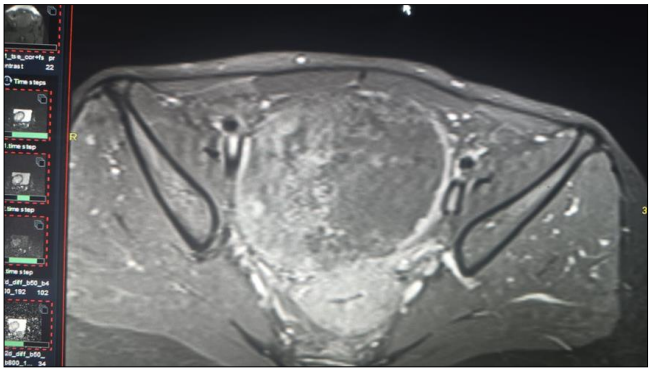

Fig 2: Axial MRI image with IV contrast showing adenxal enhancing mass lesion.

The MRI diffusion weighted images (DWI) are not routinely used in cases of ovarian mass lesions, because the lack of ability to differentiate between benign and malignant lesions, instead it is used to detect peritoneal deposits.

The most common epithelial ovarian lesions including serous and mucinous tumor, the rest of the epithelial tumors includes endometrioid, clear cell tumor and undifferentiated tumors, serous tumor is more common than mucinous tumor in both benign and malignant types, serous tumor is usually unilocular and homogeneous, more common to be bilateral than mucinous type, and typically small in size than mucinous, serous subtype showed Psmmomatous calcification which is not feature of mucinous lesion, peritoneal carcinomatosis is more common in serous rather than mucinous subtype.

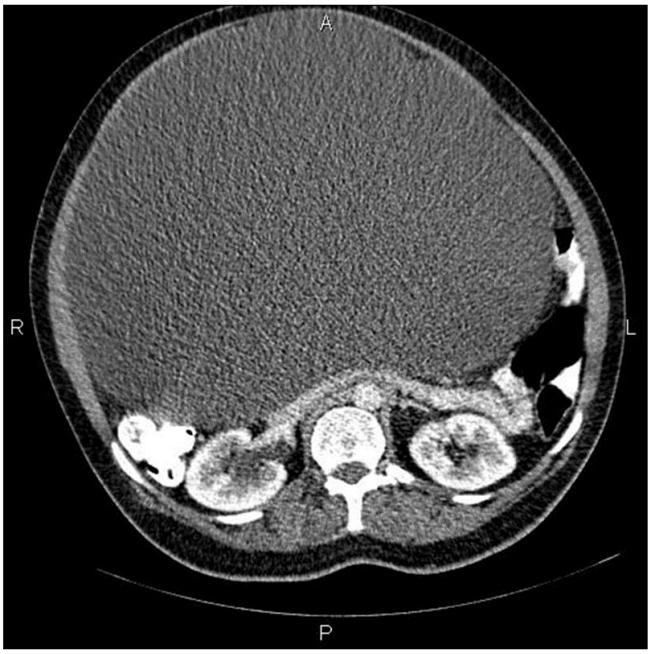

Fig 3: Axial CT image with IV contrast showing large unilocular cystic lesion originate from the adenxia representing ovarian serous mass lesion.

Mucinous lesions are larger in size than the serous and showed multilocular lesion with small size cysts and multiple septations, they appear as unilateral mass lesion,

calcification is rare, and sometimes mucinous can show pseudomyxoma peritonei.

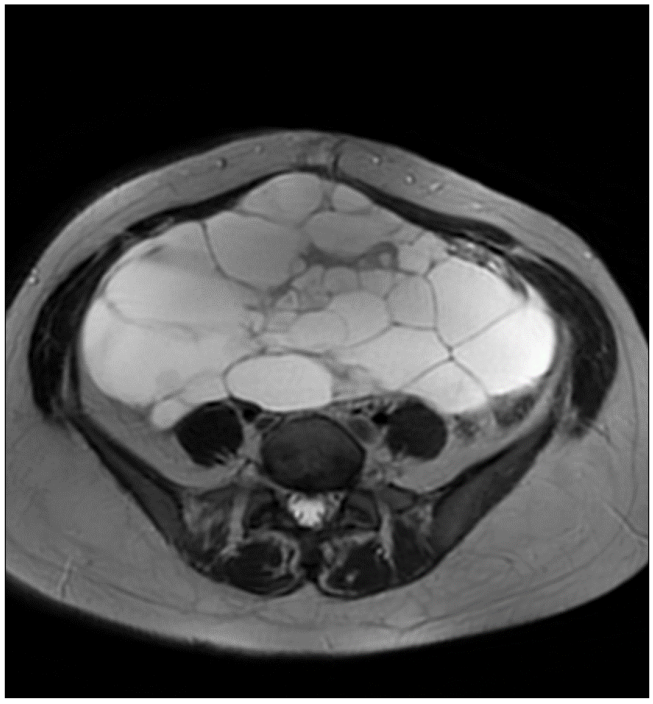

Fig 4: Axial T2 MRI image showing large multilocular cystic lesion with multiple septation representing Mucinous ovarian lesion.

Table 1: Serous versus mucinous ovarian lesions.

Serous ovarian lesion	Mucinous ovarian lesion
More common	Less common
Unilateral or bilateral	Unilateral
Unilocular and homogeneous	Multilocular with septations
Small size at presentation	Large size at presentation
Calcification is common	Calcification is rare
Peritoneal carcinomatosis	Pseudomyxoma peritonei

Abdomen and pelvis Computed Tomography CT scan is typically used for staging in cases of malignant ovarian tumor, the CT scan is less sensitive and specific for diagnosis of malignant ovarian lesions, fat containing lesions such as mature cystic teratoma (Dermoid) and calcification can be diagnosed in CT, otherwise CT is used to detect lymphadenopathy, ascites, presence of peritoneal deposits, omental caking, metastatic deposits in the solid organs such as lung and liver, and any bony deposits.

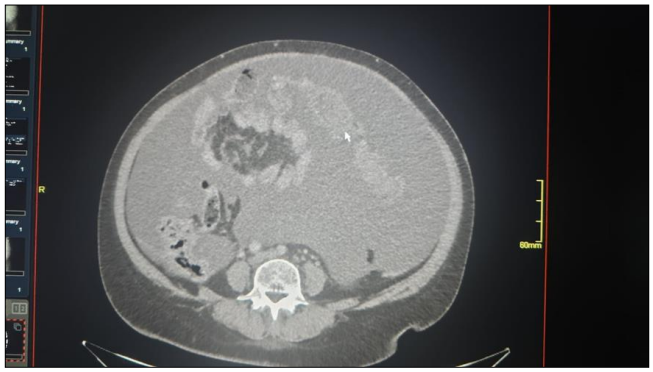

Fig 5: Axial CT image showing significant amount of ascites in the abdomen and pelvis with omental caking.

Pelvic CT scans can be used also to monitor response of the malignant ovarian lesion after giving the chemotherapy and to rule out recurrence of the tumor.

Regarding the nuclear imaging, FDG PET/CT scan can be also used in postoperative patients to rule out recurrence of the tumor, usually PET/CT scans is used when the CT scan results are inconclusive, in such cases the CT scan will be negative but with increase in the level of the serum tumor marker.

Biopsy of the malignant ovarian lesions is not recommended as there is increase risk of tumor rupture which will leads to peritoneal seeding.

Conclusion

Most of the ovarian malignant lesions are epithelial in origin, female patients with ovarian malignant lesions are presented with non-specific symptoms include abdominal pain, weight loss, menstrual irregularity, painful intercourse, change in bowel habits and low back pain.

Ultrasound is the initial radiological modality for examination, ovarian mass lesion in ultrasound can be benign, borderline or malignant.

Malignant ultrasound features include multiple papillary projections, multilocular cyst with solid component, solid component with irregular margin, presence of ovarian mass lesion with ascites or peritoneal nodules.

MRI is superior than ultrasound and CT in diagnosis of ovarian malignant lesions, features of malignancy in the MRI images include presence of papillary projections, mixed cystic and irregular solid component, enhancing of the solid component within the IV contrast.

CT scan is used for staging to evaluate any metastatic deposits within the lung, liver, any involvement of lymph nodes, also to detect any peritoneal deposits or omental caking.

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