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ROLE OF MRI IN EVALUATION OF CERVICAL CANCER AND IT'S CLINICAL & HISTOPATHOLOGICAL CORRELATION

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ABSTRACT

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Background: Cervical cancer is one of the leading causes of mortality and morbidity in women. Clinical FIGO staging has been used traditionally but due to its ineffectiveness regarding tumor extent, stromal invasion, distant organ invasion and overstaging of tumors, it is not considered the gold standard for staging of tumor. Use of MRI is now being encouraged for the pre-treatment evaluation of carcinoma cervix. Histopathology remains the most commonly utilized diagnostic tool of cervical cancers. This study was planned with the aim to compare the diagnostic performance of MR Imaging, using histology as the gold standard, with regard to the presence, size and extent of invasive cervical cancers and the detection of metastatic lymph nodes and prognosticates disease outcome and treatment modality and thus reduce the morbidity and mortality associated with the disease. **Materials and methods:** This study was conducted in the department of Radio diagnosis, Dr. Balasaheb Vikhe Patil Rural Medical College and Dr. Vitthalrao Vikhe Patil Pravara Rural Hospital, Loni BK, 413736 during the period of June 2021 to June 2022. It was a retrospective study, 30 cases of clinically suspected or diagnosed as carcinoma cervix by biopsy and Pap smear, referred to the department of Radio diagnosis. Imaging was done with 3 Tesla Philips Igesia.

Results: Among the study population, the mean age observed was 55.62 ± 15.0 years, with BMI 20.65 ± 3.29 kg/m² and majority belonged to lower socio-economic status. The common risk factors associated with Carcinoma Cervix was multiparity (74%) and the most common presenting complaint was foul smelling vaginal discharge observed in 58% cases. 5 cases out of 30 that were diagnosed as IA on clinical examination and on MRi they were staged as IB, IIA and IIB on MRI. Rest of the cases were staged as shown in the table and the results

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were Statistically significant. (p value<0.007304)

Conclusion: Carcinoma cervix is primarily staged clinically as per FIGO guidelines but MRI can modify treatment options and may provide clinically important prognostic information not available from current FIGO staging. MRI also has the potential to be used as diagnostic tool for cervical cancer as it correlates strongly with histopathology

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INTRODUCTION

Cervical cancer is one of the leading causes of mortality and morbidity in women. In 2018 worldwide, with an estimated 5, 70,000 cases and 3, 11,000 deaths, cervical cancer ranks as the fourth most frequently diagnosed cancer and the fourth leading cause of cancer death in women.¹ Approximately, 85% of the global burden of diseased cases and 88% of total cervical carcinoma deaths occur in developing countries.² Pre-treatment staging of tumor is vital in effective implementation of appropriate management therapies and prognosticate disease outcome. Clinical FIGO staging has been used traditionally but due to its ineffectiveness regarding tumor extent, stromal invasion, distant organ invasion and overstaging of tumors, it is not considered the gold standard for staging of tumor.³ MRI, with its excellent soft tissue contrast, can delineate the tumor extent, size and organ invasions. Use of MRI is now being encouraged for the pre-treatment evaluation of carcinoma cervix.³ Histopathology remains the most commonly utilized diagnostic tool of cervical cancers.³ It determines the patterns of microscopic organization of cells in tissue sections from a biopsy or surgical specimens. This study was planned with the aim to compare the diagnostic performance of MR Imaging, using histology as the gold standard, with regard to the presence, size and extent of invasive cervical cancers and the detection of metastatic lymph nodes and prognosticates disease outcome and treatment modality and thus reduce the morbidity and mortality associated with the disease. The cervix is

mainly composed of dense fibrous stroma, resulting in a typically cylindrical or ring-like pattern of low signal intensity on T2-weighted MRI sequences. Peripheral to the central canal is the endocervical mucosa which is hyperintense on T2 Weighted Images which is further surrounded by hypointense layer of outer fibrous stroma around 3-8 mm thick. Preservation of this hypointense ring has a high negative predictive value for parametrical invasion. The outermost layer is composed of loose fibrous stroma which shows intermediate signal intensity on T2 weighted images.

AIM & OBJECTIVE

To study the role of MRI in evaluation of cervical cancer and its clinical & histopathological correlation

METHODS AND MATERIALS

The study was conducted in Department of Radiodiagnosis, Dr. VitthalraoVikhe Patil Pravara Rural Hospital, Loni BK from June 2021 to June 2022. It was a retrospective study, 30 cases of clinically suspected or diagnosed as carcinoma cervix by biopsy and Pap smear, referred to the department of Radiodiagnosis. Imaging was done with 3 Tesla Philips Ignesia. Appropriate sequences were taken which included Axial T1W spin-echo images using 256 x 256 matrix, 32 cm field of view (FOV), 4 mm slice thickness, 1 mm interslice gap and number of acquisitions, 2; were taken from kidney to perineum.

High resolution T2 W fast spin echo images of pelvis were acquired in axial, sagittal, and coronal planes using 512 x 256matrix, 24 cm FOV, 4 mm slice thickness, 1 mm interslice gap and 2 acquisition. Post-

contrast Gadolinium T1W images were obtained in axial, coronal, and sagittal planes.

INCLUSION CRITERIA:

- Clinically suspected cases of Carcinoma Cervix referred for MRI
- Diagnosed cases as carcinoma cervix by biopsy referred for MRI
- Diagnosed cases as carcinoma cervix by Pap smear referred for MRI
- Patients ready to give written informed consent

EXCLUSION CRITERIA:

- Patients having MRI incompatible prosthetic heart valves, cochlear implants or any metallic implants.

- Claustrophobic patients.
- Patients who cannot lie supine.
- Uncooperative patients.

OBSERVATIONS

- Among the study population, the mean age observed was 55.62 ± 15.0 years, with BMI 20.65 ± 3.29 kg/m² and majority belonged to lower socio-economic status.
- The common risk factors associated with Carcinoma Cervix was multiparity (74%) and the most common presenting complaint was foul smelling vaginal discharge observed in 58% cases.

Table no. 1: Comparison of Site of Lesion based on clinical and MRI findings

Site of Lesion	Clinical	MRI
Anterior	13 (43.3%)	5 (16.7%)
Posterior	7 (23.3%)	7 (23.3%)
Both	10 (33.3%)	14 (46.7%)
Nil	0	4 (13.3%)
Total	30 (100%)	30 (100%)

Table no. 1 shows clinically 43.3% patients had anterior lesions whereas on MRI the most common lesions were on posterior side 46.7%

Table no2: Comparison of Morphology of Lesion based on clinical and MRI findings

Morphology of Lesion	Clinical	MRI
Exophytic	17 (56.7%)	5 (16.7%)
Endophytic	7 (23.3%)	9 (30%)
Endo-exophytic	6 (20%)	11 (36.7%)
Nil	0	4 (13.3%)
Total	30 (100%)	30

Table no2 shows most common morphology clinically recorded was exophytic 56.7% but on MRI it was endo exophytic 36.7% and endophytic 30%

Table no.3: Comparison of Size of Lesion based on clinical and MRI findings

Size of Lesion	Clinical	MRI
<4 cm	18 (60%)	9 (30%)
>4 cm	12 (40%)	21 (70%)
Total	30 (100%)	30

Table no. 3 shows Clinically 60% lesions were <4 cm whereas on MRI 70% of lesions were >4 cm

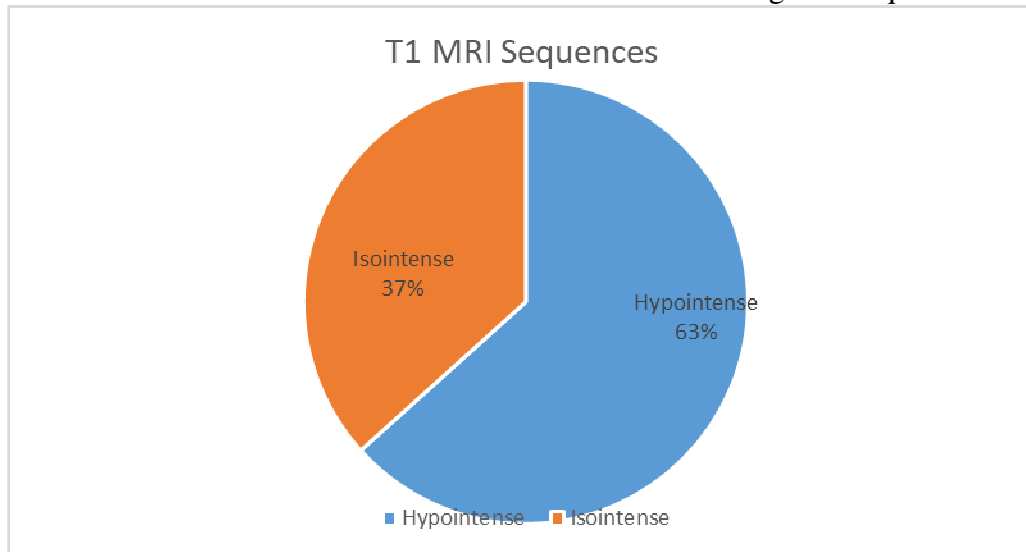
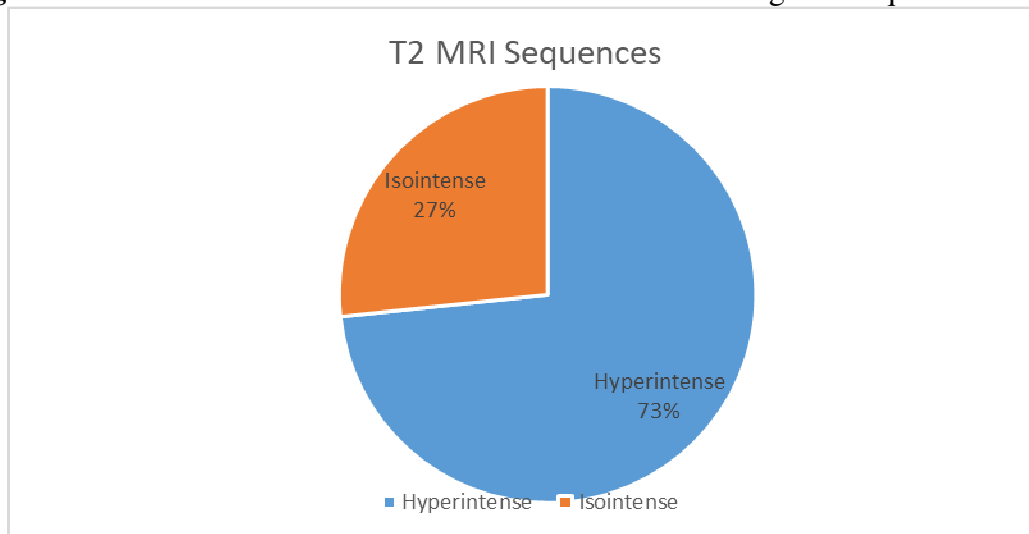
Figure no.1a : Characteristics of Carcinoma Cervix on T1 Weighted Sequences of MRI**Figure no.1b:** Characteristics of Carcinoma Cervix on T2 Weighted Sequences of MRI

Fig. 1A Characteristics of Carcinoma Cervix on T1 Weighted Sequences of MRI revealed 63% Hypointense lesions where as T2 Weighted Sequences of MRI revealed 73% Hyperintense lesions

Table no.4: Post Contrast Enhancement of Carcinoma Cervix

Pattern of enhancement	Frequency	Percentage (%)
Homogenous	21	70
Heterogenous	6	20
Peripheral	2	6.67
Poor enhancement	1	3.33
Total	30	100%

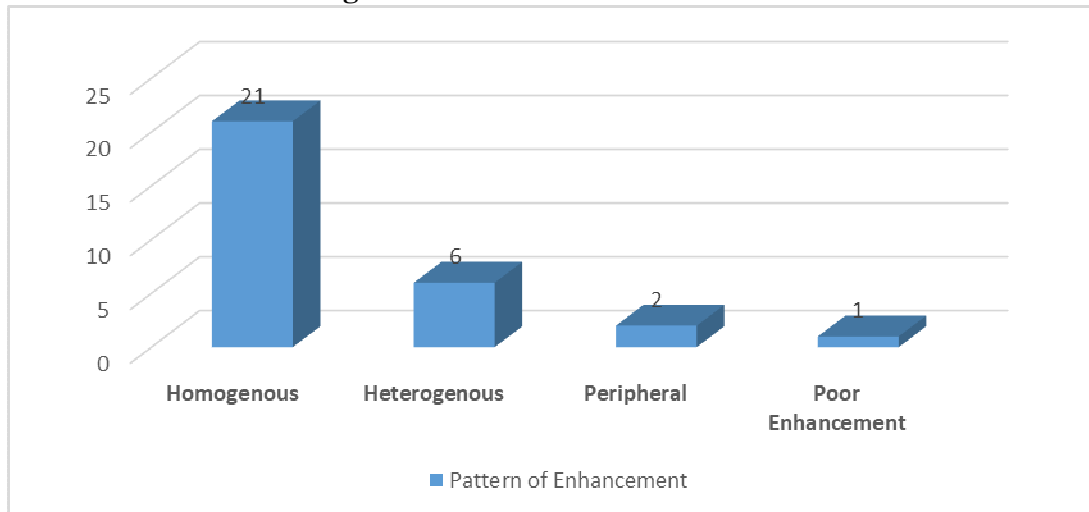
Figure no.2: Pattern of enhancement

Table 4 and fig 2 reveals 70% Homogenous pattern enhancement (21 patients)

Table no.5: Distribution of Patients Based on Extent of Soft tissue and Organ involvement in Carcinoma Cervix

Extent of Involvement	Clinical	MRI
Limited to Cervix	5 (16.7%)	1 (3.3%)
Extends up to Uterus	4 (13.3%)	6 (20%)
Upper 2/3 rd of Vagina	7 (23.3%)	4 (13.3%)
Lower 1/3 rd of Vagina	3 (10%)	2 (6.7%)
Parametrial invasion	8 (26.7%)	7 (23.3%)
Pelvic side wall	2 (6.7%)	3 (10%)
Hydronephrosis	0	1 (3.3%)
Bladder & Rectum involvement	1 (3.3%)	4 (13.3%)
Pelvic & Para-aortic lymph nodes	0	1 (3.3%)
Distant Metastasis	0	1 (3.3%)
Total	30 (100%)	30 (100%)

Table no.5: Distribution of Patients Based on Extent of Soft tissue and Organ involvement in Carcinoma Cervix revealed parametrial invasion in 26.7% patient was reported in the clinical findings whereas 23.3% in MRI findings

Table no.6: Comparison of Staging of Carcinoma Cervix based on Clinical FIGO Staging and MRI Staging

Clinical Staging	MRI Staging									Total
	IA	IB	IIA	IIB	IIIA	IIIB	IIIC	IVA	IVB	
IA	1	2	1	1	0	0	0	0	0	5
IB	0	4	0	0	0	0	0	0	0	4
IIA	0	0	3	0	0	0	0	3	1	7
IIB	0	0	0	6	0	1	1	0	0	8

IIIA	0	0	0	0	2	1	0	0	0	3
IIIB	0	0	0	0	0	2	0	0	0	2
IIIC	0	0	0	0	0	0	0	0	0	0
IVA	0	0	0	0	0	0	0	1	0	1
IVB	0	0	0	0	0	0	0	0	0	0
Total	1	6	4	7	2	4	1	4	1	30

5 cases out of 30 that were diagnosed as IA on clinical examination were staged as IB, IIA and IIB on MRI. Rest of the cases were staged as shown in the table and the results were statistically significant. (p value - 0.007304)

Table no.7: Diagnostic accuracy of MRI as compared to Histopathology among the study population

Findings	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Lesion limited to cervix	40%	33.33%	50%	57.14%
Involvement of the upper 2/3rd of the vagina	100%	71.43%	55.56%	100%

Table no7: The sensitivity MRI was 40%, specificity 33.33%, positive predicative value was 50% and negative predictive value up to 57.14% for the lesions limited to cervix, whereas for the lesions involving upper 2/3rd of the vagina showed highest sensitivity 100%, and specificity 71.43%, lower positive predicative value was 55.56% and negative predictive value up to 10

DISCUSSION

In our study clinically 43.3% patients had anterior lesions whereas on MRI the most common lesions were on posterior side 46.7% whereas most common morphology clinically recorded was exophytic 56.7% but on MRI it was endo exophytic 36.7% and endophytic 30%. (Table 1 and 2). Comparison of Size of Lesion based on clinical and MRI findings Clinically 60% lesions were <4 cm whereas on MRI 70% of lesions were >4 cm . (Table no.3). Thus the clinical estimation of the size, site and type of lesions were not comparable between clinical and MRI findings . This proves the utility of MRi more than the clinical findings . Characteristics of Carcinoma Cervix on T1 Weighted Sequences of MRI revealed 63%

Hypointense lesions where as T2 Weighted Sequences of MRI revealed 73% Hyperintense lesions (Fig1 a &1 B). 70% Homogenous pattern enhancement (21 patients). Was recorded in our study. Table 4 and fig 2).

The Distribution of Patients Based on Extent of Soft tissue and Organ involvement in Carcinoma Cervix revealed parametrial invasion in 26.7% patient was reported in the clinical findings whereas 23.3% in MRI findings only these finding could be correlated clinically and on MRI (Table no.5). 5 cases out of 30 that were diagnosed as IA on clinical examination were staged as IB, IIA and IIB on MRI. Rest of the cases were staged as shown in the table and the results were statistically significant. (p value - 0.007304) (Table 6). The sensitivity MRI was 40%, specificity 33.33%, positive predicative value was 50% and negative predictive value up to 57.14% for the lesions limited to cervix, whereas for the lesions involving upper 2/3rd of the vagina showed highest sensitivity 100%, and specificity 71.43%, lower positive predicative value was 55.56% and negative predictive value up to 10 (table no.7)

Shweel MA et al., MRI was found to be highly sensitive (100%) and specific (100%) in determining tumor extension to the stroma, urinary bladder, and rectum.⁴**Morimura Y et al.**, in their study also observed that MRI showed very high specificity (99.2%) and high sensitivity (88.5%) in detecting cervical stromal invasion.⁵**Yogaraj et al.**, in his study observed a sensitivity of 47.83% and 52% specificity in predicting mass lesion of the cervix, while involvement of the upper 2/3rd of vagina had sensitivity, specificity, positive predictive value, negative predictive value and the total diagnostic accuracy of 100% in predicting HPE. When compared, MRI (pelvic lymph nodes) had a sensitivity of 50% in predicting HPE, specificity was 92.50%, and the total diagnostic accuracy was 90.48%.³**Kumari et al.**, stated that an important pitfall of MRI staging is over estimation of parametrial invasion on T2 weighted images in large tumors with accuracy of 70% compared with small ones accuracy of 96% due to stromal edema caused by tumor compression or inflammation as this might lead to higher rate of false positive assessment of parametrial invasion in patients with large tumors, which must be considered when making the treatment decisions in patients.⁶**Giuliano R et al**, concluded that MRI use is encouraged for cervical cancer staging. There is good correlation between histological and MRI tumor bulk. MRI has been proposed as a substitute for invasive cystoscopy and proctoscopy in initial screening of cervical cancer.⁷

Limitations: The present study was only a retrospective record-based study with small sample size, only including the subjects falling under our sampling frame. So large randomized control trials are needed before establishing its diagnostic accuracy.

CONCLUSION

Carcinoma cervix is primarily staged clinically as per FIGO guidelines but MRI can modify treatment options and may provide clinically important prognostic information not

available from current FIGO staging. MRI also has the potential to be used as diagnostic tool for cervical cancer as it correlates strongly with histopathology for the lesions involving upper 2/3rd of the vagina showed highest sensitivity 100%, and specificity 71.43%, lower positive predictive value was 55.56% and negative predictive value up to 100%

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