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Benign enhancing components of mature ovarian teratoma: magnetic resonance imaging features and pathologic correlation

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ABSTRACT

The purpose of this work was to evaluate cases of benign ovarian mature teratoma (MT) with enhancing solid components on pelvic magnetic resonance imaging (MRI) and to correlate the MRI findings with the pathology reports. We retrospectively reviewed MRI findings and pathologic reports of 126 patients with pathologically confirmed ovarian MT. Enhancing solid components were observed in 24 (18.8%) of 128 benign MTs. The largest diameter ranged from 5.9 to 42.2 mm. The appearance was variable. Of 24 tumors, 19 (79.2%) had regular borders. On pathologic analysis, solid components of benign MTs were identified as glial tissue, thyroid tissue, fibrous stroma, or vessels.

1. Introduction

Mature teratoma (MT), which is composed of well-differentiated tissues that derive from all three germ-cell layers (ectoderm, mesoderm and endoderm), is one of the most common benign ovarian neoplasms, accounting for 20% of adult ovarian tumors and 50% of pediatric ovarian tumors [1,2].

Malignant transformation occurs in 1% to 2% of ovarian teratomas and accounts for 1% of all ovarian malignancies [3,4]. Squamous cell carcinoma arising from the squamous lining of the cyst is the most common type of malignant transformation, accounting for 80% of the reported cases [3,5]. According to a few reports [6–9], MT with malignant transformation is characterized by the presence of an enhancing solid component on contrast-enhanced magnetic resonance imaging (MRI). However, we have experienced cases of benign MT with enhancing solid components that mimic malignancy on pelvic MRI, and we have questioned whether an enhancing solid component within an ovarian MT always indicates malignant transformation.

There has been no previous analysis of benign MTs with enhancing solid components on MRI. The purposes of this study were to evaluate the benign enhancing solid component within ovarian MT on pelvic MRI and to correlate MRI findings with pathology.

2. Materials and methods

2.1. Patients

Institutional review board approval was received for this retrospective study with waiver of informed consent. We searched the records from January 2004 to January 2015 for cases of ovarian teratoma and identified 126 patients (154 masses) with pathologically confirmed ovarian teratomas who underwent pelvic MRI at our institution. Of these, 9 patients (11 masses) were excluded from the study because of pathologic findings including MT with malignant transformation (malignant melanoma and squamous cell carcinoma, 2 patients, 2 masses), immature teratoma (6 patients, 6 masses), and mixed germ-cell tumors associated with MT (3 patients, 3 masses). Eight patients (9 masses) who underwent nonenhanced MRI and 6 patients (6 masses) who had invisible masses on MRI were also excluded, as were 81 patients (104 masses) with no enhancing components on pelvic MRI. Finally, 22 patients (24 masses) with benign enhancing components in benign MTs were included in the study (Fig. 1). All MRIs were performed within 2 months (range, 0 to 57 days; mean, 22 days) preceding surgery.

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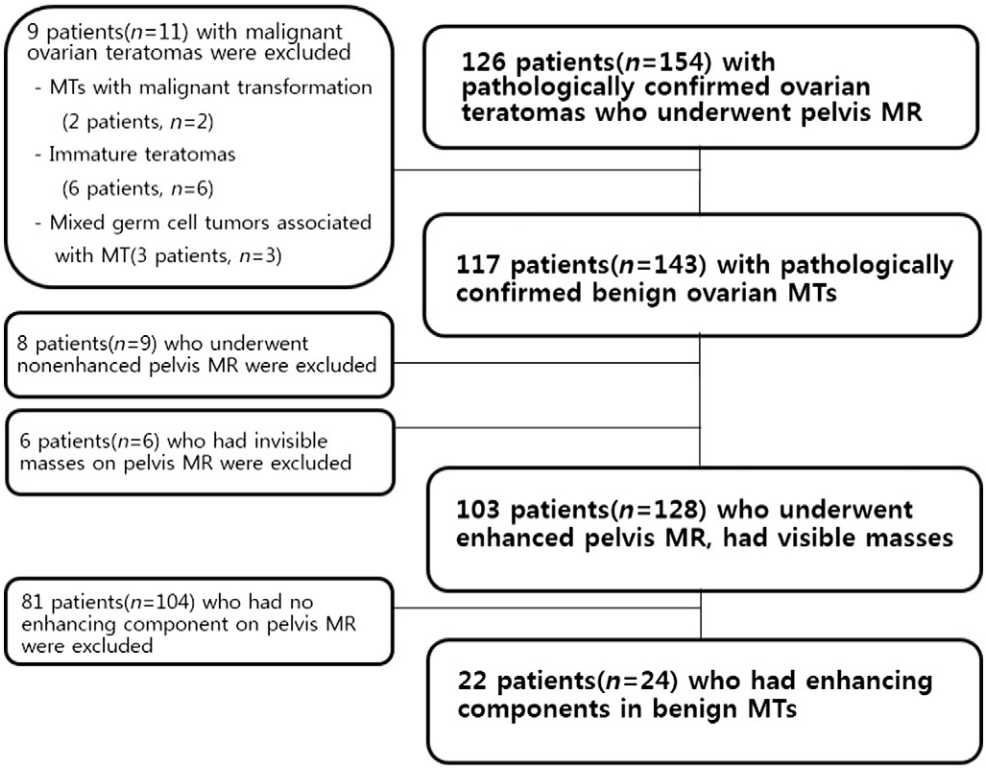

Fig. 1. Flowchart of patient selection. MT, mature teratoma; *n*, number of teratomas.

2.2. MRI techniques

MRI was performed using 1.5-T MRI (Magnetom Avanto, A Tim + Dot system or Magnetom Sonata system, Siemens, Erlangen, Germany) or 3-T MRI (Magnetom Trio, A Tim system, Siemens, Erlangen, Germany). Sagittal T_2-weighted Siemens "BLADE" images were acquired with a body array coil (repetition time [TR]/echo time [TE], 3080–4000/113; section thickness, 4 mm; intersection gap, 1.6 mm; field of view [FOV], 260×260 mm; matrix, 384×384), along with transverse T_2-weighted turbo spin-echo images (TR/TE,

Table 1
Benign enhancing components of mature ovarian teratoma: MRI features and pathologic correlation

Case	MR imaging features							Pathologic correlation
	Tumor		Enhancing component					Enhancing component
	Size (mm)	Appearance	Size (mm)	Border	Location[a]	Angle[b]	Appearance	
1	37.1	Ovoid	10.3	Regular	Inner		Nodular	Glial tissue
2	34.2	Ovoid	5.9	Regular	Inner		Nodular	–
3	69.7	Ovoid	17.6	Regular	Inner		Nodular	–
4	44.8	Ovoid	6.8	Regular	Inner		Nodular	Glial tissue
5	171.4	Lobulated	24	Regular	Inner		Multinodular	Glial tissue
6	78.4	Ovoid	8.9	Regular	Inner		Nodular	Glial tissue
7	159.5	Lobulated	22.8	Regular	Inner		Amorphous	Glial tissue
8	50.3	Ovoid	3.8	Regular	Inner		Nodular	Thyroid tissue
9	73.1	Lobulated	6	Irregular	Inner		Multinodular	Thyroid tissue
10	95.7	Ovoid	8.1	Regular	Inner		Nodular	–
11	62.1	Lobulated	42.2	Regular	Inner		Amorphous	–
12	95.3	Ovoid	15.7	Regular	Inner		Nodular	–
13	55.3	Lobulated	35.2	Regular	Wall	Acute	Elongated	Fibrous stroma
14	89.8	Lobulated	21.7	Regular	Wall	Obtuse	Triangular	Thyroid tissue
15	100.1	Lobulated	30.3	Irregular	Wall	Acute	Lobulated	–
16	44.8	Ovoid	9	Irregular	Wall	Acute	Nodular	Glial tissue
17	23	Ovoid	9.3	Regular	Wall	Acute + obtuse	Triangular	–
18	57.9	Ovoid	24.5	Regular	Wall	Acute	Elongated	–
19	96.4	Lobulated	19.5	Regular	Wall	Acute	Horseshoe	Glial tissue
20	99.3	Lobulated	19.6	Regular	Outer		Semilunar	Vessel
21	196.8	Lobulated	32	Irregular	Outer		Semilunar	–
22	71.8	Ovoid	22.8	Irregular	Outer		Semilunar	Glial tissue
23	49.7	Ovoid	13.1	Regular	Outer		Amorphous	–
24	43	Ovoid	23.2	Regular	Outer		Semilunar	–

[a] Location of the solid component within the tumor.
[b] Angle formed between the solid component and the wall of the mass.