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ORIGINAL ARTICLE

Diagnostic Evaluation and Staging of Carcinoma Cervix by Magnetic Resonance Imaging

Lavanya Dharmalingam,[1,*] Shriram T,[1] Rohith J.R[2] and Ashwanth Narayanan Murugan[3]

[1]*Associate Professor, Department of Radiodiagnosis, Aarupadai Veedu Medical College and Hospital, Vinayaka Mission's Research Foundation (DU), Kirumampakkam, Pondicherry*
[2]*Assistant Professor, Department of Radiodiagnosis, Aarupadai Veedu Medical College and Hospital, Vinayaka Mission's Research Foundation (DU), Kirumampakkam, Pondicherry*
[3]*Juniour Resident, Department of Radiodiagnosis, Aarupadai Veedu Medical College and Hospital, Vinayaka Mission's Research Foundation (DU), Kirumampakkam, Pondicherry*

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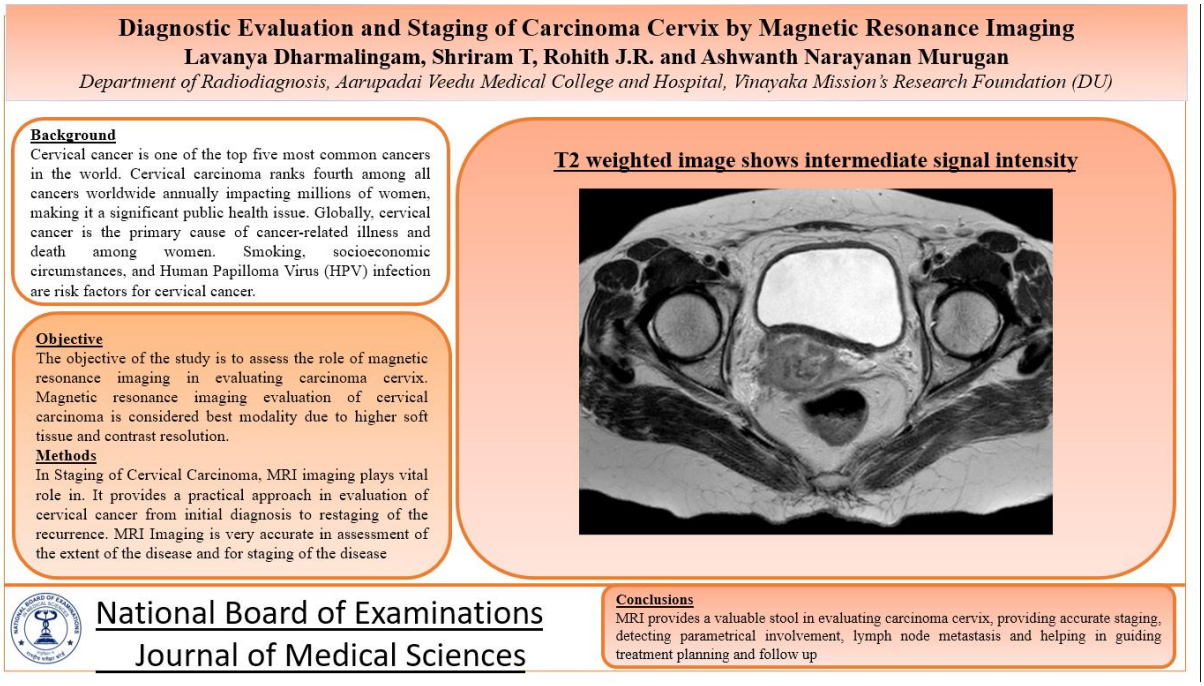
Abstract

Background: Cervical cancer is one of the top five most common cancers in the world. Cervical carcinoma ranks fourth among all cancers worldwide annually impacting millions of women, making it a significant public health issue. Globally, cervical cancer is the primary cause of cancer-related illness and death among women. Smoking, socioeconomic circumstances, and Human Papilloma Virus (HPV) infection are risk factors for cervical cancer. **Objective:** The objective of the study is to assess the role of magnetic resonance imaging in evaluating carcinoma cervix. Magnetic resonance imaging evaluation of cervical carcinoma is considered best modality due to higher soft tissue and contrast resolution. **Material and Methods:** In Staging of Cervical Carcinoma, MRI imaging plays vital role in. It provides a practical approach in evaluation of cervical cancer from initial diagnosis to restaging of the recurrence. MRI Imaging is very accurate in assessment of the extent of the disease and for staging of the disease. A total of sixty-three cases newly diagnosed, histopathologically confirmed with carcinoma of uterine cervix and treated with chemotherepy/radiotherapy were included. All of the sixty-three study participants were subjected to MRI pelvis performed with 1.5 tesla machine. The staging is classified by international federation of gynecology and obstetrics staging (an updated FIGO). **Conclusion:** MRI provides a valuable stool in evaluating carcinoma cervix, providing accurate staging, detecting parametrical involvement, lymph node metastasis and helping in guiding treatment planning and follow up.

Keywords: cervical cancer, MRI staging, Magnetic Resonance Imaging, Diagnostic

*Corresponding Author: Lavanya Dharmalingam
Email: lavinimmi@gmail.com

Graphical Abstract



Introduction

The primary cause of cancer-related mortality for women in developing nations is cervical carcinoma [1]. After lung, colon, and breast cancer, cervical cancer is the fourth most frequent type. Women of all ages are susceptible to cervical cancer, although incidence rates differ by region [1]. Persistent infection with a high-risk human papillomavirus (HPV) type, various sexual patterns, tobacco use, smoking, and a compromised immune system are risk factors [2]. Most cervical cancer cases happen in developing countries with limited access to screening and treatment. Due to restricted access to HPV vaccination and screening, the incidence rate is still high in underdeveloped nations [3].

The imaging modalities for cervical cancer are magnetic resonance imaging and computed tomography. In terms of cervical cancer staging, the International Federation of Gynecology and Obstetrics is the most widely used [4]. Vaginal hemorrhage, pelvic pain, and dyspareunia are possible symptoms of cervical cancer, or it may be asymptomatic. Research indicates that magnetic resonance imaging (MRI) is a highly accurate diagnostic method for evaluating cases of cervical cancer in its early stages. we will evaluate in details of uterine cervical carcinoma by magnetic resonance imaging and correlate with FIGO staging which be useful for treatment planning

Material and Methods

The study was conducted in department of radiodiagnosis, Aarupadai Veedu Medical college (AVMC & H) hospital from January 2024 to March 2025. The design of study was cross sectional observational study and the images were examined by the radiologist of Aarupadai Veedu medical college. The data of the patients were collected, patient with newly

diagnosed, histopathologically confirmed with carcinoma of uterine cervix, patient on post treatment willing to participitate are involved in the study. The study participants with adequate renal function subjected to MRI pelvis 1.5 tesla machine.

Informed consent was obtained from all the cases. All the participants subjected to MRI 1.5 tesla, following protocol sequence will be taken. MRI protocol done in our study are T2 weighted, T1 weighted, STIR or fat sequences. T2weighted saggital is to access tumour extent (size, shape and extent). T2W axial to evaluate the parametrial, T1w, STIR or fat saturation for detecting the fat planes and assessing the lymph node, helps in identifying haemorrhage or proteinaceous material Stir sequence suppress fat signal, increasing visibility of tumours, helps in detecting lymph nodes and accessing tumour extent. Diffusion weighted imaging with apparent diffusion coefficient can be more effective in detecting cervical cancer and grading its severity. DWI can also help in assess the response to treatment.

The 1.5 tesla philips MRI machine was used for the studies. TR/TE time of 650/22 milliseconds were used to generate the T1 and T2 weighted (saggital and axial sequence)2600/90 was used to obtain the T2 weighted images. For T1 and T2, the acquisition matrix was 192 x 256 and 256 x 256, respectively with a field of view of 260 mm (pixel size -1.02 mm) for saggital pictures, the slice thickness and inter -slice gap were 4mm and 0.4mm, whereas for the axial slice they were 3mm and 0.3mm.

Results

The fourth most prevalent gynecological cancer in women worldwide is cervical cancer. Adenocarcinoma is the second most prevalent cervical carcinoma after squamous cell carcinoma. The internal federation of obstetrics and gynecology staging classification for cervical cancer is generally recognized. MRI is a diagnostic and staging tool for cervical cancer that also aids in treatment.

A total of sixty-three case in which newly diagnosed cases are fourty nine (78%), recurrence is fourteen (22%) in number. Out of fourteen cases follow up post chemotherapy and post radiotherapy recurrence are eight cases (57%) and six cases (43%) there is no growth (Figure 1).

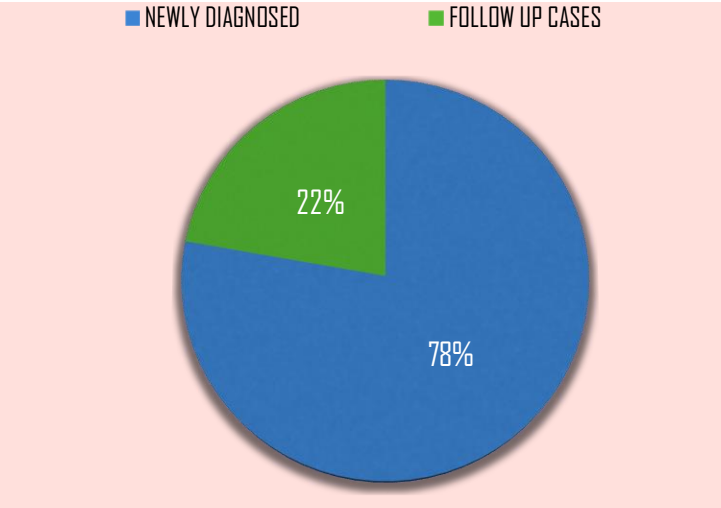


Figure 1. Total Number of Case.

Majority of cases were in between age group 51-60 years (22%), followed by 30-40 years (13%) and 41-50 years (12%), 61-70 years (12%) and 71-80 years (2%) and 81-90 years (2%) (Figure 2).

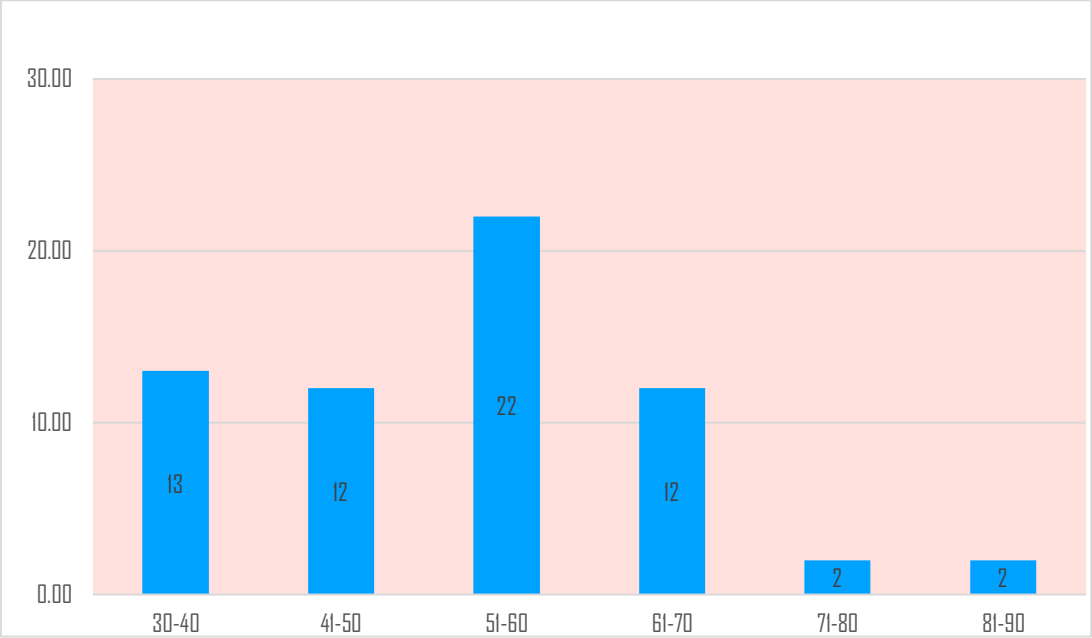


Figure 2. Age Wise Distribution

Incidence of carcinoma cervix were more in between age group 30-40 years and the figure was equal for 41-50 years and 61-70 years with peak incident between 51-60 years. The symptoms of carcinoma cervix in our study are asyptomatic, pain abdomen, white discharge, per vaginal bleeding and mass per vagina.

In our study patient presenting with mass per vagina in a newly diagnosed patients 2 percent and patients on chemotherapy/radiotheraphy were 9 percent and patient with no specific complaints were 29 percent (asymptomatic)with post menopausal bleeding complaint 15 percent, and those who came up for master health check up was 8 percent. According to FIGO classification, in our study, none of the stage IA cases were found on MRI, Stage IB in our study is eleven cases involved. Stage II tumour extends beyond the cervix upto two third of vagina. In this stage out of 25 patients were presented with stage II FIGO classification. Eight of the 25 cases of stage II tumors were in IIA, and 17 were in IIB. Seven cases of stage III tumors have spread to the pelvic wall, affecting the lower third of the vagina, and result in hydronephrosis or non-functions kidney. Of the 13 cases reported in stage III of this study, 10 cases involve no expansion to the pelvic wall, and III A comprises the lower part of the vagina. There are three examples of III B extending to the pelvic wall and/or causing hydronephosis.

In this stage the tumour extends to the bladder or rectal masses is considered as stage IV according to FIGO classification. In IV stage, IV A involves the bladder and rectal invasion and IV B the spread of tumour to liver, spleen, pancreas, kidney

and GI track Thus IV A includes seven cases and IV B includes 1 case. After post radiotherapy and post chemotherapy for follow up scan, there were no recurrence found in six cases. In newly diagnosed cases, primary group lymph nodes (illiic, parametrial and obtrurator) were involved in 18 cases. In carcinoma cervix, lymph node spread occurs usually along the obturator, external iliac, common iliac and paraaortic node (Figures 3 and 4).

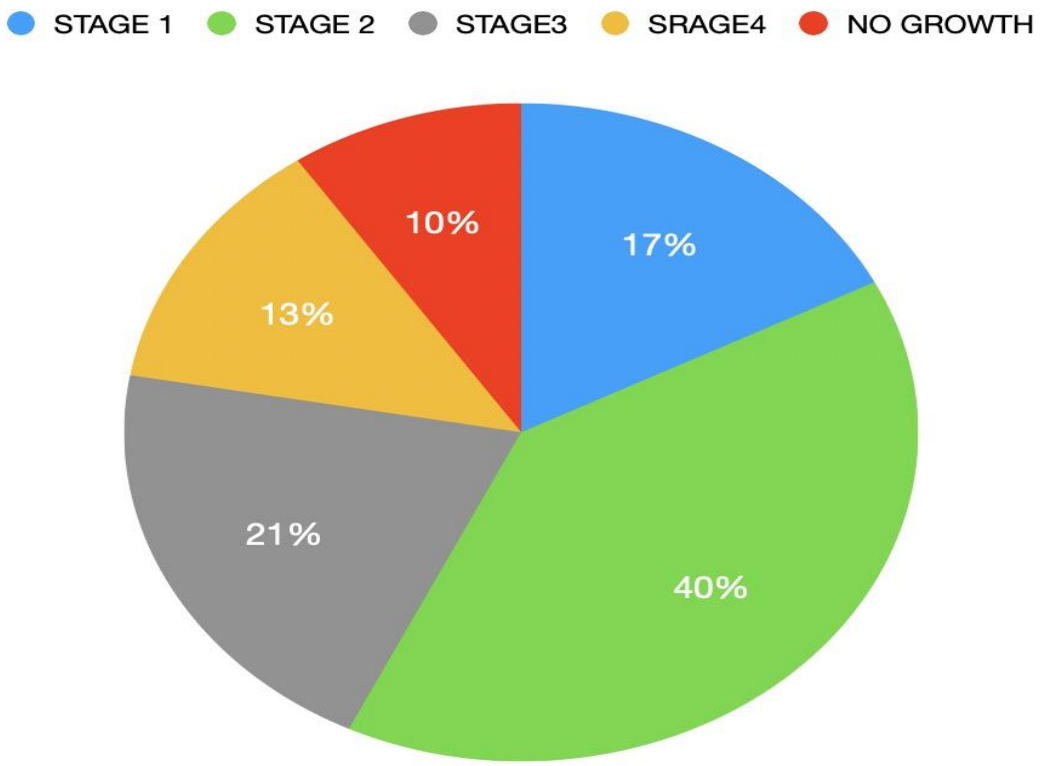


Figure 3. Total Number of Cases Categorized according to FIGO classification and data of no recurrence growth

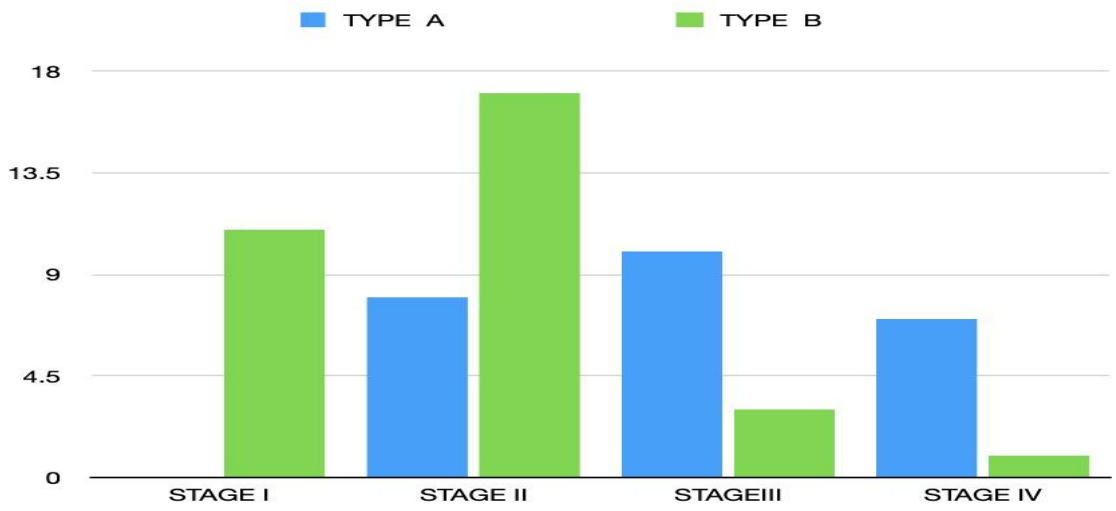


Figure 4. Total Number of Cases Categorized Subdivision of Figo Stages.

Discussion

Cervical cancer is the fourth most frequent gynecological cancer in women worldwide. In our research phase, patients are instructed to fast for four hours before the scan and to void an hour beforehand in order to acquire the best possible MRI image quality.

The preferred method for determining the size of the tumor, parametrial involvement, pelvic side wall expansion, and invasion of nearby organs is magnetic resonance imaging (MRI) with excellent soft tissue contrast. An expansile or infiltratic mass shows on the T2 weighted picture without fat suppression. The cervical stoma's signal intensity is contrasted with the mass's signal intensity. Another crucial prognostic factor in determining the phases is the tumor's size [7].

Because of its high soft tissue contrast, multi-planar imaging capacity, lack of radiation exposure, and accuracy in identifying tiny tumors and parametrial invasion, magnetic resonance imaging (MRI) is the diagnostic technique of choice for detecting cervical carcinoma. Because of its superior soft tissue resolution, MRI outperforms CT and PET/CT in terms of staging accuracy. Transvaginal ultrasonography is dependent on the operator and has depth penetration limitations [8]. Thus MRI is extremely useful in early diagnosis, staging of cervical cancer and evaluating post treatment stasis [9]. The appearance of carcinoma cervix in MRI, T1 weighted imaging tumour are usually isointense mass, T2weighted are usually hyper intense mass easily distinguishable from low signal intensity cervical stroma (Figures 5 to 8).

Figure 5. T2 weighted image shows intermediate signal intensity with right parametrial involvement

Figure 6 Sagittal T2W hyperintense mass in the cervix extending into upper third of vagina along the anterior and posterior walls

Figure:7. Axial T2W images show hypointense mass noted in the cervix

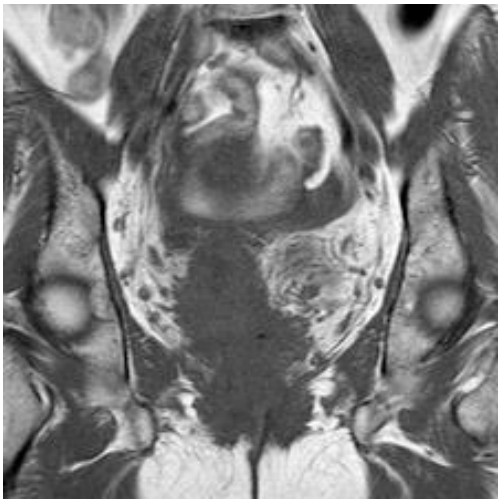


Figure 8. T1weighted images show hypointense mass noted in the cervix extending into the vagina

According to the updated FIGO classification, a stage 1 tumor is one that has been confirmed to be located on the cervix. A stage IA1 tumor has stromal invasion that is 3 mm or less deep and has a horizontal spread of 7 mm or less. A stage IA2 tumor has stromal invasion that is more than 3 mm but not more than 5 mm, with a horizontal spread of 7 mm or less. MRI cannot assess stage IA. Invasive cancer with a measured deepest invasion of >4 mm is included in stage IB.

In stage II, the tumor has spread outside the uterus, but not to the side walls of the pelvis or the bottom third of the vagina. There is no parametrial invasion in stage II A, and the tumor extends into the parametrium in stage IIB, disrupting the outer T2 hypointense cervical storm.

Stage III tumors induce hydronephrosis, or a malfunctioning kidney, and/or affect the pelvis, as well as the lower portion of the vagina. The lower third of the vagina is affected in stage IIIA, although the lateral pelvic wall is not extended. Stage IIIB occurs when the tumor is less than 3 mm from the pelvic wall, encases the iliac vessel, and penetrates the obturator internus, pyriformis, or elevator muscle.

Stage IVA is when the normally observed low signal intensity bladder wall is disrupted; bladder invasion is more common than rectal invasion; Stage IV involves invasion of bladder or rectal masses or distant metasis; and Stage IVB involves distant spread of tumors to the lungs, liver, peritoneum, paraaortic, and inguinal lymph nodes [12]. According to our research, a cancer recurrence occurs when the treated lesion recedes at least six months later and there are regrowth or distant metastases.

Conclusion

MRI is essential for optimal carcinoma cervix patient care due to its accuracy, details, ability to detect tumour spread, lymphadenopathy and distant metastasis. It guides in treatment planning and predicts patient outcome. Thus MRI is the gold standard imaging modality for carcinoma cervix staging, assessment and treatment planning.

Statements and Declarations

Conflicts of interest

The authors declare that they do not have conflict of interest.

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