Medical Journal of Bakırköy

Case Report

Magnetic Resonance Imaging of Benign Ovarian Masses

İyi Huylu Yumurtalık Kanserlerinin Manyetik Rezonans Görüntülemesi

Ahmet Kerem İmrek[1], Safiye Gürel[2], Bircan Alan[2]

[1]Niğde Training and Research Hospital, Clinic of Radiology, Niğde, Türkiye
[2]Bolu Abant İzzet Baysal University Faculty of Medicine, Department of Radiology, Bolu, Türkiye

ABSTRACT

Ovarian tumors have a wide spectrum and are pathologically classified in four main groups as epithelial, germ cell, sex cord-stromal, and metastatic tumors. Our aim is to demonstrate magnetic resonance imaging findings of benign ovarian masses with illustrative cases.

Epithelial Tumors

• Serous cystadenoma is the most common epithelial tumor. Case 1 is serous cystadenoma.

• Mucinous cystadenomas are often unilateral and tend to be larger cystic lesions. Case 2 is a mucinous cystadenoma.

Germ Cell Tumors

• Mature teratomas are unilocular masses filled with oily material and their walls contain hair follicles, skin glands, etc. Case 3 is mature teratoma.

Sex Cord-Stromal Tumors

• Fibrothecoma is the most common sex cord tumor. Case 4 is fibrothecoma.

• Cystadeofibroma is an uncommon benign tumor in which fibrous stroma is the dominant component. Case 5 is cystadenofibroma.

• Sclerosing stromal tumor is a rare benign tumor. Case 6 is a sclerosing stromal tumor.

Keywords: Adnexial benign lesions, magnetic resonance imaging, epithelial tumors

ÖZ

Yumurtalık tümörleri geniş bir spektruma sahiptir ve patolojik olarak epitelyal, germ hücreli, seks kord-stromal ve metastatik tümörler olmak üzere 4 ana grupta sınıflandırılır. Amacımız benign over kitlelerinin manyetik rezonans görüntüleme bulgularını örnek olgularla ortaya koymaktır.

Epitelyal Tümörler

• Seröz kistadenom en sık görülen epitelyal tümördür. Olgu 1 seröz kistadenomdur.

• Müsinöz kistadenomlar sıklıkla tek taraflıdır ve daha büyük kistik lezyonlar olma eğilimindedir. Olgu 2 müsinöz kistadenomdur.

Germ Hücreli Tümörler

• Matür teratomlar içi yağlı madde ile dolu, tek gözlü kitlelerdir ve duvarları kıl follikülleri, deri bezleri vb. içerir. Olgu 3 matür teratomdur.

Seks Kord-Stromal Tümörler

• Fibrotekom en sık görülen seks kord tümörüdür. Olgu 4 fibrotekomdur.

• Kistadeofibroma, fibröz stromanın baskın bileşen olduğu nadir görülen iyi huylu bir tümördür. Olgu 5 kistadenofibromdur.

• Sklerozan stromal tümör nadir görülen benign bir tümördür. Olgu 6 sklerozan stromal tümördür.

Anahtar Kelimeler: Yumurtalık iyi huylu tümörleri, manyetik rezonans görüntüleme, epitelyal tümörler

INTRODUCTION

Ovarian tumors have a wide spectrum and are pathologically classified into four main groups: epithelial, germ cell, sex cord-stromal tumors, and metastatic tumors (1).

The most common group is epithelial cancer. Epithelial benign cancers include serous cystadenoma, mucinous cystadenoma, cystadenofibroma, and Brenner tumors. Benign germ cell tumors include mature cystic teratomas. Benign sex cord-stromal tumors include thecoma, fibroma, fibrothecoma, and sclerosing stromal tumor (1).

The goal of our presentation is to demonstrate magnetic resonance imaging (MRI) findings of benign ovarian masses with illustrative cases.

CASE REPORT

It was stated that the names of the cases presented in case reports would not appear, and that permission was obtained for publication. Written and verbal consent was obtained from all patients/legal representatives.

Patients whose ultrasonographic (US) examinations revealed adnexal masses were referred to our department for lesion characterization with MRI.

Our MRI protocole consisted of big field of view (FOV) axial and coronal T1 weighted turbo spin-echo, small FOV and high resolution T2-weighted (T2W) turbo spin-echo sequences in 3 different planes, axial T2W echoplanar imaging, sagittal pre- and dynamic post-contrast gradient-echo T1-weighted (T1W) sequence and subtraction images (2,3).

Epithelial Tumors

• **Serous Cystadenoma:** It is the most common epithelial ovarian tumor, and 15-20% of serous cystadenomas are bilateral. In MRI, it has low-medium intensity on T1W and high-intensity on T2W images as a pure cyst and sometimes has small millimetric papillary projections. Often, thin <3 mm septa can be seen (4-6). Their average diameter is 10 cm, while 30 cm in diameter cystadenomas are reported in the literature. Case 1 was pathologically proven to be a serous cystadenoma (Figure 1).

• **Mucinous Cystadenoma:** They are often unilateral, multiloculated, and tend to be larger cystic lesions. They often contain only thin walls and septa. Depending on the density of mucinous content, lesions' T1W and T2W signals may differ. The presence of a thick septum (>5 mm) or a wall or a solid component with contrast enhancement should raise the suspicion of malignancy (7).

Case 2 was pathologically proven to be a mucinous cystadenoma (Figure 2).

Germ Cell Tumors

• **Mature Teratoma:** Mature cystic teratomas are unilocular masses filled with oily material and their walls contain hair follicles, skin glands, muscles, etc. Imaging findings, may range from a pure cyst to a mixed mass containing components of 3 germ sheets or a solid non-cystic mass containing mostly fat.

In MRI, hyperintensity T1W and suppression hyperintensity in fat-suppressed T1W sequence and variable fat-induced hyperintensity in the T2W sequence is typical (4).
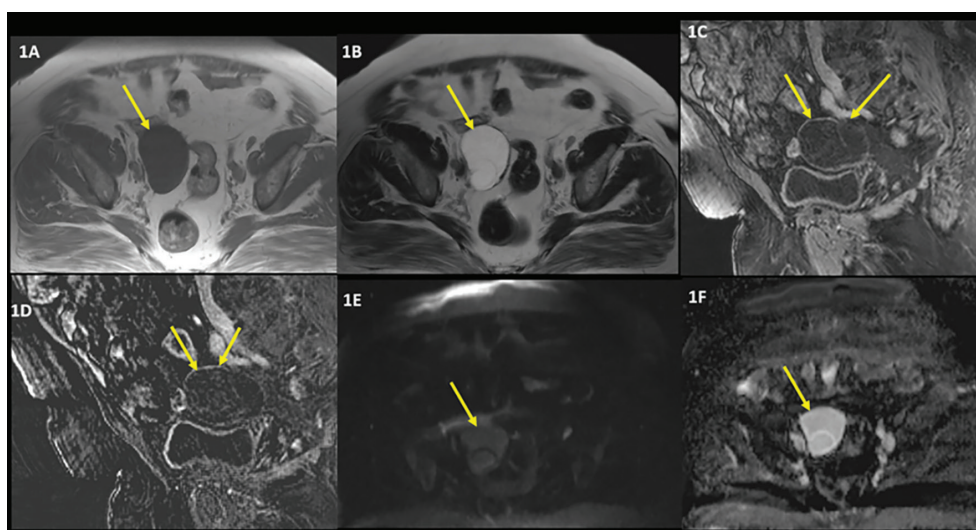

Figure 1. A 78-year-old woman with incidental ovarian mass. A 61x47x47 mm lesion was observed in the right ovary compared to the striated muscle; homogeneously hypointense in T1-weighted (Figure 1A arrow); homogeneously hyperintense in T2-weighted (Figure 1B arrow). In the postcontrast series, a triloculated cystic lesion with slight contrast enhancement in its wall and septa (Figure 1C arrow and subtraction Figure 1D arrow) and increased diffusion on diffusion weighted imagings (Figures 1E and 1F arrows) was observed, biopsy proven serous cystadenoma

Fat-suppressed T1W sequence is the key point in MRI diagnosis (5). Teeth and calcifications can be recognized as hypointense in all sequences. Ovarian teratomas can be associated with various complications including torsion (16% of ovarian teratomas), rupture (1-4%), malignant transformation (1-2%), infection (1%). Due to rupture, granulomatous peritonitis may occur.

Case 3 was pathologically proven to be a mature teratoma (Figure 3).

Sex Cord-Stromal Tumors

• **Fibrothecoma:** It is the most common sex cord tumor seen in the pre-post menopausal period. On MRI, the low signal in T1W and very low signal in T2W sequences are typical diagnostic features (5). Scattered high-signal areas within the mass may be observed due to edema or degeneration. Case 4 was pathologically proven to be a fibrothecoma (Figure 4).
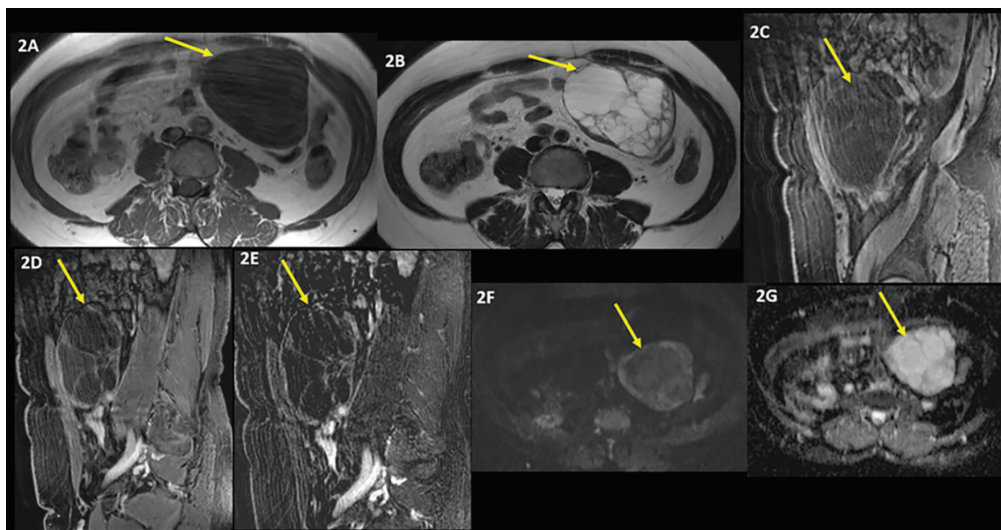

Figure 2. A 57-year-old woman with acne consulted from dermatology. A complicated cystic lesion measuring 102x67x117 mm in the left ovary was observed, exhibiting T1-weighted (T1W) hypointensity (Figure 2A arrow); T2-weighted hyperintensity (Figure 2B arrow); fatsat T1W (Figure 2C arrow) and with multiple septa, measuring 8 mm in the thickest part of the wall. In the postcontrast series, a complicated cystic lesion with minimal enhancement in its wall and septa (Figure 2D arrow and subtraction Figure 2E arrow) and increased diffusion in diffusion-weighted imagings (Figures 2F and 2G arrows) was observed, proven by biopsy mucinous cystadenoma
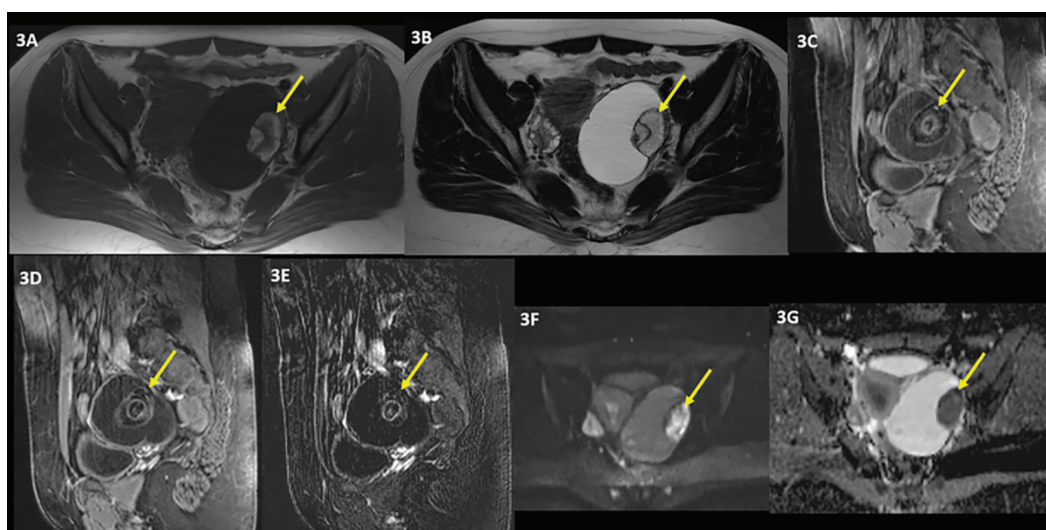

Figure 3. A 22-year-old woman with irregular menses. In the left ovary, an 88x62x71 mm lesion with 25x38 mm dimensions, containing fat, calcification, and hair-like signals (Figures 3A and B arrows), and suppressed fat in fat-suppressed sequence (Figure 3C arrow) was observed. In the postcontrast series, a lesion compatible with teratoma was observed that did not have contrast (Figure 3D arrow and subtraction Figure E arrow), and showed increased diffusion in the cystic component (Figures 3F and G arrows), proven by biopsy as a mature teratoma

• **Cystadeofibroma:** Cystadeofibroma is an uncommon benign tumor in which fibrous stroma is the dominant component of the lesion. They have either a pure cystic or complex cystic pattern with nodular or trabecular pattern (4).

On MRI, in T2W sequences fibrous stromal components such as septa have low signal intensity while cystic components have high signal and this composition creates the "black sponge" like appearance. Septa may show moderate contrast enhancement.

Case 5 was pathologically proven to be a cystadenofibroma (Figure 5).

• **Sclerosing Stromal Tumor:** Sclerosing stromal tumor is a rare benign ovarian tumor that occurs in young women in the second and third decades. On MRI, on T2W sequences, it is a large mass with a solid heterogeneous component containing hyperintense cystic areas and a medium-high signal (8). Contrast-enhanced MRI shows early peripheral and progressive centripetal enhancement

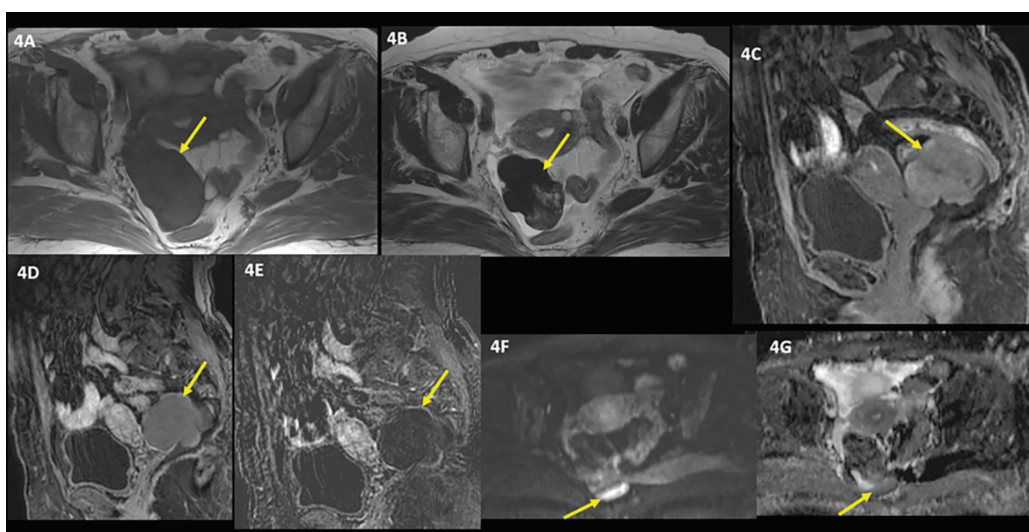Case 6 was pathologically proven to be a sclerosing stromal tumor (Figure 6).

Figure 4. A 77-year-old woman with postmenopausal complaints. In the right ovary, a solid lesion measuring 70x47x60 mm, heterogeneous, iso-to mildly hypointense in T1-weighted (T1W)s compared to the striated muscle (Figure 4A arrow) and fat-saturated T1W (Figure 4C arrow), markedly hypointense in T2-weighted (Figure 4B arrow), with millimetric cystic areas was observed. In the post-contrast series, mild heterogeneous contrast enhancement was detected in the late phase (Figure 4D arrow and subtraction Figure E arrow), and a lobulated-contour solid lesion containing partially diffusion-restricted areas (Figures 4F and G arrows) was observed on diffusion-weighted imagings (proven by biopsy fibrothecoma)
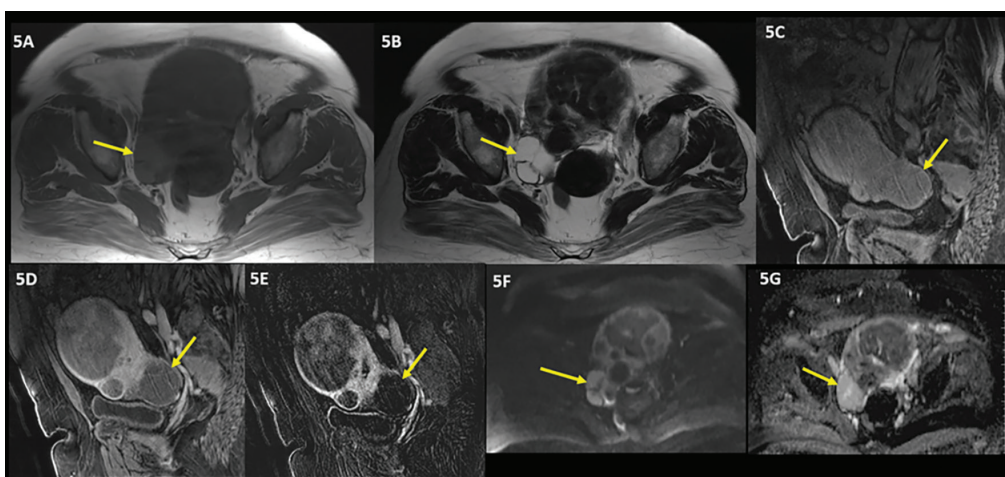

Figure 5. A 67-year-old woman referring for cervical smear. In the right ovary, a lesion sized 46x40x45 mm, slightly hyperintense compared to the striated muscle in T1-weighted (T1W) axial (Figure 5A), fatsat T1W (Figure 5C arrow), markedly hyperintense in T2-weighted axial (Figure 5B), and multiloculated cystic, was observed. In the post-contrast series, a slightly contrasting cystic lesion was observed on only one wall (Figure 5D arrow and subtraction Figure 5E arrow), and a non-diffusion-restricting cystic lesion was observed in diffusion-weighted imagings (Figures 5F and 5G) (proven by biopsy cystadenofibroma)
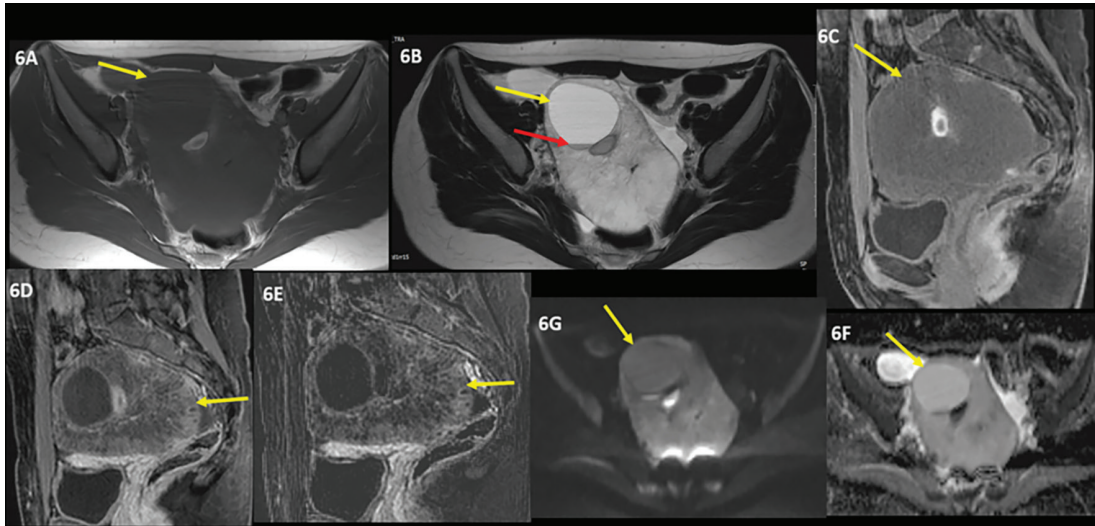
Figure 6. A 25-year-old woman with acute pelvic pain. The left ovary is 131x74x78 mm, and its size has increased compared to previous measurements. The normal stroma of the left ovary can only be seen as a crescent in a section of 30x12 mm (yellow arrows in Figures 6A and 6B). Apart from this the parenchyma signal is greatly increased, and numerous peripheral, follicle-like, millimetric, diffuse cystic areas can be observed. In the central part of the enlarged ovary, 2 hemorrhagic cystic-necrotic areas with a fluid-blood interface (Figure 6B red arrow) are observed. Additionally, there are signal changes consistent with subacute hemorrhage in the form of vaguely circumscribed areas. Slight enhancement was observed in the ovarian stroma in the postcontrast series (Figure 6D arrow and subtraction Figure 6E arrow). In diffusion-weighted imagings, increased diffusion was observed (arrows in Figures 6F and 6G). (biopsy proved sclerosing stromal tumor and ovarian torsion)

DISCUSSION

MRI is regarded as a problem-solving method for evaluating adnexal masses. When evaluating adnexal masses, gadolinium-enhanced MRI tends to be more accurate than US.

Even if solid components (such as Rokitansky nodules) are also present, the presence of fat in a cystic adnexal lesion is indicative of a cystic teratoma. Both conventional and fat-suppressed T1W imaging are necessary to demonstrate fat since the latter helps distinguish fat from blood products as the source of the high T1 signal intensity (6). Nonetheless, ovarian fibromas may be better characterized by T2W imaging. To evaluate a clinically suspected adnexal mass, US is still the predominant imaging modality, according to established practice and a review of the literature. If the outcome of the US evaluation is uncertain, MRI represents a financially advantageous course of action. Complex adnexal masses can be detected and characterized with great detection and characterization capabilities using gadolinium-enhanced MRI, and it also exhibits strong inter- and intraobserver agreement.

In case of a suspected adnexal mass, pelvic or transvaginal US is the first-step imaging modality. However, MRI's high potential for tissue characterization makes it the second step and a decisive imaging modality. MRI diagnosis of benign ovarian masses is critical in the management of patients affected by them.

REFERENCES

1. Pekindil G. Over tümörlerinde görüntüleme. Trd Sem. 2015;3:108-26.

2. Jeong YY, Outwater EK, Kang HK. Imaging evaluation of ovarian masses. Radiographics. 2000;20:1445-70.

3. Kurtz AB, Tsimikas JV, Tempany CM, Hamper UM, Arger PH, Bree RL, et al. Diagnosis and staging of ovarian cancer: comparative values of doppler and conventional US, CT, and MR imaging correlated with surgery and histopathologic analysis report of the Radiology Diagnostic Oncology Group. Radiology. 1999;212:19-27.

4. Siegelmann ES, Outwater EK. Tissue characterization in the female pelvis by means of MR imaging. Radiology. 1999;212:5-18.

5. Imaoka I, Wada A, Kaji Y, Hayashi T, Hayashi M, Matsuo M, et al. Developing an MR imaging strategy for diagnosis of ovarian masses. Radiographics. 2006;26:1431-48.

6. Hricak H, Chen M, Coakley FV, Kinkel K, Yu KK, Sica G, et al. Complex adnexal masses: detection and characterization with MR imaging. Radiology. 2000;214:39-46.

7. Thomassin-Naggara I, Aubert E, Rockall A, Jalaguier-Coudray A, Rouzier R, Daraï E, et al. Adnexal masses: development and preliminary validation of an MR imaging scoring system. Radiology. 2013;267:432-43.

8. Atram M, Anshu, Sharma S, Gangane N. Sclerosing stromal tumor of the ovary. Obstet Gynecol Sci. 2014;57:405-8.