

## Function of Magnetic Resonance Imaging in Identifying the Recurrence of Carcinoma Cervix in Patients Treated with Radiotherapy

Guruprasadsinh J Vaghela<sup>1</sup>, Premaram Choudhary<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Radiology, Banas Medical College and Research Institute Palanpur, Gujarat

<sup>2</sup>Professor, Department of Physiology, Banas Medical College and Research Institute Palanpur, Gujarat

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Corresponding author: Dr Guruprasadsinh J Vaghela

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### Abstract

**Background and Aim:** Definitive radiotherapy is the mainstream treatment for cervical squamous cell carcinoma in early-stage and advanced cases. The goals of the current study were to investigate the function of MRI in detecting the recurrence of cervical cancer in patients who had received radiotherapy and to assess the reliability of MRI in detecting treatment response and recurrence in cervix cancer patients.

**Materials and Methods:** The current study was conducted over a 2-year period in 100 women who had cervical cancer that had been histopathologically confirmed and who had been referred for an MRI pelvic at a tertiary care facility in India. Newly diagnosed individuals and patients who had just completed therapy were also included in this study. Patients with cervical cancer who were sent to the department for follow-up MR imaging after radiation were diagnosed.

**Results:** A total of 64 treated cases and 36 newly diagnosed patients are taken into consideration for the study. A total of 56 patients received radiotherapy, and the majority of them (19 patients, 33.92%) were referred for an MRI due to symptoms between the ages of 1 and 5 years, followed by less than 6 months and between the ages of 6 and 12. After 2-3 years of irradiation, when the average period of recurrence is, post radiation problems are more likely to occur.

**Conclusion:** After 2-3 years of irradiation, which also matched the usual duration of recurrence, post radiation problems were clearly more likely to manifest.

**Keywords:** Carcinoma Cervix, Radiotherapy, Recurrence, Squamous Cell Carcinoma

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### Introduction

Cervical cancer is one of the most common malignant tumors in women worldwide [1]. Definitive radiotherapy is the mainstream treatment for cervical squamous cell carcinoma in early-stage and advanced cases. The treatment outcomes of radiotherapy and surgery are comparable in the early stage. For locally advanced-unresectable cervix cancer, concurrent

chemoradiotherapy (CCRT) is the standard treatment. However, Jemal *et al.* reported that one third of the patients would experience recurrence [2]. Tumor recurrence is often not detected for several months after primary therapy. Prediction of the treatment response and the long-term outcome presents a challenge in developing precise personalized care. High-risk

recurrence patients can receive treatments such as additional chemotherapy and dose escalation in time by predicting reliable biomarkers [3-6].

Over the past two decades, MR imaging of the cervix has developed into the most helpful imaging. It is helpful for more than just preoperative staging; it also aids in finding residual or recurring cancers in individuals who have already received treatment. Early screening programmes have led to an upsurge in cervical cancer prevalence in recent years. The screening programmes encourage the patients to have additional testing done. The next-best level of modality for detecting cervical cancer turns out to be MR imaging. MRI provides more accurate staging of the malignancy than clinical staging [4,5,7-10].

The goals of the current study were to investigate the function of MRI in detecting the recurrence of cervical cancer in patients who had received radiotherapy and to assess the reliability of MRI in detecting treatment response and recurrence in cervix cancer patients.

### Materials and Methods

The current study was conducted over a 2-year period in 100 women who had cervical cancer that had been histopathologically confirmed and who had been referred for an MRI pelvic at a tertiary care facility in India. Newly diagnosed individuals and patients who had just completed therapy were also included in this study.

### Inclusion criteria

Patients with newly diagnosed cervical cancer as well as those who were receiving post-treatment follow-up were referred to the department for MR imaging.

### Exclusion criteria

Patients with cardiac pacemakers, recent implants, body clips, and other MR imaging contraindications like claustrophobia were eliminated.

Patients had MRI pelvic using a 1.5-Tesla machine after giving their informed consent and receiving approval from the institutional medical research ethics committee. There were several different MRI sequences used, including TRUFI coronal, axial and sagittal T2WTSE, axial and sagittal T1WTSE, STIR axial, DWI - MRI with ADC, and contrast-enhanced oblique axial, coronal, and sagittal FST1 WTSE.

Gadolinium DTPA, a contrast agent, was administered at a dose of 0.1 mmol/kg at a rate of 1 ml/second.

### Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

**Table 1: Distribution of cases**

Variable	Number of Patients	Percentage (%)
Newly Diagnosed	36	36
Recurrent	64	64

**Table 2: Interval between RT and imaging**

Duration post RT (N=56)	Number of Patients	Percentage (%)
< 6 months	15	26.78
6-12 months	14	25
1-5 yrs	19	33.92
> 5 yrs	8	14.28

### Results and Discussion

The study includes a total of 100 participants who have cancer of the cervix

as determined by biopsy. Included are both newly diagnosed and chemoradiotherapy

patients. Both clinically and through MRI, the FIGO stage is determined, and the characteristics are compared.

36 newly diagnosed patients (36% of the study population) and 64 treated cases (64% of the study population) are the two patient types taken into consideration. (Table 1) The radiomics technique uses image-based features as the imaging biomarker to forecast the tumor's grade, how well it will respond to treatment, and any side effects. According to earlier research, SUV max-based PET texture analysis can forecast the recurrence of cervical cancer [11,12].

A total of 56 patients received radiotherapy, and the majority of them (19 patients, 33.92%) were referred for an MRI due to symptoms between the ages of 1 and 5 years, followed by less than 6 months and between the ages of 6 and 12. (Table 2)

Our data clearly shows that post-radiation problems are more likely to appear 2-3 years following irradiation, which also happens to be the typical duration between recurrences. Since the majority of patients are referred at this time to check for tumour recurrence, more problems are also identified at this time. The replacement of bone marrow with fat is the most frequent post-radiotherapy alteration, followed by cystitis and proctitis.

Mayr *et al.* investigated the correlation of the dynamic T1-weighted MR image for the prediction of tumor control in patients treated with radiotherapy for advanced cervical cancer by pixel-by-pixel statistical analysis [13]. The dynamic MRI contrast enhancement can assess the regional variation in tumor microcirculation and facilitate a better assessment of low perfusion regions within tumors. They revealed poor blood supply and hypoxia as contributing factors to radiation therapy failure. Other studies also support the relationship between tumor hypoxia and dynamic MRI contrast enhancement [14-16]. Kjersti *et al.* divided the high and low signals on the dynamic MRI contrast

images and analyzed the relation between signals and the prognosis. They showed that the low signal enhancement was a biomarker of poor prognosis.

When evaluating the parametrium and pelvic side wall invasion, MRI without contrast is accurate. Images in T2 W provide useful information. This concurs with research conducted by Freeman SJ *et al.* and Hawighorst *et al.* [17]. It is clear from our study that not every instance that is being reviewed for the first time requires a contrast study.

Contrast study has no additional benefits over straightforward study. This is consistent with research by Schiedler J *et al.* and Hawighorst *et al.*, which discovered that this sequence does not contribute any value. The study by Lucas *et al.*, which reported a greater accuracy for the combination of T2 WI and DWI in the diagnosis, also supports this finding.

## Conclusion

In our research, it was established that MRI performed better in identifying the invasion of nearby organs. Squamous cell carcinoma was the most prevalent histopathological type in both newly diagnosed patients and those after therapy, with adenocarcinoma making up the remainder. After 2-3 years of irradiation, which also matched the usual duration of recurrence, post radiation problems were clearly more likely to arise.

Bone marrow replacement with fat was the most frequent post-radiotherapy alteration, followed by cystitis and proctitis.

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