CASE REPORT

MRI Findings of an Ovarian Dermoid Cyst with Malignant Transformation

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The ovarian dermoid cyst is the most common ovarian tumor. However, malignant transformation developing from a dermoid cyst is very rare. Because of this rarity, few reports exist of preoperative diagnosis of this tumor by MRI. We report MRI findings from a 69-year-old patient with a malignant transformation (squamous cell carcinoma with sarcomatoid features) in a right ovarian dermoid cyst.

Keywords: *MRI, ovary, dermoid cyst, malignant transformation*

Introduction

Malignant transformation developing from an ovarian dermoid cyst is rare. Because of this rarity, few reports exist of preoperative diagnosis of this tumor by MRI. We report MRI findings from a very rare patient with a malignant transformation comprising squamous cell carcinoma with sarcomatoid features in a right ovarian dermoid cyst.

Case Report

The patient was a 69-year-old woman (gravida 4, para 3) who had complained of lower abdominal distension for about one month and visited our hospital for a gynecological evaluation on November 19, 1998. The physical examination revealed a large, smooth-surfaced, nontender abdominal tumor. The upper margin of the tumor extended to about 5 cm above the navel.

MRI was performed with a 1.5T superconductive scanner (Signa; GE Medical System, Milwaukee, WI, U.S.A.). T₁-weighted images (TR: 500 ms; TE: 10 ms) and fast spin-echo T₂-weighted images (TR: 5000 ms; TE: 100 ms) were obtained in both transaxial and sagittal planes. She also received intravenous bolus injections of gadopentetate dimeglumine (Gd-DTPA, 0.1 mmol/kg of body weight). Transaxial and sagittal contrast-enhanced T₁-weighted images were obtained immediately after injection of Gd-DTPA.

The large spherical tumor was revealed with slightly high signal intensities in T₁-weighted images

and with markedly high signal intensities in T₂-weighted images. It was clearly distinguished from the smaller uterus on sagittal MR images. Numerous small round components of various sizes, which were not enhanced by Gd-DTPA, were seen within the tumor (Fig. 1A, B). From the MRI findings, the tumor was considered an ovarian cystic tumor containing fat. Moreover, a slightly enhanced solid portion was also demonstrated within the tumor. The anterior margin of the solid portion was irregular, and extracapsular extension was suspected (Fig. 1C, D). Ascites were not retained in the pelvic cavity. Tumor marker levels in the serum were as follows: CA125 20.5 U/ml, CA19-9 1097 U/ml, CEA 16.0 ng/ml, SCC (squamous cell carcinoma antigen) 24.3 ng/ml. From these clinical findings, malignant transformation of a dermoid cyst was strongly suspected and an exploratory laparotomy was performed on December 14, 1998.

In the laparotomy, ascites of about 50 ml were found in the pelvic cavity. Cytologic examination of the ascites was positive. A smooth-surfaced, spherical, cystic tumor measuring 15 × 20 × 9 cm was found to originate in the right ovary. A partial rupture of the wall and small foci of dissemination in the pelvic cavity were observed. However, the uterus and left ovary were macroscopically normal. The right ovarian tumor contained fat with many pale tan-colored fat balls, measuring about 1 cm in diameter, and a solid portion measuring 3 × 4 × 3 cm was found within the tumor. A simple total hysterectomy, bilateral salpingo-oophorectomy, omentectomy, and pelvic and paraaortic lymphadenectomy were performed.

Microscopically, the tumor was covered with

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Fig. 1. MRI of the pelvis

A: Sagittal T₁-weighted image, **B:** Sagittal T₂-weighted image, **C:** Transaxial T₂-weighted image, **D:** Transaxial Gd-DTPA enhanced T₁-weighted image

A large tumor containing fat with many small fat balls is clearly distinguished from the uterus and a solid portion within the tumor (arrow) is revealed.

benign keratinizing squamous epithelium and surrounded by sebaceous glands, hair follicles and melanin-containing spindle cells, which proved the tumor was a mature cystic teratoma. However, the solid portion comprised spindle cells with prominent nuclear atypia and frequent mitotic features showing sarcomatoid features. Squamous cell carcinoma nests were scattered against sarcomatoid elements, and carcinoma cells replaced benign squamous epithelium of cystic teratoma (Fig. 2). The uterus and left ovary were normal, and metastases to the omentum and lymph nodes were not observed. From these findings, the case was classified as FIGO clinical stage IIc.

After surgery, the patient received five courses of

combination chemotherapy consisting of taxol (135 mg/m²) and cisplatin (50 mg/m²). Serum levels of all tumor markers decreased and fell below the cutoff levels after surgery. However, an intrapelvic recurrent tumor was observed nine months after surgery, and the patient died on October 24, 1999.

Discussion

Malignant transformation developing from an ovarian dermoid cyst is rare and occurs in approximately 1% of dermoid cysts.^{1,2} Among the malignant transformations, squamous cell carcinoma is the most common type (representing about 80% of

Fig. 2. Histopathological findings of the right ovarian tumor (H.E. $\times 40$)
The solid portion comprised a squamous cell carcinoma with cancer pearls and sarcomatoid features.

cases), and adenocarcinoma, undifferentiated carcinoma, malignant melanoma, thyroid adenocarcinoma, and sarcoma have been reported in the literature.¹⁻⁴ No specific symptoms exist that would lead one to suspect malignant transformation developing from a dermoid cyst. However, some clinical features of this tumor have been reported. First, this tumor is age related; although the ages of patients with this tumor ranged from 21 to 87 years in the literature, this tumor occurs most frequently in postmenopausal women.^{5,6} Second, tumor size is an important factor contributing to a differential diagnosis between a malignant and benign dermoid cyst. Kikkawa et al. reported that a squamous cell carcinoma developing from a dermoid cyst was significantly larger than a dermoid cyst, that the mean size of 37 squamous cell carcinomas developing from dermoid cysts was 152.3 mm, and that the cutoff size between benign and malignant was 99 mm.⁶

Currently, measuring of serum tumor markers and imaging are two important tools in the differential diagnosis between benign and malignant ovarian tumors. In the present case, serum levels of SCC, CEA, and CA19-9 were markedly elevated. CA19-9 is known to be a good marker for dermoid cysts, and SCC and CEA have been reported as more useful than CA19-9 or CA125 in the diagnosis of squamous cell carcinoma developing from dermoid cysts. Kikkawa et al. reported that CEA was the most useful and SCC was second in making a differential diagnosis between a dermoid cyst and a squamous cell carcinoma developing from a dermoid cyst, and they recommended that CEA and SCC be measured in patients aged 45 years or older who have dermoid cyst-like ovarian tumors larger than 99 mm in their greatest dimension.⁶

The dermoid cyst is a tumor that can be easily diagnosed by imaging modalities such as plain radiography, CT, and MRI. Most dermoid cysts show radiolucent shadows on plain radiography and significantly low density in CT because fat is usually contained within the tumor.⁷ With MRI, dermoid cysts are seen with high signal intensities in both T₁-weighted and T₂-weighted images, and the presence of fat-fluid levels or chemical shift artifacts are also useful findings in the diagnosis of dermoid cysts.⁸ However, few reports exist of diagnosis of malignant transformations developing from a dermoid cyst with these imaging modalities. Kido et al. reported the MRI findings for six dermoid cysts with malignant transformations. They observed solid portions in five of six tumors in MRI, and solid portions in two tumors were enhanced by Gd-DTPA to varying degrees.⁹ The presence of solid, friable, or variegated portions within the dermoid cyst is an important feature in the diagnosis of malignant transformation, and this tumor generally spreads by direct invasion and peritoneal implantation rather than by metastasis to the regional lymph nodes.¹ In the present case, the diagnosis of dermoid cyst was easily made through unique MRI findings arising from the fat present in many fat balls within the tumor and a slightly enhanced solid portion with extracapsular extension demonstrated in MRI. Contrast enhancement with Gd-DTPA is imperative for differentiation between benign and malignant ovarian tumors, as contrast-enhanced MRI more clearly demonstrates the internal details of ovarian tumors, especially the presence of necrosis, papillary formations, solid portions, and septations.¹⁰ Recently, the usefulness of MRI with fat suppression techniques has also been reported in the diagnosis of dermoid cysts.^{11,12} To our knowledge, no reports of MRI with fat suppression techniques exist in the diagnosis of malignant transformation developing from a dermoid cyst. However, a contrast-enhanced solid portion within a dermoid cyst is more clearly demonstrated in fat suppressed T₁-weighted images than in conventional T₁-weighted images. Therefore, fat suppressed post-contrast MRI may be helpful in the diagnosis of malignant transformation developing from a dermoid cyst.

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