A STUDY ON ROLE OF MRI IN STAGING OF CARCINOMA CERVIX AND CORRELATION WITH CLINICAL STAGING(FIGO)

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Introduction:
According to the results of India Cancer incidence estimates for 2022 according to National Cancer Registry Programme published by Indian J Med Res. 2022 Oct-Nov, cervical cancer ranks as the second most common cancer among females affecting approximately 123907 individuals which account for 18.3% of all female cancer patients[1].

Treatment options for cervical cancer depend on the stage, classified according to the International Federation of Gynecology and Obstetrics (FIGO) system[2]. For early-stage disease (FIGO stage IA, IB1, and IIA), radical surgery, including trachelectomy or radical hysterectomy, is the preferred choice. Conversely, primary radiotherapy combined with chemotherapy is recommended for patients with bulky tumors (FIGO stage IB2/IIA2) or locally advanced disease (FIGO stage IIB or greater).

However, accurate staging is crucial for determining the appropriate treatment plan. The old FIGO staging systems (1999, 2009, and 2014) were found to be inaccurate, with significant percentages of under-staged and over-staged cases, particularly in stages IB–IIIB and IIIB, respectively[3]. Clinical assessment using the old FIGO system also had limitations in assessing tumor size, adjacent organ involvement, and lymphadenopathy [4].

Magnetic resonance imaging (MRI) emerges as a valuable non-invasive tool for improving staging accuracy in cervical cancer. MRI provides detailed information on tumor size, parametrial and pelvic sidewall invasion, as well as pelvic and abdominal lymphadenopathy. By utilizing MRI, unnecessary invasive procedures such as cystoscopy, proctoscopy, and intravenous pyelography can be avoided[4].

This study aims to compare and analyze the correlation between clinical assessment and MRI findings in staging cervical cancer, with the goal of enhancing accuracy in prognosis and treatment planning.

The aims and objectives of the study on comparing clinical assessment and MRI findings in staging cervical cancer are as follows:

Aims of the study:

- To assess the correlation between clinical staging based on the International Federation of Gynecology and Obstetrics (FIGO) system and MRI findings in patients diagnosed with cervical cancer.
- To evaluate the accuracy of clinical staging (based on pelvic examination, bladder cystoscopy, proctoscopy, and colposcopy) compared to MRI staging.
- To determine the impact of MRI on the detection of tumor size, parametrial and pelvic sidewall invasion, and pelvic and abdominal lymphadenopathy in cervical cancer staging.
- To investigate the potential of MRI in reducing the need for invasive investigations such as cystoscopy, proctoscopy, and intravenous pyelography in the staging process.
- To explore any discrepancies between clinical staging and MRI staging and identify factors contributing to these differences.

Objectives:

- To recruit patients diagnosed with cervical cancer who undergo both clinical assessment and MRI staging.
- To collect and analyze clinical data, including FIGO stage based on pelvic examination and imaging, and MRI findings.
- To compare the accuracy of clinical staging and MRI staging in determining tumor size, parametrial and pelvic sidewall invasion, and lymphadenopathy.
- To assess the diagnostic performance of MRI in detecting cervical cancer characteristics compared to clinical assessment.
- To identify any discrepancies between clinical and MRI staging and analyze potential contributing factors.

Study Design and Population: This retrospective study involved 63 patients diagnosed with histologically confirmed cervical cancer in the gyneacology outpatient department. Patients ranged in age from 35 to 70 years old and underwent clinical staging assessment according to the FIGO guideline, along with pretreatment MRI for the lower abdomen at our institute from march 2022 to march 2023. Approval for this study was obtained from the Ethics Committee for Human Research in accordance with the Declaration of Helsinki and the ICH Good Clinical Practice Guidelines.

Inclusion Criteria: All patients with histologically confirmed cervical cancer seen in the gynecology outpatient department, between March 2022 to March 2023, who underwent pretreatment MRI at our institute.

Exclusion Criteria:
1. Patients with cervical cancer who did not undergo pretreatment MRI evaluation.
2. Patients who had received previous treatment for cervical cancer, such as prior surgery (except for tissue diagnosis), chemotherapy, or radiation therapy.

Clinical Staging:

Clinical FIGO staging information for cervical cancer patients was retrospectively retrieved from medical records at the Gynecology outpatient department and reviewed by experienced one gynecologist and, one radiation oncologist. Patients staged according to the 2018 FIGO guidelines. General patient information, including age at cervical cancer diagnosis, underlying diseases, and histological type, was recorded.

Clinical staging assessments followed the 2018 FIGO guidelines, involving diagnostic biopsy, pelvic examination, chest radiography, proctoscopy, bladder cystoscopy, intravenous pyelography, or kidney, ureter, and bladder ultrasound. Recorded parameters included 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.

Pretreatment MRI Staging:

We retrospectively collected data from cervical cancer patients who underwent pretreatment MRI from March 2022 to March 2023. MRI examination records were reviewed by radiologist specializing in female pelvic imaging. Radiologist was aware of the biopsy-proven diagnosis of cervical cancer but remained blinded to patient identity, physical examination results, and clinical staging[4,5].

The following MRI findings were recorded:

1. Tumor size (measured in the longest dimension).
2. Vaginal wall invasion (identified by disruption of low-signal intensity in the vaginal wall).
3. Parametrial invasion (evidenced by disruption of the low-intensity cervical stromal rim, nodularity of parametrial tissue, or tumor extension to the parametrium).
4. Pelvic sidewall invasion (characterized by tumor extension within 2 mm of the pelvic sidewall or involvement of specific muscles such as the internal obturator, piriformis, or levator ani, with or without associated ureteral dilation).
5. Hydroureter and hydronephrosis, recorded from additional upper abdominal CT or bladder ultrasound due to limitations in lower abdominal MRI field of view.
6. Lymphadenopathy, based on morphological features such as indistinct margins, heterogeneous enhancement, or a short-axis size exceeding 0.8 cm.
7. Adjacent pelvic organ involvement, including bladder or bowel wall infiltration or tumor invasion into bladder or bowel wall mucosa.
8. Distant organ metastasis, interpreted from findings such as visible metastases in bone within the pelvic region, ovaries, urethra, or vaginal labia, or pulmonary metastases observed in chest radiography.

Then MRI staging correlates with clinical staging. Observe the differences in staging in between two.

Results:

This study includes 63 female patients from age 35 to 70 years .mean age 53

Most of the patients belong to low socioeconomic status. Bleeding per vaginum is most common symptom then post coital bleeding is 2nd most common symptom.

Major histological subtype was nonkeratinizing squamous cell carcinoma; In our study, 98% (62) patients proved as nonkeratinizing squamous cell carcinoma.

In our study shows there were total 3 cases under stage 1A ;0 case under stage 1B; 4 cases under stage 2A ;16 cases under stage 2B; 2 cases under stage 3A ;21 cases under stage 3B;12 cases under stage 3C ;4 cases under stage 4A; 1 case under stage 4B.

Number of cases according to final stage after both clinical and MRI imaging over and age tabulated below.

Staging	<45 years	45-60 years	>60 years	TOTAL
1A	1	2	0	3
1B	0	0	0	0
2A	1	2	1	4

2B	3	9	4	16
3A	0	2	0	2
3B	3	13	5	21
3C	2	7	3	12
4A	0	2	2	4
4B	0	1	0	1
TOTAL	10	38	15	63

In our study according to clinical staging 4.76% cases belongs to stage 1A ; 3.17%cases belongs to stage 1B; 7.94% cases belongs to stage 2A; 39.68% cases belongs to stage 2A; 1.59% cases belongs to stage 3A; 26.98% cases belongs to stage 3B; 7.94% cases belongs stage 3C; 7.94 % cases belongs to stage 4A; 0 % cases belongs to stage 4B.

According to MRI staging, 4.76% cases belongs to stage 1A; 0% cases belongs to stage 1B ; 6.35% cases belongs to stage 2A ; 25.40% cases belongs to stage 2B; 3.17% cases belongs to stage 3A ;33.33% cases belongs to stage 3B ; 19.05% cases belongs to stage 3C ; 6.35% cases belongs to stage 4A; 1.59% cases belongs to stage 4B.

Staging	Clinical staging	MRI Staging	Clinical staging %	MRI staging %
1A	3	3	4.76	4.76
1B	2	0	3.17	0
2A	5	4	7.94	6.35
2B	25	16	39.68	25.40
3A	1	2	1.59	3.17
3B	17	21	26.98	33.33
3C	5	12	7.94	19.05
4A	5	4	7.94	6.35
4B	0	1	0	1.59

Lymph nodal involvement was evaluated in MRI .

In our study 51   patients i.e,81.12% shows no lymphnodal involvement , 7 patients i.e,11.12% shows Internal iliac lymphnodal involvement, 4 patients i.e, 6.55% shows external iliac lymphnodal involvement, 1 patient i.e,1.21% shows inguinal lymphnodal involvement.

Involved lymphnodes	No.of patients	Percentage
No lymphnodes	51	81.12%
Internal iliac lymphnodes	7	11.12%
External iliac lymphnodes	4	6.55%
Inguinal lymphnodes	1	1.21%

There are 2 cases upgraded to stage 1B to 3C ;Because of involvement of lymphnodes seen in MRI ,this avoids surgery in this patients .1 case upgraded to 2A to 3A ;4 cases clinical stage 2B upgraded to 3B in MRI ,because pelvic wall involvement more clearly seen in MRI thank clinical staging; 5 cases upgraded to 2B to 3C ;1 case is upgraded to 4A to 4B .

In our study total 13 cases i.e, 20.64% cases staging were upgraded with MRI findings. Sensitivity of MRI in our study is 75.6%.

DISCUSSION:
In our study total 13 cases i.e, 20.64% cases staging were upgraded with MRI findings. Sensitivity of MRI in our study is 75.6%. Hence MRI incorporation in the standard protocol merits top priority

Previous research by Dhoot et al.[4]reported a significantly higher accuracy of MRI staging (89.3%) compared to clinical staging (61.3%). Similarly, Ho et al.[6,7] found MRI to have an overall accuracy rate of 75%, significantly surpassing the 55% accuracy rate of clinical staging. Additionally, studies by Ozsarlak et al.[8] and Shirazi et al.[9] showed substantial disparities between clinical and MRI staging accuracies, further supporting the need for larger sample size studies in this context.

For parameters such as vaginal invasion, pelvic sidewall invasion, adjacent pelvic organ invasion, and distant organ metastasis, moderate-to-strong correlation was observed between clinical and MRI examinations . Despite this, MRI sequences utilized alongside other imaging modalities have proven invaluable in staging and guiding treatment for cervical cancer, facilitating precise anatomical delineation and characterization of disease stages[10].According to Thomeer et al.[11] parametrial invasion by MRI evaluation is highly sensitive than clinical staging. In this MRI evaluation sensitivity is 84%whereas clinical 40%.

In our study, MRI identifies the hydronephrosis in all cases which was later confirmed by intravenous pyelogram. This indicates MRI reduces invasive procedures in this regard. These findings align with those of Chung et al.[12], supporting the efficacy of MRI or CT in identifying hydronephrosis previously detected by intravenous pyelography.

CONCLUSION:

➢ Advantages of pretreatment MRI include its ability to precisely define pelvic tumor extent, including accurate assessment of tumor size, stromal invasion depth, and parametrial invasion, lymphnodal involvement[13]. Additionally, MRI offers higher sensitivity in detecting adjacent pelvic organ invasion, potentially reducing staging costs and morbidity associated with invasive procedures.[14]

➢ Limitations of our study include the absence of comparison with pathological staging, which serves as the gold standard for evaluating the sensitivity and specificity of clinical and MRI findings. Furthermore, the study's sample composition may introduce selection bias, as it primarily includes patients with locally advanced or advanced cervical cancer who underwent pretreatment MRI. Additionally, the retrospective nature of the study precludes standardization of MRI protocols and time intervals between clinical staging and MRI examinations, potentially affecting the accuracy of comparison between clinical and MRI staging.

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