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Original Article

MRI & CLINICAL EVALUATION CONCORDANCE IN CERVICAL CANCER STAGING: A RETROSPECTIVE STUDY

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ABSTRACT

Background: MRI plays a crucial role in staging of cervical cancer following the FIGO 2018 update, which integrates imaging findings in parallel to clinical evaluation. However, in practice, staging often varies based on examiner experience and access to the imaging modalities. This study evaluates the concordance between MRI-based cancer staging and clinically assigned FIGO stage in cervical cancer patients at a tertiary oncology centre.

Objectives: To evaluate the agreement between MRI-based FIGO staging and clinical staging in biopsy-proven cervical malignancies and identify the aspects where there is a discrepancy between the two.

Materials & Methods: A total of 642 biopsy-proven cervical cancer cases imaged between June 2024 and May 2025 in Viswabharathi Medical College and Hospital, Penchikalapadu, Kurnool, AP.286 cases meeting inclusion criteria (pre-treatment MRI and documented clinical FIGO staging) were analysed. MRI-reported T-stages were extracted from structured radiology reports. Clinical stages were obtained from oncology notes based on bimanual examination & speculum inspection. Concordance, over-staging, and under-staging rates were calculated. Cohen's kappa was used to assess agreement.

Results: Among 286 patients, overall concordance between MRI and clinical staging was 72%. MRI upstaged 18% of cases with the bulk of the cases with parametrial or vaginal extension. 10% of the cases were down staged, largely in bulky exophytic lesions. Agreement between modalities was moderate ($\kappa = 0.61$).

Conclusion: MRI-based FIGO staging shows moderate-to-high concordance with clinical staging, particularly for early-stage disease. The key aspect where MRI is better over the clinical evaluation is the parametrial infiltration where the staging of the cancer differs.

Keywords: *Cervical Cancer, Magnetic Resonance Imaging, FIGO Staging, Clinical Evaluation, Parametrial Invasion, Concordance Study, Cohen's Kappa.*

INTRODUCTION

Cervical cancer is one of the most prevalent malignancies among women in India.[13,15] According to the National Cancer Registry Program of 2023, cervical cancer accounts for nearly one-fifth of all female cancers in the country, with the majority of cases presenting at fairly advanced stages.[15] Accurate disease staging plays a pivotal role in determining prognosis, selecting appropriate therapy, charting a treatment and following the response.

FIGO traditionally emphasized clinical examination as the cornerstone of staging;[2,6,7] however, the 2018 FIGO revision formally incorporated imaging and pathological findings into the staging of the cancer. This revision acknowledges that modern imaging, particularly MRI, provides superior delineation of tumor extent and adjacent organ invasion compared to clinical assessment alone.

MRI offers superior soft-tissue contrast, multiplanar capability, and noninvasive assessment of the cervix and parametria, allowing for accurate evaluation of tumor size, depth of stromal invasion, vaginal and uterine extension, and bladder or rectal involvement. [3,6,7,8] These parameters are crucial in differentiating early from advanced disease and in planning radical surgery or chemoradiation. Nonetheless, in real-world practice, many oncology centers continue to rely primarily on clinical examination and ultrasound as the initial tools for staging and treatment planning.[12] Clinician familiarity with the imaging staging is needed for the integration of MRI findings into the final FIGO stage.[2,12]

At our tertiary oncology institution, most patients present directly with complaints of bleeding per vagina and undergo initial evaluation by the oncology team. Ultrasound serves as a preliminary screening tool, while MRI is routinely performed for local staging.[6,8] CT is done for detailed lymph node and/or metastatic assessment. Despite MRI's recognized value, discrepancies are frequently noted between MRI-based staging and the clinically recorded FIGO stage.

This study was undertaken as an internal audit to assess the concordance between MRI-based and clinically assigned FIGO staging in biopsy-proven cervical cancer cases. By analyzing staging agreement and identifying common causes of discrepancy, the study aims to highlight the complementary role of MRI in accurate pre-treatment assessment and contribute to standardized staging practices within multidisciplinary oncology care.[1,4,9]

MATERIALS AND METHODS

Study Design and Setting

This was a **retrospective, observational audit** conducted in the Department of Radiodiagnosis at Viswabharathi Medical College and Hospital, a tertiary oncology institution in India. The study evaluated the concordance between MRI-based staging and clinically assigned FIGO stage in biopsy-proven cervical carcinoma patients. Institutional Ethics Committee approval was obtained and the requirement for informed consent was waived as the retrospective data was completely anonymous.

Study Period and Data Source

All consecutive patients with biopsy-confirmed cervical carcinoma who underwent pre-treatment pelvic MRI between **June 2024 and May 2025** were screened for inclusion. Data were retrieved from the institutional PACS, and clinical records from Oncology department.

Inclusion Criteria

1. Biopsy-proven cervical carcinoma of any histologic subtype.
2. Pre-treatment MRI pelvis performed at our institution.
3. Documented clinical FIGO stage in oncology records.

Exclusion Criteria

1. Prior hysterectomy, radiotherapy, or chemotherapy before MRI.
2. Incomplete imaging or poor-quality scans.
3. Absence of clinical staging details in case files.
4. Recurrence/ Relapse of previous malignant etiology at initial presentation.

Imaging Protocol

MRI examinations were performed on a **1.5T scanner** using a pelvic phased-array coil. The protocol included axial, sagittal, and coronal **T2-weighted sequences**, axial **T1-weighted sequences**, **diffusion-weighted imaging (DWI)** with corresponding ADC maps.

Post contrast images were not included as a routine in the protocol as no new information could not be gathered from the scan. Slice thickness ranged from 3-5 mm.
Parametrial invasion was diagnosed when cervical stromal ring borders were effaced or when tumor spicules infiltrated into parametrial fat.

Vaginal or bladder involvement was identified based on loss of intervening fat planes. Reactive bullous edematous changes of the bladder were not taken into consideration as organ infiltration

Clinical Staging
Clinically assigned FIGO stage was obtained from oncology case files, based on findings from bimanual pelvic and speculum examination, cystoscopy or proctoscopy whenever indicated. These stages reflected the clinician's integrated assessment at the time of presentation.

Data Collection and Analysis
A total of **642** cervical cancer cases were reviewed, of which **286** met inclusion criteria. MRI-based T-stages were collected from finalized radiology reports. Clinical FIGO stages were collected from oncology documentation. Cases were categorized as **concordant**, **upstaged**, or **downstaged** based on MRI-clinical comparison.

Descriptive statistics were used for patient demographics and stage distribution. **Cohen's kappa coefficient (κ)** was calculated to assess agreement between MRI and clinical staging. Statistical analysis was performed using **SPSS version 26.0**.

RESULTS
A total of 642 biopsy-proven cervical cancer cases were identified between June 2024 and May 2025, of which 286 met the inclusion criteria and were considered for this study. The remaining cases were excluded due to prior treatment, incomplete imaging, or missing clinical staging documentation.

Imaging

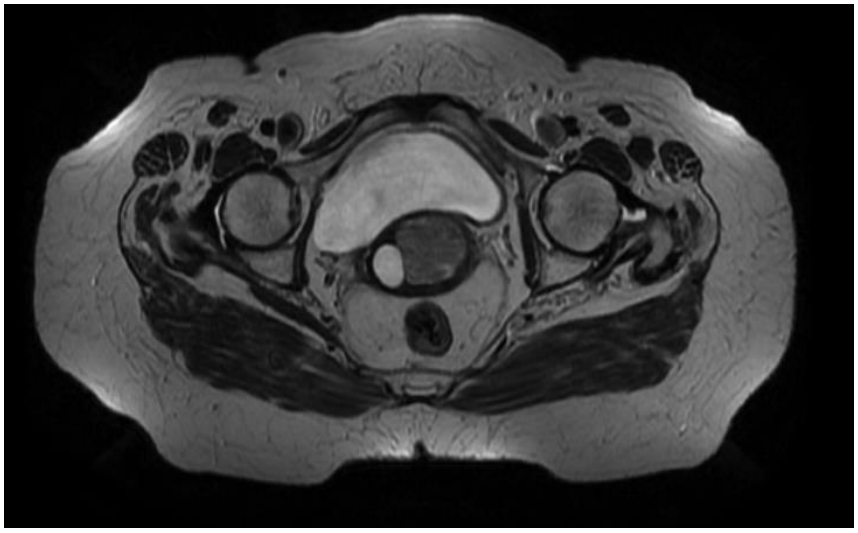

Figure 1: Axial T2 weighted image showing the cervical mass of high cellularity within the cervical stroma with no evidence of breach with an intact stromal hypointense ring.

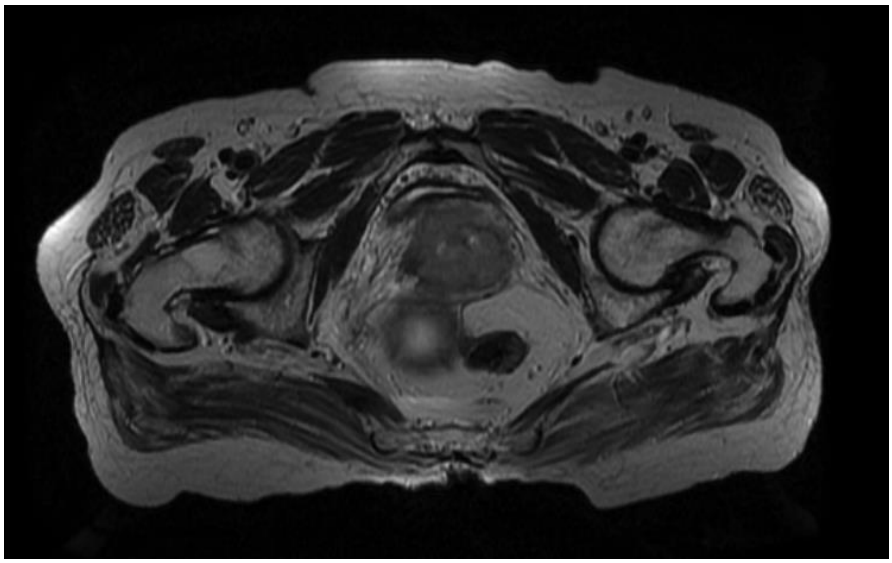

Figure 2: Axial T2 weighted image showing bilateral parametrial invasion evident by effacement of the stromal hypointense border with fibrinous extending into the bilateral parametrial fat.

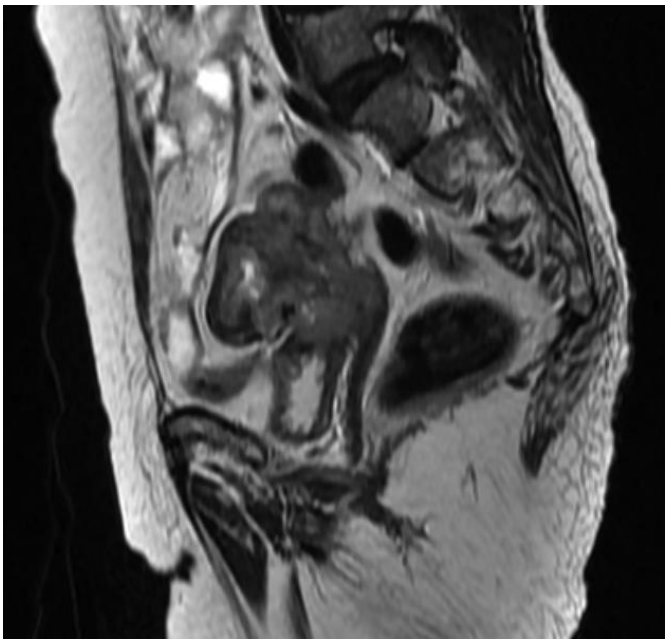

Figure 3: Sagittal T2 weighted image showing the cervical primary malignancy with urinary bladder infiltration

Patient Demographics

The mean age of patients was 52 ± 10 years (range: 31–78 years). The majority of patients (68%) were postmenopausal. Squamous cell carcinoma constituted 91% of cases, followed by adenocarcinoma (7%) and other histologic subtypes (2%).

Stage Distribution

Based on clinical evaluation, the most common stage at presentation was FIGO Stage IIB (42%), followed by Stage IIIB (26%) and Stage IB3 (18%). MRI-based staging demonstrated a similar trend, with most patients categorized as Stage IIB (38%), followed by Stage IIIB (24%) and Stage IB3 (20%).

Table 1 summarizes the comparative stage distribution.

Table 1

FIGO Stage	Clinical Staging (n = 286)	MRI Staging (n = 286)
IB1	10 (3.5%)	12 (4.2%)
IB2	14 (4.9%)	16 (5.6%)
IB3	52 (18.2%)	57 (19.9%)
IIA	20 (7.0%)	18 (6.3%)
IIB	120 (42.0%)	109 (38.1%)
IIIA	12 (4.2%)	14 (4.9%)
IIIB	74 (25.9%)	69 (24.1%)
IVA	8 (2.8%)	9 (3.1%)
Total	**286 (100%)**	**286 (100%)**

Concordance Analysis

Overall concordance between MRI-based and clinically assigned FIGO staging was 72% (206 out of 286 cases).
MRI upstaged 52 cases (18%), predominantly due to detection of parametrial or vaginal invasion not appreciated on clinical examination. MRI downstaged 28 cases (10%), primarily in exophytic or bulky lesions clinically overestimated in size.
Table 2 summarizes concordance and discrepancy patterns.

Table 2

Comparison Category	Number of Cases (n = 286)	Percentage (%)	Predominant Cause of Discrepancy
Concordant staging	206	72.0	-
Upstaged by MRI	52	18.2	Parametrial and vaginal invasion

Comparison Category	Number of Cases (n = 286)	Percentage (%)	Predominant Cause of Discrepancy
Downstaged by MRI	28	9.8	Overestimation of tumor size on clinical evaluation
Total	**286**	**100.0**	-

Statistical analysis:
The degree of agreement between MRI-based and clinically assigned FIGO staging was assessed using Cohen's kappa (κ) coefficient.
In this study, cross-tabulated data of MRI and clinical stages were analysed using a 2x2 contingency matrix, and κ was calculated using SPSS version 26.0.
A κ value of 0.61 was obtained ($p < 0.001$) and it indicated moderate agreement between MRI and clinical staging.

Patterns of Discordance
Upstaging by MRI (18%) occurred most often in clinically Stage IB and IIA cases where MRI demonstrated subtle parametrial infiltration or vaginal involvement. Downstaging by MRI (10%) was common in clinically advanced lesions later shown to be confined to the cervix without stromal breach. Parametrial invasion accounted for the largest single cause of disagreement (62% of discordant cases), followed by misinterpretation of vaginal spread (21%).

Nodal and Distant Assessment
MRI detected pelvic lymphadenopathy (>10 mm short-axis and restricted diffusion on DWI images) in 64 patients (22%), while CT correlation was available in 41 of these cases, confirming nodal enlargement in 33 (80%). No definite distant metastases were identified on MRI; cases with suspected metastasis were referred for CT evaluation.

DISCUSSION
Accurate staging of cervical cancer is crucial for determining prognosis and guiding treatment decisions.[2,6,7] The transition of FIGO in 2018 from a purely clinical to an imaging-integrated staging system represented a important shift in multidisciplinary oncology practice. [2,8]

In this study conducted at Viswabharathi Medical College and Hospital, we assessed the concordance between MRI-based and clinically assigned FIGO staging in 286 biopsy-proven cervical cancer cases. Our results demonstrated an overall concordance of 72% with a kappa value of 0.61, indicating substantial agreement between MRI and clinical staging.

Comparison with Previous Literature
The concordance rate in our study aligns closely with several previous reports. [1,4,7,9] *Singh et al.* (2019) reported a 70% agreement between MRI and clinical staging in an Indian tertiary center. *Thomeer et al.* (2013) observed a 73% concordance in a European cohort.
Similar studies by *Kaur et al.* (2021) and *Narayan et al.* (2018) also support the substantial role of MRI in refining FIGO staging.

The modest differences across studies can be attributed to variations in imaging protocols, scanner strength, radiologist experience and skill, and the relative emphasis on clinical versus radiologic staging during multidisciplinary evaluation.
Patterns of Staging Discrepancy
In our analysis, MRI upstaged 18% of cases and downstaged 10%. The most frequent cause of upstaging is parametrial invasion which was not appreciated on clinical examination. Clinical assessment of parametrial spread remains inherently subjective and is affected by operator experience, patient discomfort, and coexisting fibrosis or inflammation. MRI, with its superior soft-tissue resolution, allows confident visualization of stromal disruption and spiculations extending into the parametrium.

Downstaging occurred primarily in bulky or exophytic lesions that were clinically overestimated. Clinical palpation may overestimate tumor size, particularly when the cervix is distorted or edematous, while MRI provides a true volumetric and multiplanar assessment.

Nodal and Distant Evaluation
On MRI detected pelvic lymphadenopathy in 22% of cases, with CT correlation confirming nodal enlargement in 80% of these. The absence of PET/CT in our institution limits malignant deposits within the nodes; however, MRI combined with CT remains an acceptable alternative in most Indian tertiary centers.
Clinical Implications
The observed moderate-to-substantial agreement suggests that MRI can reliably complement clinical staging, especially for parametrial invasion. Integrating MRI findings into the initial FIGO staging could reduce mistagging and improve

treatment planning.[2,6,8] Particularly, early detection of parametrial invasion or discrete vaginal extension can help avoid inappropriate surgical selection and potential under-treatment.[5,6,8,11]

Study Limitations

This audit has certain limitations inherent to its retrospective design. Clinical staging data were extracted from case notes and may have inter-observer variability. Histopathological or surgical correlation was not included, as the purpose of the study aimed to assess real-world concordance between radiologic and clinical staging. The large sample size and standardized MRI protocol provide good clarity and reflect actual oncology practice in Indian tertiary settings.

Future Aspects

Future studies incorporating prospective imaging-pathologic correlation and inclusion of PET/CT or diffusion-tensor MRI parameters could further refine accuracy. Additionally, developing standardized MRI reporting templates aligned with FIGO criteria may promote uniform staging interpretation across radiologists and institutions.

CONCLUSION

This study reassures MRI's pivotal role in the staging of cervical cancer, demonstrating substantial concordance with clinical assessment while identifying key areas of discrepancy. MRI remains indispensable for comprehensive pre-treatment evaluation and should be considered the reference imaging modality for staging integration in Indian oncology practice. In resource-limited Indian oncology centers, optimizing MRI utilization and structured reporting can further improve the accuracy and reproducibility of cervical cancer staging.

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