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Endometrial Polyps: MR Imaging Features and Distinction from Endometrial Carcinoma

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ABSTRACT

PURPOSE: To determine the magnetic resonance (MR) imaging characteristics of endometrial polyps and the accuracy of MR imaging in distinguishing endometrial polyps from endometrial carcinomas in a case-control study.

MATERIALS AND METHODS: Cross-referencing pathology records with MR studies from two institutions disclosed 35 patients with surgically proved endometrial polyp or carcinoma after controlling for tumor size. All MR examinations were performed at 1.5 T with T2-weighted fast spin-echo sequences in multiple planes. Three independent readers blinded to histologic diagnoses and clinical data scored each image for the presence of several defined findings.

RESULTS: A central fibrous core (low signal intensity on T2-weighted images) and intratumoral cysts (high signal intensity on T2-weighted images) were seen more frequently in endometrial polyps than in carcinomas; myometrial invasion and necrosis showed high predictive value for carcinomas. The readers' responses showed a mean sensitivity of 79%, specificity of 89%, accuracy of 86%, positive predictive value of 82%, and negative predictive value of 88% for diagnosis of carcinoma. The mean area under the receiver operating characteristic curve for the three readers was 0.87 for the diagnosis of carcinoma.

CONCLUSION: MR images can help to distinguish most polyps from endometrial carcinomas on the basis of morphologic features. Accuracy does not appear to be sufficient to obviate biopsy, partly because carcinomas and polyps frequently coexist.

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Uterine neoplasms, MR, 854.121411, 854.30
Uterus, diseases, 854.30, 854.33
Uterus, endometrium, 854.30, 854.33

Endometrial biopsy is the standard test for detecting carcinoma in women with dysfunctional uterine bleeding (1). Endovaginal ultrasonography (US) can be used to stratify women with bleeding into two groups: those requiring biopsy and those not requiring biopsy (2–4). Biopsy can be performed on thickened endometrium, and patients with endometrial thickness that measures less than 4–5 mm do not require biopsy (3,5).

There can be limitations to this approach. First, endometrial thickening at

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endovaginal US is nonspecific, and benign abnormalities, most commonly polyps, greatly outnumber cancers in patients who undergo endovaginal US screening (2–4). Second, it may be difficult to obtain an adequate specimen, particularly when endometrial polyps are present (3). Last, it is difficult to perform biopsy in some patients because of vaginal or cervical stenosis, which necessitates hysterectomy with endometrial histologic examination if suspicious US findings are present. These patients could benefit from an imaging procedure such as magnetic resonance (MR) imaging or hysterosonography to differentiate polyps from carcinoma.

Endometrial polyps are among the most common pathologic lesions of the uterine corpus (6). They are benign nodular protrusions of the endometrial surface that consist of irregularly distributed endometrial glands and stroma. They generally consist of three components: (*a*) a stroma of focally or diffusely dense fibrous or smooth muscle tissue, (*b*) thick-walled vessels, and (*c*) endometrial glands (6,7). Cystic glandular hyperplasia within the polyp occurs most commonly (6,8). Endometrial polyps may occur with or without generalized endometrial hyperplasia, but polyps are a more common cause of abnormal endometrial thickening than hyperplasia alone (4,9).

It is uncertain whether MR imaging features can help to distinguish polyps from cancer. The fibrous core and intratumoral cysts of polyps may be visible on T2-weighted MR images as low- and high-signal-intensity features, respectively.

The purpose of this study was to determine the MR imaging characteristics of endometrial polyps and the accuracy of MR imaging for helping to distinguish endometrial polyps from similar-sized endometrial carcinomas on the basis of features such as a fibrous core and intratumoral cysts.

MATERIALS AND METHODS

Study Design

The design of this investigation was a case-control, blinded-reader study of MR images in patients with endometrial polyps or endometrial carcinomas to determine if the two can be distinguished on the basis of specified MR image features. Because many polyps are very small and many carcinomas are large, we controlled the study population for tumor size as described in the next paragraph so that similar-sized carcinomas and polyps were compared. This study design was chosen to test whether MR images could help distinguish between polyps and cancer, not to test the sensitivity of MR imaging for the detection of polyps and cancer.

Study Group

The MR imaging reports of female pelvic examinations at the Thomas Jefferson University Hospital, Philadelphia, Pa, and at the Hospital of the University of Pennsylvania, Philadelphia, from January 1992 to January 1998 were cross-referenced with pathology records to identify patients who underwent MR imaging of the pelvis and hysterectomy or who had endometrial biopsy results that showed either endometrial polyps or endometrial carcinoma. This search yielded 42 patients, 14 with carcinoma and 28 with polyps. The study population presented to the blinded readers (E.K.O., S.M.H., E.S.S.) was controlled for tumor size as described subsequently. The maximum "double-layer" endometrial width, which included any endometrial mass, was measured on sagittal T2-weighted MR images by one investigator (R.P.G.) who did not serve as a blinded reader. Endometrial fluid was excluded from this measurement.

The largest carcinoma (endometrial width, 6 cm) and smallest polyps (endometrial width, <5 mm) (n = 6) were excluded so that there was no statistical significance (two-tailed Student t test) for size differences

between the group with carcinomas and the group with polyps.

After matching by size, our study group consisted of 22 patients with polyps and 13 patients with carcinomas. Four of the latter patients also had polyps; these cases were considered to be carcinoma for the purposes of the blinded-reader ratings. One papillary serous carcinoma was believed to be metastatic from an ovarian primary tumor.

The study group of 35 patients showed no significant difference in mean age, endometrial width, or uterine size between the patients with polyps and those with carcinoma (Table 1). Tissue diagnosis of the endometrial abnormalities was obtained at hysterectomy in 21 patients, at biopsy in 10 patients, and at resection in four patients. At histopathologic examination, two carcinomas had no identifiable myometrial invasion, six carcinomas were invading less than half the myometrial width, and two carcinomas were invading more than half the myometrial width (one tumor had associated endocervical invasion). The degree of myometrial invasion was unknown for three patients with carcinomas because they underwent only biopsy.

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TABLE 1. Study Group Clinical Data

MR Imaging Examinations

All examinations in the 35 patients were performed on 1.5-T-magnet systems (Signa; GE Medical Systems, Milwaukee, Wis). In 33 examinations, a phased-array multicoil for imaging the pelvis was used, and in two, a body coil was used.

Routine clinical MR imaging sequences were used. All patients ($N = 35$) underwent fast spin-echo (SE) T2-weighted imaging in the sagittal (3,233-6,000/85-140 [repetition time msec/effective echo time msec] two to four signals acquired; field of view, 20-26 cm) and transverse (3,000-7,900/85-140 [effective]; two signals acquired; field of view, 20-28 cm) planes. Thirty patients underwent fast SE T2-weighted imaging in the coronal plane (3,500-8,500/90-144 [effective]; two signals acquired; field of view, 20-30 cm). The acquisition matrix for all fast SE images was 256 × 256 with a 4-7-mm section thickness and a 0-2.5-mm intersection gap. The echo train length for all fast SE sequences was 16.

Transverse SE T1-weighted images (400-750/8-17; one or two signals acquired; field of view, 20-30 cm) were acquired in all patients with a 128-256 phase-encoding step matrix, 5-7-mm-thick sections, and a 0-1-mm intersection gap. T1-weighted fat-saturated imaging was performed with either an SE ($n = 4$) or opposed-phase gradient-echo ($n = 15$) technique in the transverse plane after intravenous injection of gadopentetate dimeglumine (0.1 mmol/kg; Magnevist; Berlex Laboratories, Wayne, NJ). Parameters for the SE fat-saturation sequence were 500-650/10-16; 1.5-2 signals acquired; field of view, 22-28 cm; with a 128-192 phase-encoding step matrix; 5-7-mm-thick sections; and a 1-mm intersection gap. One milligram of glucagon was given intramuscularly to the patients before imaging.

MR Image Analysis

Three readers (E.S.S., E.K.O., S.M.H.) (all attending-level body MR imaging radiologists) blinded to the histopathologic diagnoses and clinical data reviewed each MR study independently and scored it for the following findings: The presence of (*a*) mass (defined as any focal abnormality with thickening in the endometrium), (*b*) myometrial invasion (superficial, <50% of myometrial thickness; deep, >50%), (*c*) fibrous core (low-signal-intensity stripe or center in the mass on the T2-weighted images [Fig 1]),

(*d*) intratumoral cysts (discrete, smooth-walled cystic structures of high signal intensity within the mass [Fig 1]), (*e*) necrosis within the mass (irregular, high signal intensity within the mass on T2-weighted images or central irregular lack of contrast material enhancement), (*f*) fluid in the endometrial cavity, (*g*) predominant signal intensity of the abnormal endometrium, and (*h*) enhancement of the mass.

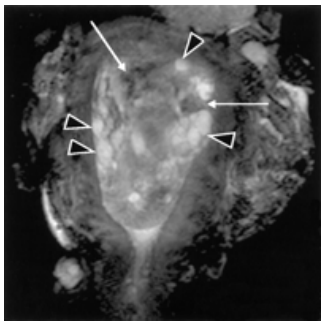

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Figure 1a.

Endometrial polyp in an 81-year-old patient. (a) Coronal T2-weighted fast SE (3,000/125 [effective]) MR image of the uterus ex vivo shows multiple high-signal-intensity, smooth-walled intratumoral cysts (arrowheads) and the low-signal-intensity fibrous core (arrows); note the overall heterogeneous appearance of the mass. This image was used to show examples of intratumoral cysts and fibrous core to the readers in our study and is not from a study patient. (b) Photomicrograph shows the intratumoral cysts (*C*) and the fibrous core (*F*) in the polyp adjacent to the myometrium (*M*). (Hematoxylin-eosin stain; original magnification, ×40.)

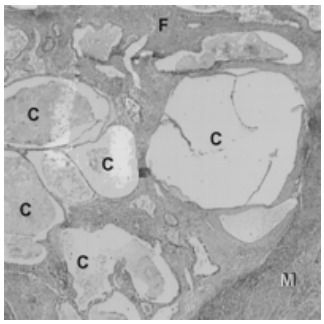

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Figure 1b.

Endometrial polyp in an 81-year-old patient. (a) Coronal T2-weighted fast SE (3,000/125 [effective]) MR image of the uterus ex vivo shows multiple high-signal-intensity, smooth-walled intratumoral cysts (arrowheads) and the low-signal-intensity fibrous core (arrows); note the overall heterogeneous appearance of the mass. This image was used to show examples of intratumoral cysts and fibrous core to the readers in our study and is not from a study patient. (b) Photomicrograph shows the intratumoral cysts (*C*) and the fibrous core (*F*) in the polyp adjacent to the myometrium (*M*). (Hematoxylin-eosin stain; original magnification, ×40.)

The readers were asked to subjectively grade the signal intensity on the basis of a signal intensity example scale from 1 to 5 that featured T2-weighted images, with 1 being equal to the signal intensity of skeletal muscle; 3, of outer myometrium; and 5, of general fluid (Fig 2). The readers were asked to differentiate between homogeneous enhancement, heterogeneous enhancement due to cysts, heterogeneous enhancement due to necrosis, and lacelike enhancement. Heterogeneous enhancement due to necrosis was defined as inhomogeneous with irregular nonenhancing areas within; heterogeneous enhancement due to cysts was defined as an inhomogeneous, nonenhancing space with smooth walls.

Lacelike enhancement was considered to be a septumlike enhancement between cystic areas, as described in reference 10.

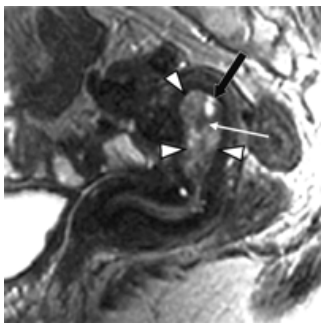

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Figure 2a.

Endometrial polyp in a 76-year old patient. (a) Sagittal T2-weighted fast SE (3,883/126 [effective]) MR image shows a polyp (arrowheads) with small, smooth-walled, high-signal-intensity intratumoral cysts (black arrow). Note the lower-signal-intensity fibrous stroma (white arrow). (b) Transverse T2-weighted fast SE (4,316/116 [effective]) MR image shows the polyp with small cysts (black arrows) and the fibrous core (white arrow) to better advantage. Note that the junctional zone (arrowheads) is intact. The gray scale shows the five-point rating of signal intensity used by the three readers. (c) Photomicrograph shows the intratumoral cysts (*C*) and stroma (*S*). (Hematoxylin-eosin stain; original magnification, ×40.)

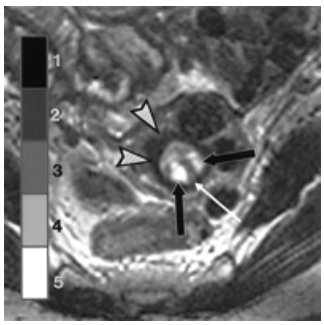

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Figure 2b.

Endometrial polyp in a 76-year old patient. (a) Sagittal T2-weighted fast SE (3,883/126 [effective]) MR image shows a polyp (arrowheads) with small, smooth-walled, high-signal-intensity intratumoral cysts (black arrow). Note the lower-signal-intensity fibrous stroma (white arrow). (b) Transverse T2-weighted fast SE (4,316/116 [effective]) MR image shows the polyp with small cysts (black arrows) and the fibrous core (white arrow) to better advantage. Note that the junctional zone (arrowheads) is intact. The gray scale shows the five-point rating of signal intensity used by the three readers. (c) Photomicrograph shows the intratumoral cysts (*C*) and stroma (*S*). (Hematoxylin-eosin stain; original magnification, ×40.)

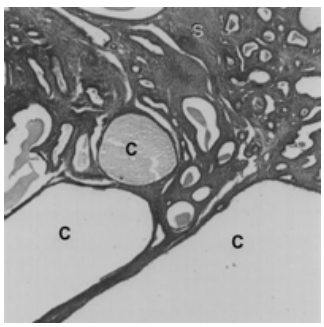

Figure 2c.

Endometrial polyp in a 76-year old patient. (a) Sagittal T2-weighted fast SE (3,883/126 [effective]) MR image shows a polyp (arrowheads) with small, smooth-walled, high-signal-intensity intratumoral cysts (black arrow). Note the lower-

signal-intensity fibrous stroma (white arrow). (b) Transverse T2-weighted fast SE (4,316/116 [effective]) MR image shows the polyp with small cysts (black arrows) and the fibrous core (white arrow) to better advantage. Note that the junctional zone (arrowheads) is intact. The gray scale shows the five-point rating of signal intensity used by the three readers. (c) Photomicrograph shows the intratumoral cysts (*C*) and stroma (*S*). (Hematoxylin-eosin stain; original magnification, ×40.)

The readers also gave a diagnosis of either polyp or carcinoma and graded their degree of confidence from 1 to 5, with 1 being the maximum for polyp, 3 being indeterminate, and 5 being the maximum for carcinoma. If the readers thought that both carcinoma and polyp were present, they were asked to score the findings only for carcinoma.

Statistical Analysis

Sensitivity, specificity, accuracy, positive predictive value (PPV), and negative predictive value (NPV) were calculated for the overall diagnosis. Mean values refer to the mean for the three readers. The Student *t* test was used to compare polyps and carcinomas by size and to evaluate the signal intensity scores. Receiver operating characteristic analysis was performed with the 1–5 confidence scores and the ROCFIT program (Metz CE, Shen JH, Wang PL, Kronman HB, Department of Radiology, University of Chicago, Ill, 1994).

The *z* test for proportions was used to test statistical association between the MR imaging findings of intratumoral cysts, fibrous core, myometrial invasion, necrosis or fluid in the cavity, enhancement pattern, and the histopathologic diagnosis for all readers. The Fisher exact test was used to test the statistical association for each reader for these findings.

Interobserver variation using κ statistics was calculated for each of the evaluated features. Percentage agreement was also calculated because of low base rates in some categories when κ is calculated (11). For the percentage agreement, we considered agreement to be present only when all three readers agreed on a finding.

RESULTS

Polyps showed intermediate signal intensity on T1-weighted images and heterogeneous, intermediate to high signal intensity on T2-weighted images, probably because of their internal structure. Polyps had mean signal intensity slightly higher than that of the carcinomas, with *P* values showing significance ($P < .03$) for two of three readers.

Intratumoral cysts and fibrous cores were visible predominantly in polyps (Figs 2, 3). Smaller polyps without cysts or fibrous cores were not seen because they tended to blend with surrounding endometrium (Fig 4). Low-signal-intensity fibrous cores were significantly ($P = .01$, *z* test) associated with the diagnosis of polyps and were seen in 12–16 (55%–73%) of the 22 patients with polyps (Table 2). Intratumoral cysts were seen in seven to 10 (32%–45%) of those with polyps and were seen in only zero, one, and three of the 13 patients with carcinoma; the number of patients in whom cysts were seen was dependent on the reader (Table 2). Intratumoral cysts were significantly associated with polyps for two of the three readers ($P < .04$, Fisher exact test). Polyps without cysts were more likely to be misclassified as carcinomas by the readers (Fig 5).

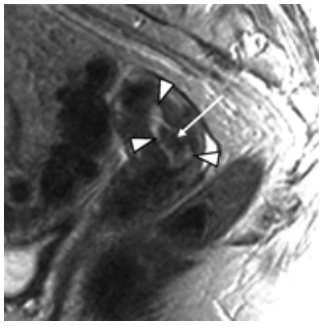

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Figure 3a.

Endometrial polyp in a 76-year-old patient. (a) Sagittal fast SE T2-weighted (4,000/126 [effective]) MR image shows a polyp (arrowheads) and fibrous core (arrow). (b) Transverse fast SE T2-weighted (4,000/126 [effective]) MR image shows a homogeneous, low-signal-intensity fibrous core (arrow) that represents the bulk of the mass, surrounded by high-signal-intensity cysts. *m* = myoma. (c) Photomicrograph of the specimen shows the intratumoral cysts (*C*) and fibrous core (*F*). (Hematoxylin-eosin stain; original magnification, ×40.)

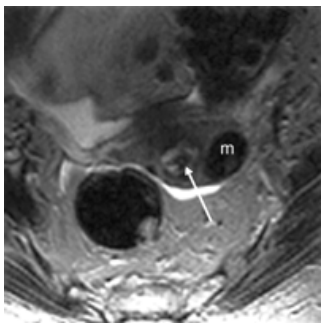

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Figure 3b.

Endometrial polyp in a 76-year-old patient. (a) Sagittal fast SE T2-weighted (4,000/126 [effective]) MR image shows a polyp (arrowheads) and fibrous core (arrow). (b) Transverse fast SE T2-weighted (4,000/126 [effective]) MR image shows a homogeneous, low-signal-intensity fibrous core (arrow) that represents the bulk of the mass, surrounded by high-signal-intensity cysts. *m* = myoma. (c) Photomicrograph of the specimen shows the intratumoral cysts (*C*) and fibrous core (*F*). (Hematoxylin-eosin stain; original magnification, ×40.)

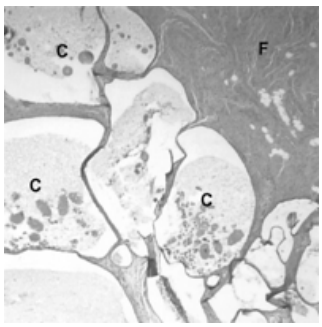

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Figure 3c.

Endometrial polyp in a 76-year-old patient. (a) Sagittal fast SE T2-weighted (4,000/126 [effective]) MR image shows a polyp (arrowheads) and fibrous core (arrow). (b) Transverse fast SE T2-weighted (4,000/126 [effective]) MR image shows a homogeneous, low-signal-intensity fibrous core (arrow) that represents the bulk of the mass, surrounded by high-signal-intensity cysts. *m* = myoma. (c) Photomicrograph of the specimen shows the intratumoral cysts (*C*) and fibrous core (*F*). (Hematoxylin-eosin stain; original magnification, ×40.)

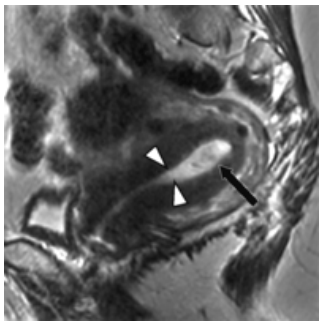

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Figure 4a.

Endometrial polyp in a 44-year-old patient. (a) Sagittal fast SE T2-weighted (5,000/102 [effective]) MR image shows an intracavitary mass (arrow) with signal intensity similar to the high signal intensity of the endometrium (arrowheads). (b) Photomicrograph of the specimen shows multiple endometrial glands imbedded in stroma (*S*), which resembles normal endometrium. (Hematoxylin-eosin stain; original magnification, ×40.)

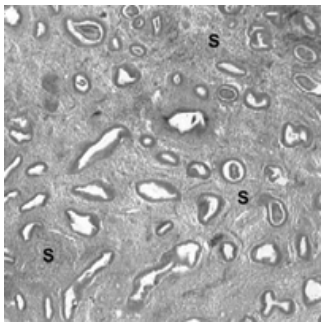

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Figure 4b.

Endometrial polyp in a 44-year-old patient. (a) Sagittal fast SE T2-weighted (5,000/102 [effective]) MR image shows an intracavitary mass (arrow) with signal intensity similar to the high signal intensity of the endometrium (arrowheads). (b) Photomicrograph of the specimen shows multiple endometrial glands imbedded in stroma (*S*), which resembles normal endometrium. (Hematoxylin-eosin stain; original magnification, ×40.)

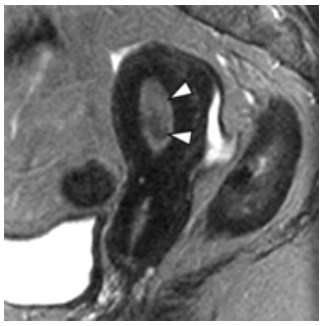

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Figure 5a.

Endometrial polyp mistaken for carcinoma by two of three readers in a 59-year-old postmenopausal patient. (a) Sagittal T2-weighted fast SE (6,000/126 [effective]) MR image shows a heterogeneous, intermediate-signal-intensity mass (arrowheads) within the expanded endometrial cavity. No cyst or fibrous core is seen. This unusual appearance may be a pitfall for the diagnosis of a polyp. (b) Photomicrograph of the specimen shows multiple endometrial glands embedded in stroma (*S*), which appears similar to normal endometrium. (Hematoxylin-eosin stain; original magnification, ×40.)

Figure 5b.

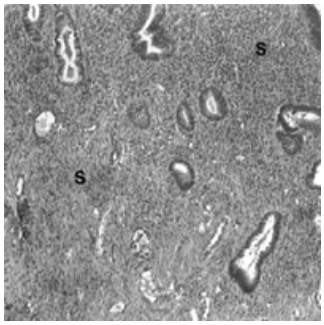

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TABLE 2. Diagnostic Features Distinguishing Endometrial Polyps from Endometrial Carcinoma on MR Images as Determined by Three Independent Readers

Carcinomas appeared generally as low- to intermediate-signal-intensity abnormalities on T2-weighted images (Fig 6). Both myometrial invasion and necrosis were significantly associated with carcinoma, although neither finding occurred in a high proportion of cases. Myometrial invasion was seen in six to nine (46%-69%) of the 13 patients with carcinoma. Deep myometrial invasion was seen in fewer cases but was more predictive of carcinoma as opposed to polyp. Fluid in the endometrial cavity was not predictive of carcinoma (Table 2).

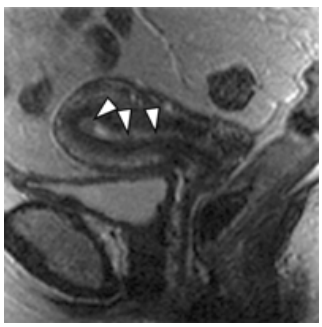

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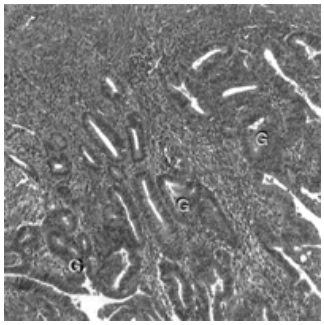
Figure 6a.

Endometrial carcinoma in a 58-year-old patient. (a) Sagittal fast SE T2-weighted (4,000/119 [effective]) MR image shows nodular, discretely irregular foci of low signal intensity (arrowheads) in the endometrial cavity. (b) Photomicrograph of the specimen shows abundant stroma between the glands (*G*). (Hematoxylin-eosin stain; original magnification, ×40.)

Figure 6b.

Endometrial carcinoma in a 58-year-old patient. (a) Sagittal fast SE T2-



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weighted (4,000/119 [effective]) MR image shows nodular, discretely irregular foci of low signal intensity (arrowheads) in the endometrial cavity. (b) Photomicrograph of the specimen shows abundant stroma between the glands (*G*). (Hematoxylin–eosin stain; original magnification, ×40.)

Both carcinomas and polyps generally appeared hypointense to the outer myometrium on enhanced images. The pattern of heterogeneous enhancement due to necrosis was significantly ($P < .05$) associated with carcinoma. Other enhancement patterns showed no significant association with carcinoma or polyp.

The overall diagnosis of carcinoma had a mean sensitivity, specificity, accuracy, PPV, and NPV of 79% (31 of 39 observations), 89% (59 of 66), 86% (90 of 105), 82% (31 of 38), and 88% (59 of 67), respectively, with a κ value of 0.67 for interobserver variability. The areas under the receiver operating characteristic curve (A_z) for the three readers were 0.90, 0.92, and 0.79 (mean, 0.87) for the diagnosis of carcinoma.

Four patients had polyps that were mistaken for carcinoma by the readers; intratumoral cysts and fibrous cores were not identified in these patients (Fig 5). Five patients had carcinomas that were mistaken for polyps by one or more readers (Fig 7). Three of these patients had both polyps and carcinoma at histopathologic examination; one of these had only microscopic carcinoma.

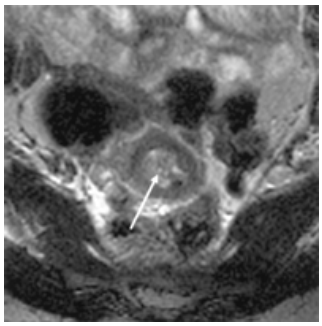

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Figure 7.

Endometrial polyp and a microscopic focus of endometrial carcinoma, rated as a polyp by two of three readers, in a 71-year-old patient. Transverse T2-weighted fast SE (4,000/120 [effective]) MR image shows an intracavitary mass with heterogeneous, intermediate-to-high signal intensity and small intratumoral cysts (arrow).

Interobserver variation (as a percentage) was generally good for findings related to polyps and carcinomas. The findings of intrauterine fluid and fibrous core features had lower percentages of agreement of 46% and 60%, respectively (Table 2).

DISCUSSION

In this article, we have described the MR imaging appearance of

endometrial polyps and have correlated it with their histopathologic features. Polyps appeared generally with intermediate signal intensity on T1-weighted images and with heterogeneous high signal intensity on T2-weighted images, with the larger ones distending the endometrial cavity. Smaller polyps blended with surrounding endometrium and were not visible. We found that MR imaging can help to distinguish endometrial carcinomas from similar-sized endometrial polyps on the basis of features such as a fibrous core and intratumoral cysts in the polyps, albeit not accurately enough to obviate biopsy. The fibrous core was seen as a variably sized low-signal-intensity core or stripe in the mass on T2-weighted images. Intratumoral cysts were seen as smooth-walled, variable-sized, well-defined cystic structures within the mass. Previous descriptions of endometrial polyps in the literature have been variable but have suggested similar features (10,12,13).

Intratumoral cysts and the fibrous core had a high mean PPV but a low sensitivity for the diagnosis of polyps. The polyps had signal intensity higher than that of carcinomas on T2-weighted images. None of the polyps in our study had an identifiable stalk, per se, because fluid does not usually outline the polyp and therefore the polyp is not recognized as a pedunculated mass. In the polyps that were mistaken for carcinomas, neither intratumoral cysts nor a fibrous core was identified by one or more readers.

Carcinomas usually appeared as relatively homogeneous, intermediate-signal-intensity masses on T2-weighted images, which is similar to previous descriptions (14–16). For the diagnosis of carcinoma, myometrial invasion had the highest mean specificity (97% [64 of 66]) and PPV (92% [22 of 24]) among the evaluated features. Its use, though, was limited to lesions that already had some degree of myometrial extension, since carcinoma may be restricted exclusively to the endometrium. When only the deep myometrial invasion was considered, the mean specificity was slightly higher. Necrosis also had high mean specificity and PPV values, but, once again, its use was somewhat limited because it is a feature of generally larger tumors.

Enhancement patterns were not found to be particularly useful for distinguishing polyps from carcinoma in this study. The heterogeneous pattern due to necrosis was the only one significantly associated with the diagnosis of carcinoma. The lacelike pattern of enhancement was not significantly associated with the diagnosis of polyps. This pattern, though, may be more common in polyps that result from tamoxifen citrate therapy (10).

Our study had some limitations. Since we sought to identify features that may discriminate similar-sized polyps from carcinomas, the figures for sensitivity and specificity in this study are not applicable to patients as a whole. We sought to answer the question: With a thickened endometrium on MR images, can one reliably distinguish between polyps and carcinoma?

Although the small size of this study may not give a precise estimate of the ability of MR images to help distinguish polyps from carcinoma, it seems large enough to indicate that this distinction is less than perfect. However, the presumptive diagnosis of polyps or carcinoma may still be helpful, since it may allow a more appropriate and efficient pattern of referral, particularly in problematic situations such as cervical stenosis. Although we did not find any distinguishing enhancement characteristics of carcinomas and polyps, there is certainly the possibility that more standardized enhancement techniques, possibly dynamic gadolinium enhancement, may reveal useful distinguishing features.

In summary, the results of this study show that endometrial carcinoma and endometrial polyps can be discriminated on MR images with some accuracy on the basis of morphologic features. The findings that correlate with the diagnosis of polyps include a fibrous core, intratumoral cysts, and lack of

myometrial invasion. Morphologic features that indicate carcinoma include myometrial invasion. However, accuracy high enough to obviate biopsy was not obtained. This was partly due to the presence of microscopic carcinomas and the coexistence of polyps and carcinomas in the same patients.

FOOTNOTES

Abbreviations: NPV = negative predictive value PPV = positive predictive value SE = spin echo

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