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Diagnostic Accuracy of Magnetic Resonance Imaging in Carcinoma of Cervix Taking Histopathology as Gold Standard

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ABSTRACT

The crucial factor that plays important role in diagnosis and prompt treatment management of cervical cancer is staging. To stage cervical carcinoma Magnetic Resonance Imaging (MRI) is considered to be the most accurate and gold standard diagnostic tool. **Objective:** The aim of the present study was to elaborate the diagnostic accuracy of MRI in correlation with Histopathological Examination (HPE). **Methods:** The 53 patients diagnosed with cervical carcinoma attending the gynecology department of hospital from May 2021 to April 2022 were included in the study. Those patients who had undergone the abdomen and pelvis MRI fulfilled the inclusion criteria. The MRI and histopathological examination not only help in staging of cancer but also consider valuable in tracking tumor location, size and extension. The retroperitoneal lymphadenopathy, and involvement of the tumor to the adjacent areas was also evaluated by the study. Staging of all patient was done according to the International Federation of Gynecology and Obstetrics FIGO standards. Findings of MRI and HPE were assessed. For statistical evaluation of data, the SPSS version 22.0 was used. For quantitative variables the values were represented as mean with standard deviations. **Results:** The 54.46±9.29 years was the calculated mean age. Squamous cell carcinoma was diagnosed in almost 46 patients (87.5% cases). Stage IB carcinoma was diagnosed in almost 47.91% cases. Pelvic lymphadenopathy was observed in 8.34% cases, while metastasis of pelvic nodal lymph was observed in 4.16% cases on the HPE. **Conclusion:** Malignant diseases require early and accurate tool for their diagnosis. For identification of cancer stage and better planning of treatment of cervical carcinoma the highly non-invasive modality MRI can be used. With the advents in MR imaging, it is considered as gold standard diagnostic tool with better sensitivity, specificity and high accuracy for cervical carcinoma.

INTRODUCTION

The third most common gynecological malignancy among younger women is cervical carcinoma. In cervical carcinoma, the tissue of cervix and narrow end of uterus have malignant cells. The mean decisive age is 61 years [1-2]. Cervical cancer remains asymptomatic at the early stages, the later stages of cancer involve vaginal bleeding, lymphatic or ureteral compression and watery discharge. Many risk factors are associated with cervical carcinoma [2-3]. There is a strong association between cervical cancer and Human Papilloma virus (HPV). HPV can be found in about 90-95% cases of cervical carcinoma. HPV-16 found in about 50% of cervical cancer patients HPV-18 in about 15% of cervical cancer patients and HPV-45 in about 8% of cases respectively. Smoking, Oral contraceptive pills, high parity, Intrauterine devices and weak immune system are other risk factor involved in causing cervical carcinoma [4-5]. For better planning of treatment, it is necessary to identify the significant factor play crucial role in prognosis

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of cervical cancer. Squamous carcinoma and Adenocarcinoma are histological types of cervical carcinoma. Mucinous carcinoma, mesonephric carcinoma, and endometrioid carcinoma are included in Adenocarcinoma[6]. The squamous cell carcinoma shares almost 75% cases of cervical carcinoma. MR imaging most clearly depict many such factors. Adenocarcinoma, adenosquamous cell carcinoma are involved in other 10-15% cases [7-8]. Because of formal screening of cervical carcinoma in developed countries the total percentage of cases has reduced to half. But in the developing countries the cases are increasing. The most effective test for screening of cervical cancer is Papanicolaou(Pap)HPV test [9]. Surgery is recommended for the patients diagnosed with early stage cervical cancer (stages I and IIA), while radiation therapy in combination with chemotherapy is used to treat advanced stage cervical cancer (stage IIB or greater). It is difficult to distinguish the cervical cancer stages. According to former International Federation of Gynecology and Obstetrics (FIGO) the patients with the metastasis of lymph node are included in (stage IIIC)[10]. The common diagnostic tool for histopathological examination of cervical carcinoma is cervical biopsy. The efficient modality to track tumor location, its size, volume, extensions and depth of stromal invasion is MRI. It also plays crucial diagnostic role in evaluation of metastases of lymph node. The Non-invasive MRI has superseded the use of invasive techniques. MRI also play putative role in pre-treatment of uterine cervical carcinoma[11-12].

METHODS

It was a retrospective Study with statistical approach conducted in BKMC/ MMC, Mardan for the duration of six months from January 2020 to June 2020. This study was conducted on 53 patients presented with cervical carcinoma at gynecology department of hospital. The duration of the present study was 14 months from May 2021 to April 2022. The result obtained from Shweel MA et al., study depicted that the proportion of squamous cell carcinoma as 73.3%. The sample size of present study was calculated according to the Shweel MA et al., study squamous cell proportion [13]. The confidence level of the study was calculated as 95% with absolute precision of 13%. To reduce the standard error the infinite population correction was applied on the study. For calculation of sample size, the given formula; **n=Z2P(1−P)/d2**
In the given formula the n is the sample size, z is the statistic for a level of confidence and p is the expected prevalence of proportion [14]. The P value for expected prevalence of proportion 73.3% is 0.733. The d is the precision. From the above formula the calculated n was 45. About 5% was the

non-participation rate. Hence 52 was calculated as sample size. The patients presented with diagnosed cervical carcinoma after MRI of abdomen and pelvis was included in the study. GE- Optima MR 360 1.5 T 16 channel was used for diagnostic purposes. Pelvis-3 Plane T2, T1 axial, STIR axial, diffusion was set as standard MRI protocols. Post-contrast-T1FS pre, dynamic contrast for uterus, 3 Plane T1 FS, Axial lava, Coronal lava. Screening of upper abdomen-T2FS Axial, Coronal T2 Haste, diffusion. Gadopentetate Dimeglunine Injection USP-10 mL was used as contrast agent. The patients with elevated renal parameters, and history of contrast allergy were excluded from contrast study. The stages of cervical carcinoma were allocated on the basis of 2018 FIGO revised staging system for cervical carcinoma. The data obtained from MRI and HPE were assessed. SPSS version 22.0 was used for the analysis.

RESULTS

The 53 patients attended the hospital was included in the study. The 54.46±9.29 years was the calculated mean age. The age of youngest patient was 32-years, while the oldest patient included in the study was 74-year-old. From HPE the 47% patients were diagnosed with mass lesion of cervix. Almost 16% has the extension of mass lesions to the upper 2/3rd of the vagina. The Two out of 53 was diagnosed with the micro-invasive carcinoma cervix and other two was diagnosed with pelvic lymph nodes. The results of HPE and MRI are highly correlated. About 47% cases of mass lesion of cervix was diagnosed by MRI. The mass lesion extension to the upper 2-3rd of vagina was observed in 16% cases, parametrical infiltration was observed in about 16% cases, and other 8% was diagnosed with Pelvic lymphadenopathy. About 6% cases was diagnosed with Retroperitoneal lymphadenopathy, 2% with the cervical extension to the lower 2-3rd of the vagina, 2% with cervical mass lesion Invasion of the urinary bladder, 4% with invasion of rectum. There was no patient with cervical mass lesion extension to the pelvic sidewall (showed in table 1). On HPE the majority of the (87%) patients were diagnosed with squamous cell carcinoma. Other 4% was diagnosed with squamous/adenocarcinoma and 4% with poorly differentiated carcinomacervix, 2.1% with adenocarcinomas, and another 2.1% with carcinoma in situ. The majority of the patients 62% presented with cervical carcinoma complaint about white discharge. Other 60% were suffering from postmenopausal bleeding, 47.9% with lower abdominal pain and 16% with dysmenorrhea. The total diagnostic accuracy was 50%, as sensitivity of MRI was observed to be 47% with HPE specificity of 52%. MRI has 50% sensitivity in predicating HPE with 92% specificity. The diagnostic accuracy is 90%.

MRI has 100% diagnostic accuracy in predicting HPE, Table 1.

Extension	Percentage	Frequency
Mass lesion confined to the cervix	47%	25
Extension of lesion to the upper two-third of vagina	16%	9
Extension to the parametrial infiltrations	16%	9
Pelvic lymphadenopathy	8%	4
Retroperitoneal lymphadenopathy	6%	3
Extension of lesion to lower 2-3rd of vagina	2%	1
Invasion of the urinary bladder	2%	1
Rectum invasions	4%	2
Extension to the pelvis	0%	0
Histopathological Examinations (HPE) Findings		
Mass lesion of cervix	47%	25
Extension to upper two-third of the vagina	16%	9
Micro invasive carcinoma	4%	2
Pelvic lymph node	4%	2

Table 1: Clinical diagnosed cases distribution according to histopathological HPE and MRI findings

The staging of cervical carcinoma was done in accordance with FIGO standards. The 47% cases of stage I B, 16% cases of stage II A, 16% cases of stage II B was diagnosed. Stage I A, stage III C1, stage III C2 and stage IV A have equal share of 2%. The 1% cases of Stage III A were reported (shown in Table 2).

Staging of cervical carcinoma	Percentage	Number
Stage I B	47%	25
Stage II A	16%	9
Stage II B	16%	9
Stage I A	4%	2
Stage III C1	4%	2
Stage III C2	4%	2
Stage IV A	4%	2
Stage III A	2%	1

Table 2: Staging of cervical carcinoma and their respective percentage

DISCUSSION

Cervical carcinoma has highest mortality ratio in developing countries. This type of cancer shares second highest number among the women of age 15-44 years. The squamocolumnar junction are the most common origin sites of cervical carcinoma in younger women, while in older women the cancer mostly originates from endocervical canal [15]. The lesion of the cervix either protrudes to vagina or invades to myometrium. The standardized mortality rate of cervical carcinoma is also high. It is as most common gynecological malignancy with the highest morbidity rates [16]. For management and control of malignant diseases early and accurate diagnosis is required. In this regard, MRI and ultrasonography are widely used. The present study was conducted to evaluate the diagnostic accuracy of MRI in detection of cervical carcinoma [17]. The most commonly used screening test for cervical carcinoma are HPV and Papanicolaou test. MRI and PET-CT are used for diagnostic purposes in the advanced disease cases. According to the results the 87.5% of patients was diagnosed with squamous cell carcinoma. The 4.2% patients have poorly differentiated carcinoma on HPE. 2.1% patients had in situ carcinoma [18]. The findings of our study were comparable to the study conducted by Collettini F. In their about 80-90% patients were diagnosed with squamous cell carcinoma. The stage IB carcinoma was diagnosed in about 47.91% patients, stage IIA carcinoma in about 16.67% patients. While other 16.6% were diagnosed with stage IIB carcinoma. According to the study conducted by Shweel MA et al. stage IB carcinoma was observed in 6.6%, Stage IIA in 40.3%, Stage IIB in 26.6% and another Stage IVA carcinoma in 26.6% [19]. The stage IB was observed in the most of the patients. In our study three patients was detected with stage IA with no abnormality seen under MRI. Both MRI and HPE are accurate in diagnosis of extension and involvement of carcinoma. The MRI and HPE both showed the similar results of cervix mass lesions in about 47.9%. Similarly, in about 16.66% the upper 2-3rd of the vagina was involved. The lymph node metastasis on HPE was observed in 4.16% patients, and other 8.33% has involvement of pelvic lymphadenopathy [20]. MRI not only help to clearly identify the paramaterial infiltration, urinary bladder. The results of HPE and MRI was comparable. The study conducted by Shweel MA et al., depicted that the results of magnetic resonance imaging are comparable to histopathological staging. Two patients were observed at Stage IIA. The one patient with Stage IIB disease was observed in our study [21-22]. The study conducted by Morimura et al., concluded that MRI has high specificity of about (99.2%) and high sensitivity of about (88.5%) for diagnosis of cervical carcinoma. The Shweel MA et al., showed that the sensitivity of MRI was 100% and specificity was 100%. With sufficient confidence level that are achievable through MRI the absence of rectal and bladder invasion can be diagnosed. MRI has low sensitivity in the cases where evaluation of metastasis in normal-sized lymph node is needed [23]. Parametrium invasions of cervical carcinoma has strong influenced on the staging and treatment of the cancer. Shweel MA et al., used MRI to detect parametrial infiltrations the sensitivity of MRI was about 100% with 85.7% specificity. In a study conducted by Nisha et al., the sensitivity and specificity was 60% and 100% respectively. The accuracy rate of MRI in diagnosis was calculated as 90%. In about 80% patients the cervical carcinoma was metastasized to pelvic lymph node . The sensitivity, accuracy and specificity was observed as 100%, 96% and 96.1% respectively in the study conducted by Kim

WY. The parametrial infiltration was detected in about 16.6% cases. MRI is a non-invasive modality. MRI not only help to diagnose the main prognostic factor involve in cervical carcinoma but also give insight for selection of best therapeutics approach. To depict primary tumor the imaging modality MRI is widely used. In our study the correlation between HPE and MRI was observed[24].

CONCLUSION

Staging is a crucial factor in order to determine the treatment strategy for the malignant diseases. Cervical carcinoma is common type of tumor among women globally. Its increasing prevalence and higher mortality and morbidity rates are raising it as a challenging type of cancer. Therefor the need of the hour is to determine best diagnostic tool for identification of stage of cancer, its location, size, lesions extensions and metastasis. MRI being a non-invasive imaging modality is proving to be more effective diagnostic method with higher accuracy and better specificity and sensitivity.

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