PELVIC MASSES IN FEMALE PATIENTS - INTERPRETATION PITFALLS ON MSCT AND MR IMAGING

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Summary

Different conditions within the pelvis are presented with very few symptoms. Likewise, their imaging characteristics are usually non-specific, implying high chance of misinterpretation.

The aim of this paper is to point to the misinterpretation possibilities in computed tomography (CT) and magnetic resonance (MR) studies of the pelvic lesions and to outline their differential diagnosis.

CT (11), MR (seven) or both (four patients) were performed in 22 female patients (age 23-69) with suspicious pelvic masses. Relevant laboratory and medical history data were available for most of the patients. Twenty patients underwent subsequent surgery and pathological findings were available in 18 cases.

After radiological examinations different diagnoses were proposed in respect to imaging findings and available clinical data: pelvic inflammatory disease (one), ovarian tumor (six), uterine tumor (eight), metastatic or recurrent tumor (four), lymphocele (one), and post-irradiation and post-chemotherapy changes (two) patients. Postoperative results of the pathological analysis differed from radiological diagnosis in three of 18 pathologically examined materials: one benign tumor was falsely characterized as possibly malignant by the radiologist, one surgically transposed ovary was described as tumor, and one case of post-irradiation changes was described as recurrent tumor.

Aside from knowing imaging characteristics, it is of great importance for radiologists to be aware of clinical, laboratory, and surgical protocols information as well as to have insight in patients' prior imaging material in order to be able to correctly interpret imaging findings of the pelvic lesions.

KEY WORDS: *computed tomography, magnetic resonance imaging, pelvic neoplasms*

TVORBE U ŽENSKOJ ZDJELICI – ZAMKE U TUMAČENJU SNIMAKA DOBIVENIH VIŠESLOJNOM KOMPJUTORIZIRANOM TOMOGRAFIJOM (MSCT) I MAGNETSKOM REZONANCIJOM (MR)

Sažetak

Simptomi različitih stanja u zdjelici neznatni su pa su prema tome i njihove značajke na snimkama obično nespecifične, što podrazumijeva i veliku mogućnost pogrešnog tumačenja.

Cilj ovoga rada jest upozoriti na mogućnosti pogrešnog tumačenja komjutorizirane tomografije (CT) i magnetske rezonancije (MR) lezija u zdjelici te u glavnim crtama prikazati i razmotriti diferencijalnu dijagnozu.

CT (11), MR (sedam) ili oboje (četiri bolesnice) obavljeno je u 22 bolesnice (dob 23-69) sa sumnjivim tvorbama u zdjelici. Za većinu su bolesnica na raspolaganju bili njihovi prethodni relevantni laboratorijski i medicinski podaci. Dvadeset bolesnica bilo je podvrgnuto kirurškom zahvatu i za 18 bili su dostupni patološki nalazi.

Nakon radiološkog pregleda predložene su različite dijagnoze s obzirom na snimke i raspoložive kliničke podatke: upalna bolest zdjelice (jedan), tumor jajnika (šest), tumor maternice (osam), metastatski tumor ili recidiv (četiri), limfokela (jedna), te postiradijacijske i postkemoetrapijske promjene (dvije bolesnice). Postoperativni nalazi patološke analize razlikovali su se od radiološke dijagnoze u tri od 18 pregledanih materijala: jedan dobroćudni tumor radiolog je pogrešno opi-

sano kao vjerojatno zloćudni, jedan kirurški transponirani jajnik opisan je kao tumor, a u jedne su bolesnice postiradijacijske promjene opisane kao recidiv tumora.

Osim prepoznavanja značajki na snimkama, za ispravno tumačenje snimaka lezija u zdjelici radiolozima su vrlo važni i podaci dobiveni kliničkim, laboratorijskim i kirurškim postupcima te uvid u prethodne snimke pacijenata.

KLJUČNE RIJEČI: *kompjutorizirana tomografija, magnetska rezonancija, novotvorine u zdjelici*

INTRODUCTION

The symptoms of different pelvic diseases in women (pelvic pain, abdominal distension, palpable pelvic mass, abnormal vaginal discharge, fertility disorders) are overlapping, resulting in broad differential diagnosis (1). A majority of pelvic masses arise from reproductive organs, mainly from the ovaries and uterus. Due to different surgical and therapeutical approach, it is important to differentiate primary gynecologic neoplasm from masses arising from the gastrointestinal system, urinary system, adjacent soft tissues, peritoneum and retroperitoneum, and from pelvic metastases, as well as to characterize it as a benign and malignant disorder (1,2). Ultrasonography (US) is usually the first imaging modality used for evaluation of a pelvic mass (1,3). If the findings of sonographic exam suggest malignancy or are indeterminate, US should be followed by computed tomography (CT) and/or magnetic resonance (MR) examination. In addition to initial evaluation, women treated for gynecologic cancer are usually followed up by CT or MR as primary imaging modalities in order to distinguish local reccurence from benign pelvic diseases (4). Although CT and MR provide excellent anatomical details with submilimeter resolution, radiologists often cannot establish a specific diagnosis of the pelvic mass because many benign and malignant diseases resemble each other in terms of shape, structure, enhancement, origin, and localization (5).

In this paper we present our experiences in interpretation of cross-sectional imaging findings of pelvic masses, in order to point to the misinterpretation points.

PATIENTS AND METHODS

The study included 22 female patients (age range 23-69 years, mean 49 years) referred to our department during a sixteen-month period for the evaluation of pelvic pathology detected by bimanual pelvic examination, and confirmed by sonography in all patients.

Pelvic or pelvic and abdominal CT scan was done using LightSpeed Ultra scanner (GE Medical Systems, Milwaukee, USA). Scanning protocol parameters and administration of oral and/or intravenous contrast material were adjusted in accordance with referral data. Multiplanar and volume rendered images were performed in order to precisely define the anatomic relationship of the mass to adjacent structures, and to determinate its vascular supply.

MR imaging (1.5 T Magnetom Symphony, Siemens Medical Systems, Erlangen, Germany) of the pelvis or abdomen and pelvis was performed using T1-weighted and T2-weighted images with and without fat suppression in the axial, sagittal and coronal plane. Axial T1-weigted sequence with fat suppression was repeated after intravenous administration of gadolinium contrast material (Magnevist [gadopentetate dimeglumine], Schering).

Images were analyzed by two experienced radiologists who had access to clinical information, laboratory findings, prior imaging studies and reports. In one patient the diagnosis was reached by consensus of both radiologists.

In 20 women, subsequent surgery was performed, and postoperative data, including histopathology reports, were available in 18 patients and were compared to original imaging findings.

RESULTS

Pelvic diseases reported by radiologists on CT and MR examinations were pelvic inflammatory disease in one patient, ovarian neoplasm in six patients, uterine (including cervical) neoplasm in eight patients, metastatic or recurrent
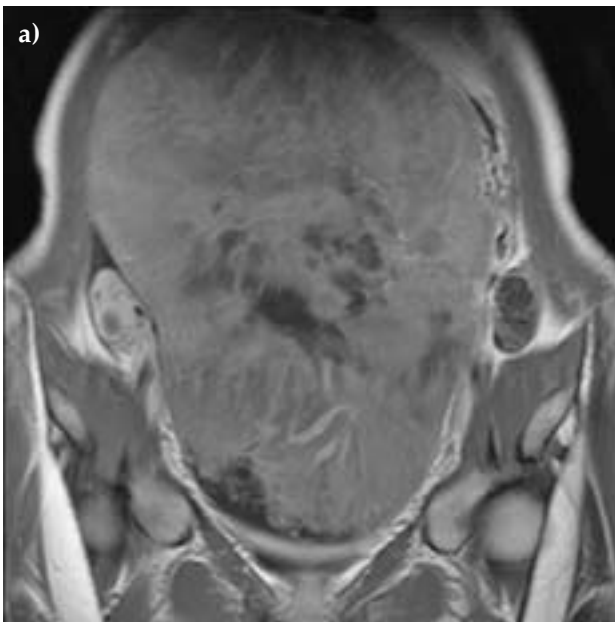
Figure 1. Ovarian dysgerminoma in a 15-year-old girl. a) Coronal T1-weighted MR image. Large abdominal and pelvic mass with areas of low signal intensity, implying necrosis. Compression and displacement of bowel loops and urinary bladder. b) 3D volume rendered CT angiography. Vascularization of the tumor by the ovarian artery (arrow).

cancer (including lymph node metastases) in four patients, lymphocele in one patient, and benign postirradiation changes in two patients.

The specific diagnosis and the origin of the neoplasm were determined by consensus of both radiologists in one woman with a large abdominal and pelvic mass (Figure 1). In this patient, elevated levels of β-HCG in peripheral blood samples helped to characterize the mass as a dysgerminoma, and detailed analysis of the abdominal vessels enabled the diagnosis of ovarian origin.

CT and MR examinations differed from surgical and pathological data in three patients. A benign retention cyst was characterized as a cervical cancer recurrence in the vaginal cuff (Figure 2). In the other patient who underwent pelvic irradiation for cervical cancer, a surgically transposed ovary was described as a peritoneal metastasis (Figure 3), while excessive postirradiation pelvic fibrosis was falsely characterized as a recurrent cervical cancer in one woman (Figure 4).

The most common false positive finding on CT and MR examinations was lymph node enlargement, which was the case in two patients.

Figure 2. Cystic mass in the vaginal cuff (arrow) in a 50-year-old woman after hysterectomy and bilateral adnexectomy for cervical cancer, sagittal T1-weighted MR image. A retention cyst misinterpreted as a local recurrence.
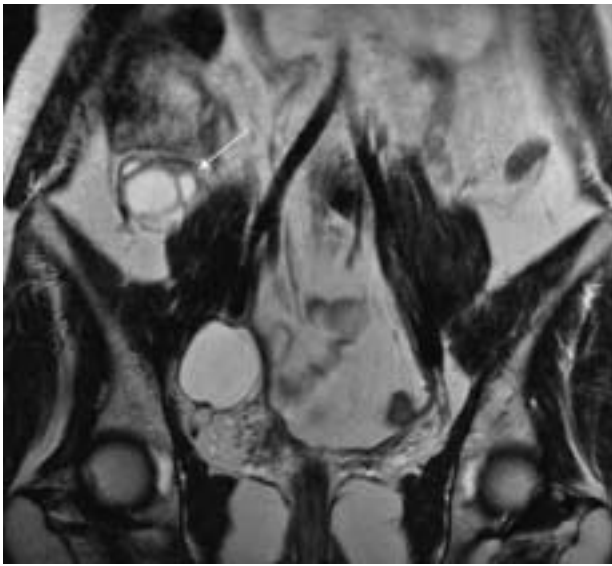
Figure 3. Multicystic mass (arrow) of the right iliac region in a 37-year-old woman who treated for cervical cancer, coronal T2-weighted MR image. A transposed right ovary reported as possible peritoneal metastasis.
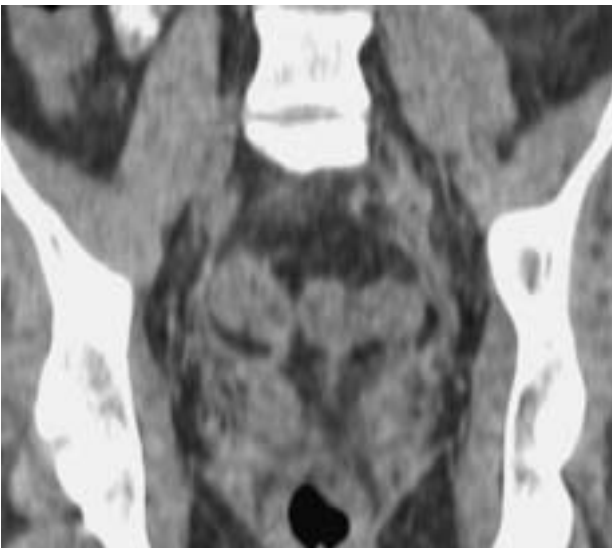

Figure 4. Multiple, ill-defined, heterogeneous masses in pelvis in a 60-year-old woman with non-surgically treated cervical cancer, coronal reformatted CT image. Excessive post-irradiation pelvic fibrosis documented in the radiological report as local recurrence.

Figure 5. Teratoma of the ovary (arrows) located anterior to the uterus in a 60-year-old woman, coronal reformatted CT image. Well-defined, round mass composed of fat tissue, Rokitansky nodule and calcification.

DISCUSSION

MR and CT are important imaging techniques in diagnostic algorithm of the female pelvic diseases. They are usually performed for initial evaluation of a pelvic mass detected by trans-abdominal/transvaginal sonographic examination, as well as for follow-up of patients with known pelvic malignancy.

The knowledge of appropriate clinical data (medical history, gynecological findings, laboratory results, treatment details) is necessary for correct interpretation of imaging findings and it enables narrowing of the differential diagnosis. For example, if surgical protocol is unknown the transposed ovary can be falsely interpreted as a mucocele of the appendix, lymphocele, or metastatic tumor (6), as was the case in our study where it was misinterpreted as a peritoneal implant.

The origin of the mass can be suggested on the basis of its location and anatomic landmarks, including relationship to blood vessels, displacement of pelvic organs, and peritoneal, extraperitoneal and pelvic wall involvement (2). In the evaluation of advanced gynecological cancers, contrast enhanced CT should be the method of choice due to its speed, availability, high spatial

resolution, and accuracy in detecting and staging of the disease similar to that of MR (1,3).

The accurate specific diagnosis of a pelvic mass can sometimes be provided by detection of specific tissue characteristics, defined by attenuation values on CT, and signal intensities on different MR sequences. In the comparative study of different imaging techniques, MR and US confidently identified the tissue of origin in 94% and 66%, respectively (3). In the patient from our study demonstration of the fat within a pelvic mass on CT and MR examination provided accurate preoperative diagnosis of teratoma (Figure 5). Cystic mass with minimal soft tissue located in the vaginal cuff can be a presentation of a local recurrence of cervical cancer (4), but this was not the case in our study where retention cyst was misinterpreted as a recurrent tumor.

In comparison with CT and US, MR can better characterize wide spectrum of adnexal diseases (7,8), and is superior in defining overall pelvic pathology (1,7), particularly of the uterus and cervix. The main advantages of MR imaging are excellent soft tissue contrast and multiplanar capabilities (1, 3). It is more sensitive, more specific and more accurate than CT in tumor detection, parametral evaluation, and overall staging of cervical carcinoma (9). The overall accuracies of MR and CT in the assessment of pelvic pathology in the Balan's study were 97% and 87%, respectively (3).

CT and MR are only moderately sensitive for detection of lymph node metastases in the pelvis, based on morphologic criteria, with CT still considered somewhat more specific than MR (1, 3). The positive predictive value for malignancy increases to 100% when central lymph node necrosis is detected on CT and MR imaging (10).

CONCLUSIONS

Modern radiological equipment, like MR and CT, usually permits preoperative diagnosis of pelvic masses, staging of gynecological malignancies, as well as follow-up of patients after treatment. The referring gynecologist and the reading radiologist must be aware of possible difficulties in determination of the pelvic mass origin, in differentiation between benign and malignant conditions, and overstaging and understaging of the pelvic malignancy. In order to correctly interpret imaging findings of the pelvic lesions, the radiologist must be familiar with clinicopathological and imaging features of wide range of pelvic diseases, and informed about relevant patient's clinical, laboratory and surgical data, and prior imaging studies.

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