

# Sensitivity and specificity of Nuclear Magnetic Resonance for the evaluation of myometrial infiltration, cervical stromal invasion and lymph node involvement and their anatomopathological correlation in endometrial cancer

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## Introduction

Endometrial cancer is the most common gynecologic malignancy in North America, and there are approximately 320.000 cases diagnosed annually worldwide. The overall 5-year survival in developed countries is in the order of 80%.<sup>1</sup>

In mainly effects postmenopausal women, between 55 and 70 years old, 25% manifest in premenopausal women and of these 5% in those under 45 year of age. Endometroid-type carcinoma is the most frequent endometrial carcinoma, representing 85% of endometrial epithelial tumor.<sup>2</sup>

The most important risk factors for the development of the disease the postmenopausal state, a body mass index (BMI) of 25 mg/m<sup>2</sup> or more, fat consumption, nulliparity, anovulation and use of estrogens without progestational opposition. However, up to 50% of the patients with endometrial cancer present without these factors. Diagnosis is based on clinical and Anatomopathological findings, in addition to imaging studies (transvaginal ultrasound, MRI, CT).

As for MRI, it allow the evaluation of loco regional extension, detecting cervical involvement and helping to distinguish primary cervical carcinoma from endometrial carcinoma. It is, therefore, the most important imaging method to establish the pre-surgical staging of endometrial cancer.<sup>3,4</sup>

Depth of myometrial invasion, local and regional spread, lymph node metastasis, and metastasis to distance.<sup>5,6</sup>

## Objectives

To evaluate the sensitivity and specificity of Nuclear Magnetic Resonance (MRI) for the detection of myometrial invasion, cervical stromal invasion and lymph node involvement and to correlate it with the results of pathology in patients operated on for endometrial cancer at the Gynecology Service of The German Hospital of Buenos Aires.

## Materials and methods

The hospital's computerized medical records and surgical protocols were retrospectively reviewed to determine the characteristics of the study population, the interventions performed, and patients diagnosed with stage I-IV endometrial carcinoma who underwent surgical at Hospital's Gynecology Department German in the period between January 1, 2010 and December 31, 2020. The results of MRI were reviewed and compared with the pathological results.

The MRI of the abdominal and pelvis performed at the German Hospital with a 3-tesla General Electric Architect resonator, with

gadolinium and with T1 T2 sequences, diffusion technique and fat suppression. Prior to carrying out the antiperistaltic study, fasting for 4 hours, bladder emptying is indicated. With the patient in the supine position. Axial and sagittal slices enhanced in T1 are performed prior to contrast administration, sagittal slices 1 and 2 minutes after contrast administration and axial slices 3 minutes after contrast administration.

The variables analyzed from MRI reports of the abdominal and pelvis were myometrial invasion (grater or less than 50%), suspicion of lymph node involvement, and invasion of the cervical stroma. 181 surgeries for endometrial carcinoma were performed in the service, 10 patients were excluded because they were relapse surgeries. Between the years 2010 and 2014, MRI were not performed, therefore 91 patients were excluded. A total of 54 MRI were analyzed and one patient was excluded due to advanced disease, and it was not possible to collect the analyzed data.

The average age was 62.5 years (ages between 43 and 80 years), Race: 3 Orientals (5.66%) and 51 whites (96.23%). Regarding the stages E1 43 (81.3%), IA 28 (52.83%), IB 15 (28.30%), EII 1 (1.89%), E III 7 (13.21%) and IV 2 (3.77%).

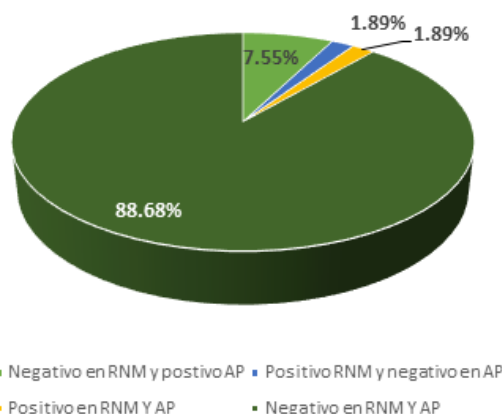
The surgical approach route laparotomy 14 (26.41%) laparoscopy 39 (73.58%).

Regarding the histological type Sarcoma 2 (3.77%) Serous 8 (15.09%) Clear cells 3 (5.66%) endometroid carcinoma Gh1 13 (24.53%) Gh2 20 (37.74%) Gh3 7 (13.21%).

Distribution of stages	
Estage I	IA 28 (52.83%) IB 15 (28.30%)
Estage II	1 (1.89%)
Estage III	7 (13.21%)
Estage IV	2 (3.77%)

Histology tipe	
Endometrioides	GH1 13 (24.53%) GH2 20 (37.74%) GH3 7 (13.21%)
Serouse	8 (15.09%)
Clear cells	3 (5.66%)
Sarcoma	2 (3.77%)

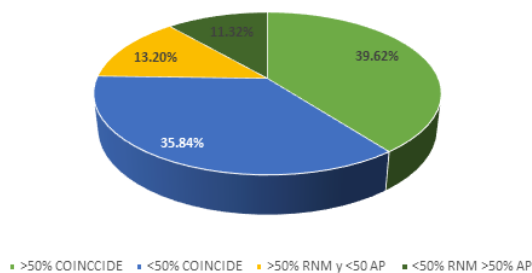


Graph 3 Cervical invasion.

Variables	S	E	PPV	NPV
Myometrial Invasion	77.78%	74.07%	75%	76.92%
Lymph node involvement	33.33%	74.07%	14.29%	95.65%
Cervical invasion	20%	97.92%	50%	92.16%

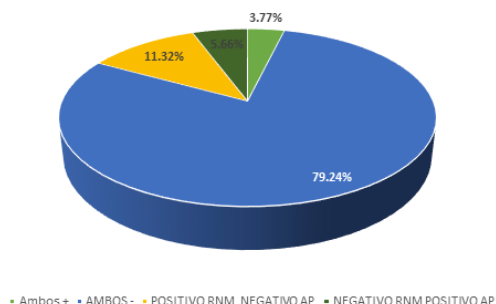
## Results

Of the total of 91 patients between 2014 and 2020, 53 (58.24%) underwent pre-surgical MRI of the abdominal and pelvis. With respect to myometrial invasion, 40 (75.47%) coincide in the report and pathology (in greater and less than 50%) and 13 (24.53%) do not coincide (7 were reported with greater than 50% and 6 reported less than 50%), with sensitivity of 77.78%, specificity of 74.07%, PPV 75.00%, NPV 76.92% (Graph 1).



Graph 1 Myometrial invasion.

Regarding the lymph node study, 44 patients coincided in pathology and MRI (84.91%). Eight patients with positive lymph nodes by MRI were reported, of which 2 (3.77%) were positive in pathology and 6 were negative (11.32%). Sensitivity of 33.33%, Specificity of 88%, PPV 14.29%, NPV 95.65% (Graph 2).



Graph 2 Nodal status.

Regarding cervical invasion, 4 (7.55%) were not evident in MRI, but were positive in anatomy, one (1.89%) was positive in images and negative in pathology, 1 (1.89%) was positive in both methods and 47 (88.68%) coincide in both negative methods. Specificity 97.92%, Sensitivity of 20.00%, NPV 92.16%, PPV 50.00% (Graph 3). Of the total of 53 patients, 33 (62.26%) coincided in all the parameters studied.

## Discussion

In the staging of endometrial cancer, the complementary study of choice is Magnetic Resonance, providing transcendental information such as myometrial invasion, cervical and lymph node involvement, affecting the planning of surgery and correlating it with the stage and prognosis.

MRI is the best method for evaluating primary tumors larger than 10 mm in size, as it can accurately determine tumor size, parametrial invasion, pelvic sidewall invasion, and nodal metastasis, with a correlation of up to 95% for stage IB or higher. It has moderate sensitivity (43%) and specificity (73%) for the detection of metastatic lymph nodes. This is because MIR cannot discriminate between enlarged inflammatory lymph nodes and metastatic nodes and shows an unsatisfactory diagnostic approach in cases of micro metastases.<sup>7</sup>

The basic imaging protocol for gynecologic MIR includes T1-weighted images of the pelvis in the axial plane and T2-weighted images in the axial and sagittal planes. Fat-suppressed T1-Weighted images facilitate differentiation between fat and hemorrhage, which can have high signal intensity on T1-weighted images.<sup>8</sup>

In a recent UK national audit of the accuracy of magnetic resonance imaging for endometrial cancer staging, the reported diagnosis accuracy for depth of myometrial invasion was 82%; for cervical extension, 90%; and for the involvement of pelvic lymph nodes 94.9%.<sup>9</sup>

Another study of 56 patients performed a pre-surgical MRI and compared it with the results of pathology, it was concluded that the study had a sensitivity of 16.66%; specificity, 97.368% PPV 75%, NPV 71.154%. for cervical invasion and for myometrial infiltration sensitivity, 72.72%; specificity 92.68%; PPV 53.33% NPV 92.683%.<sup>4</sup>

A retrospective study conducted in 56 patients with early stage endometrial carcinoma compared the MRI results with the Anatomopathological results regarding myometrial invasion, obtaining a sensitivity of 57.5% and specificity of 71.4%.<sup>10</sup>

In a Canadian trial, 28 patients who underwent preoperative magnetic resonance imaging with a diagnosis of endometrial

carcinoma and cervical carcinoma were evaluated. The precision of the study for the evaluation of myometrial invasion and cervical stroma was 78%.<sup>11</sup>

Antonsen et al, made a comparison between MRI, computed Axial Tomography and PET CT. 318 patients with endometrial cancer were included it was evidenced that MRI.

For myometrial invasion, 87.3% sensitivity, 57.3% specificity, PPV 44%, NPV 92.2% were found to predict cervical invasion, s 33,3% E 94.55, PPV 60% and NPV 85.1%. And for lymph node metastasis s 58.85, E 92.85, PPV 405, VPN 96.5%.<sup>12-14</sup>

Another clinical trial carried out on 44 patients with diagnosis of cervical carcinoma and endometrial carcinoma, MRI was performed before and after the administration of ferumoxtran-10, an ultra small particle iron oxide compound (USPIO) for the detection of lymphatic metastases, it was observed that the NMR S 29%, E 99%, PPV 56% and NVP 96%.<sup>15</sup>

When we compare our experience with published works see results similar sensitivand specificity in the evaluation of myometrial infiltration In Regarding lymph node involvement, disparate results have been published, while for evaluation of cervical infiltration we found in our experience lower sensitivity and specificity than published.<sup>16-19</sup>

## Conclusion

Currently, magnetic resonance imaging is the study of choice for evaluation. Presurgical treatment of endometrial cancer having a level of evidence 1 A, since it allows us evaluate the patient with respect to myometrial invasion, cervical stromal invasion, and lymph node metastasis. In our study, the results were compared taking into account three parameters. The first was myometrial invasion, obtaining a sensitivity of 77.78%, specificity of 74.07%, regarding the involvement of the cervical stroma, a specificity 97.92% and Sensitivity of 20.00%, in terms of lymph node involvement a Sensitivity of 33.33%, Specificity of 88%. We can conclude that according to the data analyzed that the MRI was adequate to evaluate myometrial invasion, but when evaluate the invasion of the cervical stroma and lymph node evaluation, the method turned out to be insufficient.

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## Conflicts of interest

The authors report no conflicts of interest.

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