ORIGINAL RESEARCH PAPER

Radio-Diagnosis

MRI CORRELATION WITH CLINICAL STAGING AND HISTOPATHOLOGY FINDINGS IN CERVICAL CANCER

Dr. Satyarth Singh	Junior Resident, Department of Radiodiagnosis, SRMS Institute of Medical Sciences, Bareilly (UP), India.
Dr. Sameer R. Verma*	Professor & Head, Department of Radiodiagnosis, SRMS Institute of Medical Sciences, Bareilly (UP), India. *Corresponding Author
Dr. Vibhu Gupta	Junior Resident, Department of Radiodiagnosis, SRMS Institute of Medical Sciences, Bareilly (UP), India.

ABSTRACT

AIM AND OBJECTIVES: To correlate MRI findings with clinical findings based on FIGO staging and to evaluate the role of MRI in assessing extension of uterine cervical malignancy in reference to post surgery/staging laparoscopy histopathologic examination where ever available. **MATERIAL AND METHODS:** This retrospective observational study included 35 patients of histopathologically confirmed carcinoma cervix attending the SRMS Institute of Medical Sciences, Bareilly, UP, who underwent clinical staging and preoperative MRI for evaluation of disease extension between November 2019 to February 2022. **RESULTS:** the mean age observed was 57.43 ±11.03 years. There is strong percentage agreement between clinical and MRI findings for parametrial invasion, vaginal invasion, hydronephrosis, adjacent pelvic organ involvement and distant metastases with fair to moderate agreement with kappa coefficient except for pelvic side wall involvement in which there was only slight agreement. MRI shows high sensitivity, specificity, PPV and NPV of MRI in diagnosing disease extension in comparison to the histopathology findings. **CONCLUSION:** Carcinoma cervix is primarily staged clinically as per FIGO guidelines but MRI can modify clinical staging and treatment options. MRI is a reliable diagnostic tool for cervical cancer as it correlates strongly with histopathology.

INTRODUCTION–

Cervical cancer is one of the leading causes of mortality and morbidity in women.[1] Although the introduction of cervical cancer screening programs, HPV vaccination and improved treatment strategies have caused a reduction in mortality rates in industrialized nations, there has been insignificant difference in developing countries, where maximum cases are usually detected at an advanced stage.[1]

Approximately, 85% of the global burden of disease and 88% of total cervical carcinoma deaths occur in developing countries.[2] India alone contributes to 25.4% and 26.5% of the global burden of cervical cancer cases and mortality, respectively.[2]

Pre-treatment staging of tumor is vital in effective implementation of appropriate management therapies and prognosticate disease outcome.[3] Clinical FIGO staging has been used traditionally but has low accuracy regarding tumor extent, stromal invasion, distant organ invasion and staging of tumors. MRI, with its excellent soft tissue contrast, can delineate the tumor extent, size and organ invasions. Hence, due to deficiencies of clinical staging, and superior soft-tissue resolution and multiplanar capability, MR imaging provides a "one-stop" assessment of local disease extension and is being increasingly used in the pre- treatment work-up of cervical cancer in Indian subcontinent.[4]

This study was done to correlate MRI findings with clinical findings based on FIGO staging and to evaluate the role of MRI in assessing extension of uterine cervical malignancy in reference to post surgery/staging laparoscopy histopathologic examination where ever available.

MATERIAL & METHODS –

This retrospective observational study included 35 patients of histopathologically confirmed carcinoma cervix attending the SRMS Institute of Medical Sciences, Bareilly, UP, who underwent clinical staging, preoperative MRI for evaluation of disease extension between November 2019 to February 2022. This study was approved by the institutional Ethics Committee. Patients without preoperative MRI or those with previous treatment history for cervical cancer were excluded from the study.

The clinical FIGO staging information of the cervical cancer patients were retrospectively retrieved from the medical records. Patient demographics such as age at diagnosis of cervical cancer, underlying diseases, and socio-economic status were recorded. The tumor size, vaginal wall invasion, parametrial invasion, pelvic sidewall invasion, hydronephrosis or nonfunctioning kidney, adjacent organ involvement (bladder or rectum invasion), and distant organ metastasis were recorded for each patient.

Retrospective data collection of the cervical cancer patients with pre treatment MRI was done The MRI examination records were analyzed for tumor size, vaginal wall invasion, parametrial invasion, pelvic sidewall invasion, hydronephrosis/hydroureter, adjacent organ involvement (bladder or rectum invasion), and distant organ metastasis blinded to the clinical findings.

All the collected data was entered into MS excel spreadsheets and analyzed with the help of software IBM SPSS version 20.0. Percentage agreement and Cohen kappa coefficient was calculated for agreement between clinical and MRI findings. Calculation of sensitivity, specificity, PPV and NPV of MRI finding for disease extension was done using post operative/ staging laparoscopy histopathological findings as reference standard.

Observations-

Among the study population, the mean age observed was 57.43 ±11.03 years, with BMI 21.75 ± 4.26 kg/m^2 and majority belonged to lower socio-economic status (69%).

The most common risk factors associated with carcinoma cervix was multiparity (79% cases) and the most common presenting complaint was foul smelling vaginal discharge observed in 62% cases followed by postmenopausal bleeding in 39% study population. Squamous cell carcinoma was the most common type of malignancy (33 cases, 94%) with poorly differentiated carcinoma in two cases (6%)

Table 1: Distribution of Patients Based on Extent of Soft tissue and Organ involvement in Carcinoma Cervix

Extent of Involvement	Clinical	MRI

Vaginal invasion		
No	2 (5.7%)	1
Upper 2/3rd of Vagina	27 (77%)	19 (54.2%)
Lower 1/3rd of Vagina	6 (17.1%)	16 (45.7%)
Parametrial invasion		
No	2 (5.7%)	1 (2.8%)
Yes	33 (94.3%)	34 (97.1%)
Pelvic side wall		
No	5 (14.3%)	13 (37.1%)
Yes	30 (85.7%)	22 (62.8%)
Hydronephrosis		
No	34 (97.1%)	29 (82.8%)
Yes	1 (2.8%)	6 (17.1%)
Adjacent pelvic organ involvement		
No	33 (94.3%)	27 (77.1%)
Yes	2 (5.7%)	8 (22.8%)
Distant Metastasis		
No	35 (100%)	32 (91.4%)
Yes	0	3 (8.5%)
Total	35 (100%)	35 (100%)

In 11(31.4%) cases disease was upstaged on MRI in relation to clinical staging with reference to extent of vaginal involvement, adjacent pelvic organ invasion, hydronephrosis and distant metastases and down staged disease in 5 (14.2%) cases with respect to pelvic side wall invasion (Table 1)

Table 2: Comparison of Clinical Staging of Carcinoma Cervix with MRI Staging (n=35)

Extent of Involvement	Agreement (%)	Cohen k
Vaginal invasion	92.3%	0.360 Fair agreement
Parametrial invasion	91.89%	0.356 Fair agreement
Pelvic side wall	60%	0.09 Slight agreement
Hydronephrosis/ non-functioning kidney	83.33%	0.2815 Fair agreement
Adjacent pelvic organ involvement	78.38%	0.2211 Fair agreement
Distant Metastasis	89.18%	0.4401 Moderate agreement

There was strong correlation between clinical and MRI findings based on percentage agreement (Table 2). According to kappa coefficient, clinical and MRI evaluation for parametrial invasion, vaginal invasion, hydronephrosis, adjacent pelvic organ involvement and distant metastases showed fair to moderate agreement except for pelvic side wall involvement in which there was only slight agreement.. A total of twelve cases underwent surgery with radical hysterectomy and six cases underwent laparoscopic staging with pelvic lymph node sampling. Comparison between MRI and pathological staging of cervical carcinoma is shown in Table 3.

Table 3: Diagnostic accuracy of MRI as compared to histopathology among the study population.

Findings	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Involvement of the upper 2/3rd of the vagina	100%	70.23%	77.06%	100%
Parametrial involvement	100%	89.27%	75.65%	100%
Adjacent organ invasion	100%	78.45%	81.97%	100%

DISCUSSION –

Cervical cancer is the commonest cancer cause of death among women in developing countries.[5] In India, the mortality due to cervical cancer is high, and nearly 122,844 new cases are diagnosed, and almost 67,477 deaths occur every year.[3]

In this study, the mean age observed was 57.43 ±11.03 years which is in agreement with studies by Yogaraj et a3 and Nawapun et al5 and in contrast to younger mean age of 45 years in study by Shweel et al[6]

In this study MRI in relation to clinical staging upstaged the disease in 31.4% cases and down staged the disease in 14.2 % cases, while in the study by D. Amitha Kumari et al7 MRI showed higher staging in 28.6% and lower staging in 9.6% of the cases.

This study showed strong percentage agreement between clinical and MRI findings for parametrial invasion, vaginal invasion, hydronephrosis, adjacent pelvic organ involvement and distant metastases with fair to moderate agreement with kappa coefficient except for pelvic side wall involvement in which there was only slight agreement. Nawapun et al. in his study showed that the correlation of clinical and MRI findings in the vaginal invasion, pelvic sidewall invasion, adjacent pelvic organ invasion, and spreading to distant organ had moderate-to-strong correlation by percent agreement (ranging from 67.6 to 91.9%) but slight correlation between clinical and MRI examinations by kappa or weighted kappa coefficient (K = 0.000–0.128).[6]

Our study shows high sensitivity, specificity, PPV and NPV of MRI in diagnosing disease extension in comparison to the histopathology findings. Yogaraj et al., reported that MRI predicted involvement of the upper 2/3rd of vagina with sensitivity, specificity, positive predictive value, negative predictive value and the total diagnostic accuracy of 100%3

Shweel MA et al.,found MRI to be highly sensitive (100%) and specific (100%) in determining tumour extension to the stroma, urinary bladder, and rectum.6 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.[8]

Giuliano Rigon et al, stated 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.[9]

Limitations

The present study was only a retrospective record-based study with small sample size, only including the subjects falling under our sampling frame. Solarge randomized control trials are needed for confirmation of our findings.

CONCLUSION –

Carcinoma cervix is primarily staged clinically as per FIGO guidelines but MRI can modify clinical staging and treatment options. MRI is a reliable diagnostic tool for cervical cancer as it correlates strongly with histopathology.

REFERENCES -

1- Zhang S, Xu H, Zhang L, Qiao Y. Cervical cancer: Epidemiology, risk factors and screening. Chin J Cancer Res 2020;32(6):720-728. doi:10.21147/j.issn. 1000-9604.2020.06.05.
2- Mishra GA, Pimple SA, Shastri SS. An overview of prevention and early detection of cervical cancers. Indian J Med Paediatr Oncol 2011;32:125-32.
3- Yogaraj, Kumaran. Association between MRI Findings and Histopathological Examination in Carcinoma Cervix: A Retrospective Study. International Journal of Anatomy, Radiology and Surgery. 2021 Apr,Vol-10(2):RO61-RO64.
4- Khashayar RZ, Caroline R, Hisashi A, Sharad M, Ahmed M, Daniel U. Magnetic resonance imaging of the cervix. International Cancer Imaging Society 7, 69-76 (2007).
5- Nawapun S, Chalida A,Srisitthiprapha W, Komsan T and Amornrat T. Egyptian

Journal of Radiology and Nuclear Medicine(2021) 52:162.

6- Shweel MA, Abdel-Gawad EA, Abdelghany HS, Abdel-Rahman AM, Ibrahim EM. Uterine cervical malignancy: diagnostic accuracy of MRI with histopathologic correlation. J Clin Imaging Sci. 2012;2:42.PMID: 22919556.

7- D. Amitha Kumari, AnanthalakshmiPaga. Comparative study of MRI staging vs figo staging of carcinoma cervix. International Journal of Contemporary Medical Research 2017;4(5):1196- 1198.

8- Morimura Y, Soeda S, Hashimoto T, Takano Y, Ohwada M, Yamada H, et al. The value of pre-operative diagnostic procedures for cervical involvement in uterine corpus carcinoma. Fukushima J Med Sci. 2000;46(1-2):1-11.

9- Giuliano Rigon, Cristina Vallone, Andrea Starita, Marco Flavio Michele Vismara, Pasquale Ialongo, et al. Diagnostic Accuracy of MRI in Primary Cervical Cancer. Open Journal of Radiology. 2012;2:14-21.