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Diffusion-weighted MR imaging's Place in Preoperative Endometrial Cancer Assessment

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Key Words:

MR imaging's, Cancer, Diffusion-weighted, Preoperative Endometrial

Abstract:

The aim of the study is to investigate the Diffusion-weighted MR imaging's Place in Preoperative Endometrial Cancer Assessment. Selected patients were first explained about Magnetic Resonance procedure. Detailed clinical history was taken. Previous medical records and informed written consent was obtained. Then patients were screened for metallic objects and positioned. Our study confirms that MRI is a potent tool for the preoperative evaluation of endometrial cancer, notably for the measurement of the depth of myometrial invasion, one of the most significant predictive markers associated to endometrial cancer.

1. Introduction

Increasingly, doctors are turning to diffusion-weighted magnetic resonance imaging (DW-MRI) before operating on patients suspected of having endometrial cancer. This method relies on tracking the movement of water molecules within tissues to provide details about their cellular composition and substructure [1].

DW-MRI may be helpful in determining the histologic grade and aggressiveness of endometrial cancer, as well as its location and extent. Here are some specific applications of DW-MRI [2]:

- DW-MRI is useful for assessing tumour volume and invasion because it provides precise measurements of tumour size and extension and reveals sites of infiltration beyond the endometrium.
- DW-MRI may assist tell the difference between benign and malignant endometrial lesions, an important step in determining the best course of therapy.
- The apparent diffusion coefficient (ADC) values obtained from DW-MRI may be used to infer the aggressiveness of the tumour, with lower ADC values indicating more aggressive tumours.
- Response to treatment may be tracked by DW-MRI, with changes in ADC values reflecting improvement as a result of treatment [3].

DW-MRI is an effective tool for assessing endometrial cancer before surgery, yielding useful data for subsequent treatment planning and follow-up. It is helpful in the treatment of endometrial cancer because of the insight it provides about tumour aggressiveness and therapeutic response [4].

Review of Literature

In industrialised nations, endometrial cancer is by and away the most frequent gynecologic cancer. Histologic subtype and grade; tumour stage at diagnosis (including depth of myometrial invasion); and the existence of lymph node metastases [4] all have a role in determining the prognosis of endometrial cancer. Preoperative assessment of the tumour extent is important in planning the surgical procedure and deciding whether to perform lymph node sampling, even though most patients with endometrial cancer present with abnormal genital bleeding and the initial diagnosis is usually established by endometrial biopsy. Myometrial invasion and cervical involvement in endometrial cancer are two examples of local spread that MRI is particularly good at detecting [5]. T2-weighted imaging often reveals a thicker endometrium in cases

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of endometrial cancer. The signal strength of endometrial cancer may fluctuate from high to low, making it difficult to differentiate from normal endometrium or neighbouring myometrium [6]. This makes it difficult for conventional MRI to clearly illustrate the tumor's focus.

Recently, diffusion-weighted (DW) MRI has become the standard method for displaying tissue properties by exploiting the diffusion of water molecules [7]. Initially validated in the CNS, DW imaging has now been widely recognised as the most sensitive approach for detecting acute cerebral ischemia. Recent applications of DW imaging to the abdominal organs have been shown to clearly highlight malignant tumours [8-10]. The tissue's apparent diffusion coefficient (ADC), which is thought to be affected by nuclear-to-cytoplasm ratio (NCR) and cellular density, may be obtained by DW imaging as well. It has been found that the ADC value correlates with the histologic grade of malignant tumours, with high-grade tumours showing lower ADC values. Endometrioid adenocarcinoma [11] is the most common histologic subtype of endometrial cancer and is further categorised into three grades (grades 1, 2, and 3) based on architectural elements seen during histological examination. An significant prognostic indicator, its histologic grade corresponds closely with the probability of lymph node metastases and patient survival [12-15]. Other markers include the level of myometrial invasion.

2. Methodology

Study population:

Patients with histologically proven instances of endometrial cancer, of any subtype, are sent to our division for an MRI study, and the results corroborate the diagnosis. Gynaecologists are the ones who send their patients to us. Patients will be included in the trial whether they are pre- or post-menopausal.

DWI Parameters:

Before the contrast was given, an axial plane diffusion weighted MRI was obtained. Single-shot echo-planar imaging (1000/74 ms TR/TE effective range; 4 mm slice thickness; 36–42 cm FOV; 384 x 256 matrix). The b-value of one thousand s/mm2 was applied in the X, Y, and Z planes. The ADC values acquired from conventional MRI and DWI scans were analysed.

Sampling Technique

Cases of endometrial cancer confirmed by high-performance liquid chromatography were intentionally sampled.

Calculation of ADC value:

Grayscale ADC map was shown. In accordance with the ADC map, the region of interest (ROI) was positioned in regions with genuine diffusion limitation and no signs of haemorrhage or necrosis. The two ROIs were 20mm2 +/- 10mm2. The ADC was then calculated mechanically by the program's default settings. The average of these values was used to get the Mean ADC value. The results from the conventional MRI were then correlated with those from the DWI and the ADC measurements.

Statistical analysis

IBM SPSS Statistics for Windows, Version 23.0 was used to examine the obtained data. Armonk, New York: IBM Corp. Categorical variables were described using frequency analysis and percentage analysis, whereas continuous variables were described using mean and standard deviation. The Chi-Square test was employed to determine statistical significance in the categorical data. The Receiver Operating Characteristics (ROC) curve, together with Severity, Specificity, PPV, NPV, and Accuracy, was used to determine the MRI's ability to predict the HPE result. The probability value of.05 is deemed to be significant in both of the aforementioned statistical methods.

3. Result:

The percentage of the population above the age of 70 is shown in the Figure below.

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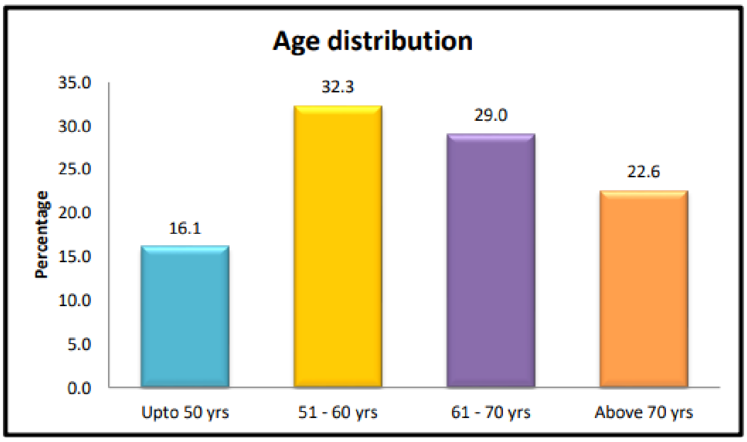

Figure 1: Age distribution

Menopausal distribution is seen in the following figure, where 80.6% are postmenopausal and 19.4% are premenopausal.

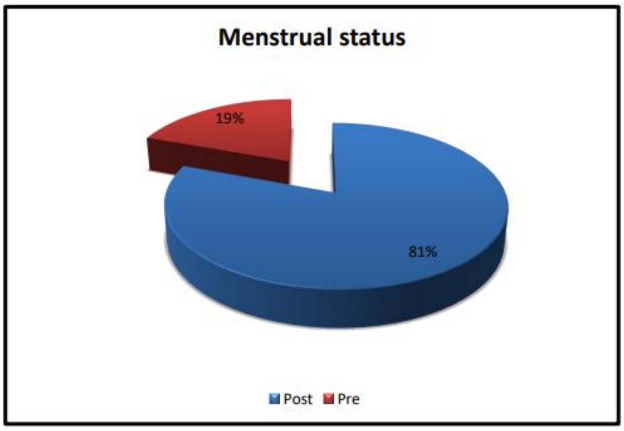

Figure 2: Menstrual status distribution

The distribution of presenting complaints is shown in the figure below, with HMB at 6.5%, LAP at 6.5%, PMB at 64.5%, and WDPV at 22.6%.

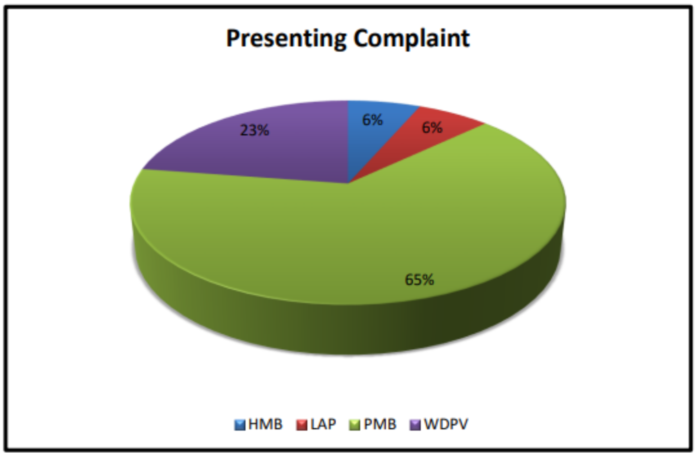

Figure 3: Complaint distribution

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The results of a Pearson's Chi-Square test comparing MRI T2WI and HPE Stage are shown in the figure below: $X2=28.666$, $p=0.001$.

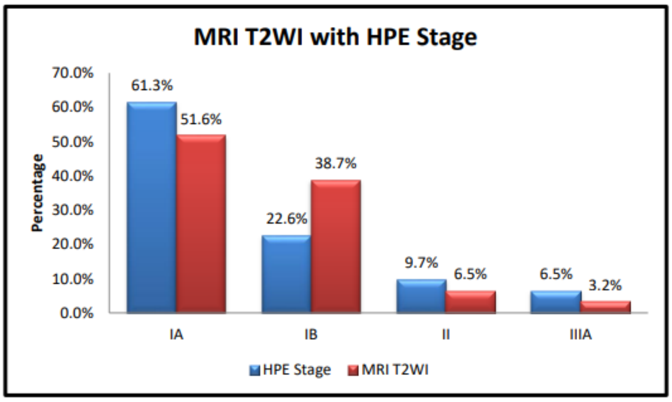

Figure 4: MRI T2WI Comparison with HPE Stage

The results of a Pearson's Chi-Square test comparing MRI T2WI + DWI with HPE Stage are shown in the figure below: $X2=66.696$, $p=0.0005$.

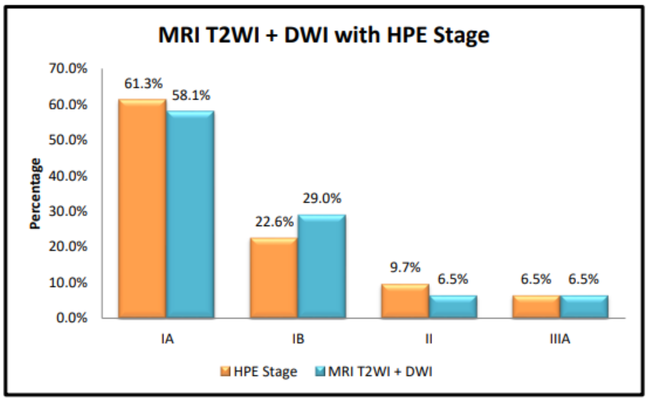

Figure 5: MRI T2WI + DWI Comparison with HPE Stage

As may be seen in the figure below, when comparing MRI T2WI+DCE to HPE Stage using Pearson's Chi-Square test, the significance levels were $X2=78.186$, $p=0.0005$.

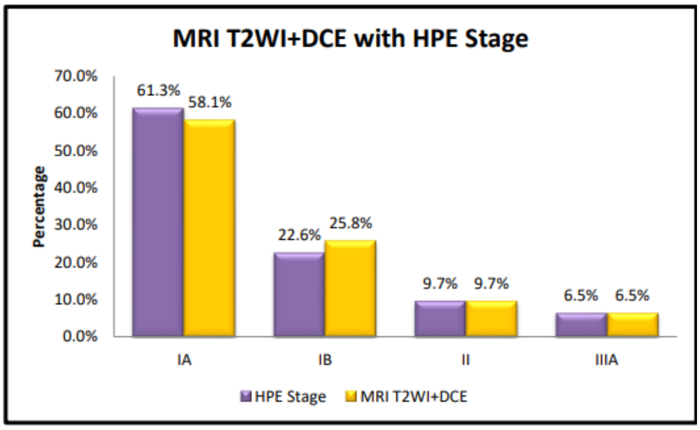

Figure 6: MRI T2WI+DCE Comparison with HPE Stage

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The below figure shows the comparison of MRI T2WI < 50%, MRI T2WI + DWI < 50%, MRI T2WI+DCE < 50% with HPE < 50% using Receiver Operating Characteristic curve (RoC), were MRI T2WI < 50% with HPE < 50% shows the area of the curve is 0.613, p- value= 0.289>0.05 with 95% C.I 0.409 to 0.817, which is no statistical significance with the Sensitivity is 61.1%, Specificity 61.5%, PPV 68.8%, NPV 53.3% and accuracy is 61.3% whereas in MRI T2WI + DWI < 50% with HPE < 50% shows the area of the curve is 0.868, p- value= 0.001< 50% with HPE < 50% shows the area of the curve is 0.868, p-value= 0.001.

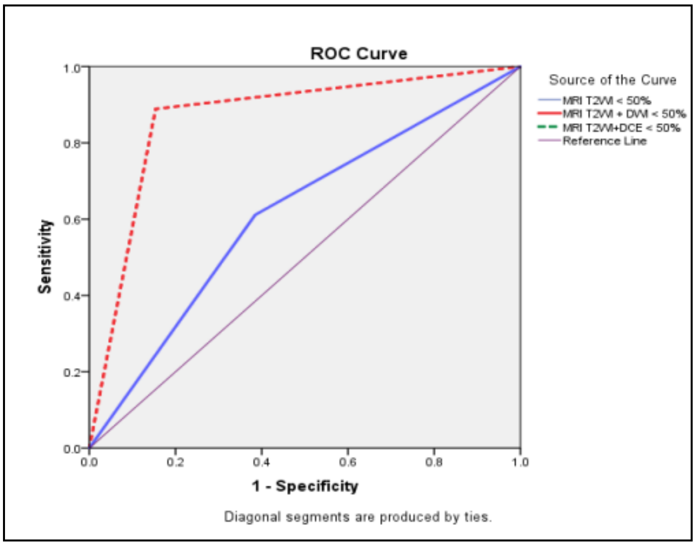

Figure 7: MRI T2WI < 50%, MRI T2WI + DWI < 50%, MRI T2WI+DCE < 50% with HPE < 50% Comparison

The below figure shows the comparison of MRI T2WI >=50%, MRI T2WI + DWI >=50%, MRI T2WI+DCE >=50% with HPE >=50% using Receiver Operating Characteristic curve (RoC), were MRI T2WI >=50% with HPE >=50% shows the area of the curve is 0.649, p- value= 0.168>0.05 with 95% C.I 0.447 to 0.851, which is no statistical significance with the Sensitivity is 66.7%,Specificity 63.2%, PPV 53.3%, NPV 75.0% and accuracy is 64.5%. whereas in MRI T2WI + DWI >=50% with HPE >=50% shows the area of the curve is 0.906, p- value= 0.0002=50% with HPE >=50% shows the area of the curve is 0.906, p-value=0.0002< 0.01 with 95% C.I 0.724 to 1.000, which is highly statistical significance with the Sensitivity is 91.7%, Specificity 89.5%, PPV 84.6%, NPV 94.4% and accuracy is 90.3%.

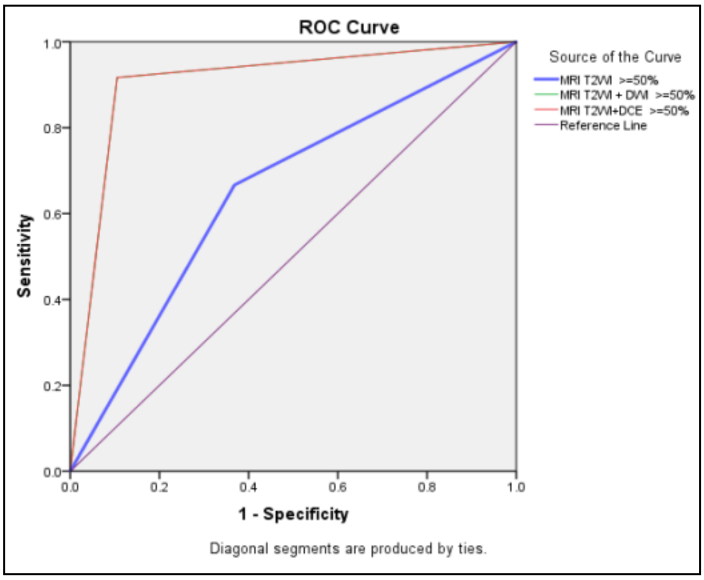

Figure 8: of MRI T2WI < 50%, MRI T2WI + DWI < 50%, MRI T2WI+DCE < 50% with HPE >=50% Comparison

4. Conclusion:

Based on our research, DWI+T2WI is preferred to DCE-MRI+T2WI for assessing the depth of myometrial invasion since it has a diagnostic accuracy of 95% compared to DCE-86%. Small tumours contained within the endometrial cavity can be detected using DCE-MRI because they show an enhancement at 30 s and because most tumours are hypovascular compared to normal myometrium.

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