

# MR Imaging Findings of Ovarian Cystadenofibroma: Clues for Making the Differential Diagnosis from Ovarian Malignancy

Jae Young Byun, MD

Department of Radiology, Kangnam St. Mary's Hospital, The Catholic University of Korea, Seoul 150-010, Korea

Ovarian cystadenofibromas are uncommon epithelial ovarian tumors in which fibrous stroma is the dominant component of the neoplasm, in addition to the epithelial lining of the cystic tumor. These tumors are classified, according to the epithelial cell types, into the serous, endometrioid, mucinous, clear cell and mixed categories. The degree of epithelial proliferation and its relation to the stromal component of the tumor are used for their classification as benign, borderline and malignant tumors, although most of the reported ovarian cystadenofibromas were usually benign (1–3).

There are a few reports that have described the MR imaging features of ovarian cystadenofibromas (3–7). In their reports, the gross morphology of ovarian cystadenofibromas was predominantly cystic and the most frequent finding was the presence of solid nodules. Outwater et al. (3) have reported that ovarian cystadenofibromas were multilocular cystic masses with a solid component and they had a specific MR signal intensity for the solid portion, which consisted of fibrous tissue that had very low signal intensity on the T2-weighted sequences. Takeuchi et al. (5) reported that small or tiny cystic locules within the solid component are the characteristic findings of cystadenofibroma, corresponding to a black sponge-like appearance on T2-weighted image. Cho et al. (7) found that about half of ovarian cystadenofibromas are purely cystic and the other half are complex cystic masses with one or more solid components on CT or MR imaging. The imaging findings of purely cystic ovarian cystadenofibromas were identical to those of ovarian cystadenomas on CT or MR imaging (8). Upon reviewing of the pathology of these tumors, they had small foci of fibrous stromas that were detected only on microscopic examination. The cystadenofibromas with a complex cystic nature demonstrated variable amounts of solid components in the cystic tumor

on the CT or MR imaging. Due to their solid component or thick septa, they were all diagnosed as being malignant on the preoperative imaging (7).

The article by Jung et al. (9) in this issue of the *Korean Journal of Radiology* has reported other common imaging features of ovarian cystadenofibromas on MR imaging. They encountered several cases of cystadenofibroma that showed different MR imaging findings from the previous characteristic findings. The previously reported characteristic MR findings of cystadenofibroma (a multilocular cystic mass with a T2-dark-signal-intensity solid component containing small cystic locules) were found only in 43% of the tumors they examined. Diffuse or partial thickening of the cyst wall with a T2-dark signal intensity without any definite solid component was as common as that the previous reported findings. This dark-signal-intensity thickening may represent a dense fibrous component within the wall (9).

Ovarian malignancy can be strongly suspected whenever we encounter an ovarian cystic mass with solid components in clinical practice. Ovarian cystadenofibromas are important from an imaging standpoint because they may have solid portions and so they mimic malignant neoplasms. Some investigators have reported that this type of tumor could be diagnosed as being malignant on imaging (3–7). This tumor may also have the gross appearance of a malignant tumor at the time of surgery. A frozen-section diagnosis may be helpful in many of these cases because a correct diagnosis of cystadenofibroma in the operating room might save the patient from unnecessary extensive surgery; therefore, the awareness of this tumor by the clinician is of utmost importance (7). Cystadenofibromas may occur in the reproductive period of patients, and an accurate preoperative diagnosis may contribute to avoiding excessive surgical procedures (5).

MR imaging has significant advantages over CT or

ultrasonography for characterizing the tissue of ovarian masses. Gadolinium-enhanced MR imaging is highly accurate for the detection and characterization of complex adnexal masses, with excellent inter- and intra-observer agreement. MR imaging can be recommended as a reliable and reproducible modality for the assessment of complex adnexal masses (10). On ultrasonography or CT, cystadenofibroma may appear as a complex solid and cystic mass and it may be difficult to differentiate it from malignancy. The specific MR imaging features of this tumor would be helpful for distinguishing cystadenofibroma from malignant neoplasms. Cystadenofibromas have a typical appearance on MR imaging; the fibrous component can be appreciated on the T2-weighted sequences. On the T2-weighted images, the solid components of the tumors show very low signal intensity, in which very intense tiny cysts are present. The fibrous component has signal intensity that is similar to that of the ovarian fibromas. This finding, like the "black sponge" that reflects dense fibrous stromal proliferation with scattered small cystic glandular structures on the T2-weighted images, was considered to be characteristic of the solid components of cystadenofibromas (5). In addition, diffuse or partial thickening of the cyst wall with T2-dark signal intensity without a definite solid component is a common finding (9).

Cystadenocarcinofibroma is the malignant counterpart of cystadenofibroma. This malignant tumor is very rare and there is no report in the literature on the MR imaging findings of this tumor (9). The study by Jung et al. (9) in this issue of the *Korean Journal of Radiology* has reported two cases of cystadenocarcinofibroma that had more of a solid portion with strong enhancement and higher signal intensity as compared with benign cystadenofibromas. In that study, two cystadenocarcinofibromas had a markedly enhancing solid component that showed intermediate signal intensity on the T2-weighted images. The signal intensities of the solid portions on the T2-weighted images were higher than those of their benign counterparts. In general, the likelihood of malignancy increases with an increasing solid tissue portion, and thicker septa and contrast enhancement usually increases the accuracy of differentiating between benign and malignant lesions (9). The criteria that are most useful for the prediction of ovarian malignancy are lesion size (> 4 cm), thickness (> 3 mm) of the walls and septa, and the internal structure, including papillary projections, nodularity and the various degrees of the solid components, necrosis and hemorrhage (11). According to these criteria, the imaging findings of cystadenocarcinofibroma are identical to those of other malignant ovarian tumors.

The differential diagnosis of ovarian cystadenofibroma

should include ovarian masses with fibrous components, including fibroma, fibrothecoma and Brenner's tumor. The fibrous components of these masses tend to have very low signal intensity on the T2-weighted MR images. Ovarian fibromas may mimic malignancy, but they have a characteristic MR appearance that consists of a solid mass of very low signal intensity tissue on the T2-weighted sequences. The low signal intensity on the T2-weighted sequences is the result of dense fibrous tissue in these tumors (3, 4, 12). Brenner's tumors manifest as a multilocular cystic mass with a solid component or as a small, mostly solid mass. Brenner's tumors may have an abundant fibrous stroma, resulting in low signal intensity on the T2-weighted images. Extensive amorphous calcification is often present within the solid component (13). Metastatic ovarian tumors with a highly fibrous component, and particularly those from the gastrointestinal tract, often demonstrate hypointense solid components on the T2-weighted images with strong enhancement in the bilateral complex masses (14). Struma ovarii may have a multicystic tumor with a solid component, a multilobulated surface and low signal intensity on the T2-weighted images with no contrast enhancement that indicates the presence of viscid gelatinous materials. Struma ovarii is usually associated with hyperthyroidism (15). Endometriomas of the ovary are characteristically homogeneously hyperintense on the T1-weighted sequences with relatively low signal intensity on the T2-weighted sequences, and they may contain a peripheral rim of low signal intensity that represents hemosiderin or a fibrous capsule (16).

Although the study by Jung et al. (9) in this issue of the *Korean Journal of Radiology* has several limitations, this study has widened the imaging spectrum of cystadenofibromas. Yet the small number of cystadenocarcinofibroma might not accurately reflect the full imaging spectrum of this malignant counterpart of cystadenofibroma. Therefore, further study with a larger sample size is necessary.

Familiarity with the above mentioned MR imaging features of ovarian cystadenofibromas may allow a specific diagnosis and help distinguish this benign tumor from malignant tumors, and this can be a big help during surgical planning to avoid inappropriate management or excessive surgical intervention.

## References

1. Compton HL, Finck FM. Serous adenofibroma and cystadenofibroma of the ovary. *Obstet Gynecol* 1970;36:636-645
2. Czernobilsky B, Borenstein R, Lancet M. Cystadenofibroma of the ovary. A clinicopathologic study of 34 cases and comparison with serous cystadenoma. *Cancer* 1974;34:1971-1981
3. Outwater EK, Siegelman ES, Talerma A, Dunton C. Ovarian fibromas and cystadenofibromas: MRI features of the fibrous

## Ovarian Cystadenofibroma on MRI

- component. *J Mag Reson Imaging* 1997;7:465-471
4. Jeong YY, Outwater EK, Kang HK. Imaging evaluation of ovarian masses. *Radiographics* 2000;20:1445-1470
  5. Takeuchi M, Matsuzaki K, Kusaka M, Shimazu H, Yoshida S, Nishitani H, et al. Ovarian cystadenofibromas: characteristic magnetic resonance findings with pathologic correlation. *J Comput Assist Tomogr* 2003;27:871-873
  6. Kim KA, Park CM, Lee JH, Kim HK, Cho SM, Kim B, et al. Benign ovarian tumors with solid and cystic components that mimic malignancy. *AJR Am J Roentgenol* 2004;182:1259-1265
  7. Cho SM, Byun JY, Rha SE, Jung SE, Park GS, Kim BK, et al. CT and MRI findings of cystadenofibromas of the ovary. *Eur Radiol* 2004;14:798-804
  8. Ghossain MA, Buy JN, Lignerres C, Bazot M, Hassen K, Malbec L, et al. Epithelial tumors of the ovary: comparison of MR and CT findings. *Radiology* 1991;181:863-870
  9. Jung DC, Kim SH, Kim SH. MR imaging findings of ovarian cystadenofibroma and cystadenocarcinofibroma: clues for differential diagnosis. *Korean J Radiol* 2006;7:199-204
  10. Hricak H, Chen M, Coakley FV, Kinkel K, Yu KK, Sica G, et al. Complex adnexal masses: detection and characterization with MR imaging-multivariate analysis. *Radiology* 2000;214:39-46
  11. Stevens SK, Hricak H, Stern JL. Ovarian lesions: detection and characterization with gadolinium-enhanced MR imaging at 1.5 T. *Radiology* 1991;181:481-488
  12. Jung SE, Lee JM, Rha SE, Byun JY, Jung JI, Hahn ST. CT and MR imaging of ovarian tumors with emphasis on differential diagnosis. *Radiographics* 2002;22:1305-1325
  13. Moon WJ, Koh BH, Kim SK, Kim YS, Rhim HC, Cho OK, et al. Brenner tumor of the ovary: CT and MR findings. *J Comput Assist Tomogr* 2000;24:72-76
  14. Kim SH, Kim WH, Park KJ, Lee JK, Kim JS. CT and MR findings of Krukenburg tumors: comparison with primary ovarian tumors. *J Comput Assist Tomogr* 1996;20:393-398
  15. Joja I, Asakawa T, Mitsumori A, Nakagawa T, Hiraki Y, Kudo T, et al. Struma ovarii: appearance on MR images. *Abdom Imaging* 1998;23:652-656
  16. Gougoutas CA, Siegelman ES, Hunt J, Outwater EK. Pelvic endometriosis: various manifestations and MR imaging findings. *AJR Am J Roentgenol* 2000;175:353-358