Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2013; 1(1): 1177-1180 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2013.v01i06.0108
Received: 14-10-2013, Accepted: 30-11-2013, Published: 31-12-2013

Research Article

Correlation of MRI Staging of Carcinoma Cervix with USG and CT scan

Md. Nazrul Islam Mollah[1*], A. K. M. Anowar Hossain[2], Zereen Sultana Deepa[3], A K Al Miraj[4]

[1]Medical Officer, Radiology & Imaging Department, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh
[2]Medical Officer, Radiology & Imaging Department, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh
[3]Medical Officer, Radiology & Imaging Department, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh
[4]Research Assistant, Vascular Surgery Department, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

***Corresponding author**
Md. Nazrul Islam Mollah

Abstract: ***Background:*** Cervical cancer is one of the main causes of cancer death in women, most of which is caused by human papillomavirus (HPV) infection. Approximately 86% of women who die from cervical cancer are in developing countries. Uterine cervical cancer is the most common gynecologic malignancy and the second most common cancer in women worldwide in terms of incidence and mortality. The present study was conducted to assess MR imaging staging in uterine cervical carcinoma. ***Methods:*** This prospective study was conducted on 120 patients visited to the Dept. of Radiology & Imaging, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh July 2012 to June 2013. Total 120 patients of neoplastic etiology involving endocervix. All patients diagnosed as having uterine cervical carcinoma were included in this study. All were informed regarding the study and their consent was obtained. ***Results:*** Total 120 patients of neoplastic etiology involving endocervix. MRI showed high rate of detection (96.7%) as compared to CT scan and USG with failure of detection only in lesion staged Ia1 or Ia2 which represents microscopic involvement of carcinoma of cervix. CT scan was able to detect nodes in 80% cases. USG failed to demonstrate enlarged nodes in 6 cases. Maximum stage was IV seen in 21% followed by IIb in 20% and Ib2 in 16%. The difference was significant ($p< 0.05$). ***Conclusion:*** In patients with cervical cancer, pretreatment MRI provides higher spatial soft tissue resolution which can define pelvic tumor extent, including a more accurate assessment of tumor size (due to multiplanar evaluation), parametrial invasion, pelvic sidewall invasion, and adjacent pelvic organ invasion. Authors found that MRI is highly sensitive in detection of early stage of carcinoma of cervix.
Keywords: CT scan, MRI, USG.

INTRODUCTION

Cervical cancer is one of the main causes of cancer death in women, most of which is caused by human papillomavirus (HPV) infection. Approximately 86% of women who die from cervical cancer are in developing countries [1-3]. According to the GLOBOCAN publication in 2020, cervical cancer is ranked as the fifth most common female cancer (16.4 per 100,000), or the third most common in Thailand with the estimated number of approximately 9158 (9.4% of all female cancer patients) [4]. The treatment of choice for cervical cancer is divided into two main strategies depending on the clinical staging based on the International Federation of Gynecology and Obstetrics (FIGO) classification system [5]. Although these were not mentioned in FIGO stage, lymph node metastasis has a very close relationship with the prognosis of cervical cancer and is the most important in cervical cancers [6,7]. Magnetic Resonance Imaging (MRI) has radically modified the practice of medicine in general and radiology in particular. Nowadays Magnetic Resonance imaging (MRI) in evaluation of gynecological malignancy especially carcinoma of cervix is considered the primary modality of choice [8]. Availability of higher magnetic strength magnets and superior coil technology has led to the development of highly sophisticated MR sequences that has boosted the potential of magnetic resonance imaging [9]. However, MRI has certain limitations. MRI is contraindicated in patients with cardiac pacemakers, cochlear implants, metallic prosthesis and fixators. Also, MRI is relatively contraindicated in first trimester of pregnancy. CT has advantage over MRI in evaluation of any bony involvement [10]. MRI is based on the safe interaction between radio waves and hydrogen nuclei in the body in presence of a strong magnetic field. The physical characteristics of a volume element or 'voxel' of tissue are translated by the computer into a two-dimensional image composed of picture elements or 'pixels'[11]. The pixel intensity in MRI reflects the density of hydrogen, generally as water or fat. To be more exact, MR signal intensity reflects the density of mobile hydrogen nuclei modified by the chemical environment, that is, by the magnetic relaxation times, T1 and T2, and by motion.

The present study was conducted to assess MR imaging staging in uterine cervical carcinoma.

MATERIALS & METHODS

This prospective study was conducted on 120 patients visited to the Dept. of Radiology & Imaging, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh July 2012 to June 2013. All patients diagnosed as having uterine cervical carcinoma were included in this study. All were informed regarding the study and their consent was obtained. MR characteristics of different sequences including the contrast-enhanced sequences were noted and recorded.

The radiologists were aware of the biopsy-proven diagnosis of cervical cancer but were blinded to the patient's identity, the results of physical examination, and clinical staging. The following findings were recorded by radiologists [12].

1. Tumor size (in the longest dimension)
2. Vaginal wall invasion (disruption of low-signal intensity vaginal wall)
3. Parametrial invasion (disruption of the low-intensity cervical stromal rim, nodularity of parametrial and/or tumor extending to parametrium)
4. Pelvic sidewall invasion (extension of tumor within 2 mm of pelvic sidewall, or involvement of internal obturator, piriformis or levator ani muscles with or without dilated ureter)

Data such as name, age etc. was recorded. Relevant history of illness and significant clinical findings of all patients were recorded. Patients were scanned on 1.5 Tesla MRI Scanner. Contrast enhanced scans were performed wherever indicated. The contrast used in the study was Gadolinium- DTPA at the rate 0.1 ml mol/kg. MR characteristics of different sequences including the contrast-enhanced sequences were noted and recorded. The results of this study were analyzed. P value less than 0.05 was considered significant.

RESULTS

Table 1: Detection of lesion

Modality	No. of patients	Percentage
USG	100	83.33
CT	84	70.0
MRI	116	96.7

Table 1 shows that MRI showed high rate of detection (96.7%) as compared to CT scan and USG with failure of detection only in lesion staged Ia1 or Ia2 which represents microscopic involvement of carcinoma of cervix.

Table 2: Lymph node involvement

Modality	No. of patients	Percentage
USG	12	50.0
CT	20	83.33
MRI	24	100.0

Table 2 shows that CT scan was able to detect nodes in 83.33% cases. USG failed to demonstrate enlarged nodes in 6 cases.

Table 3: Assessment of Staging on MRI

Stage	MRI (%)	p-value
Ia1	0	0.02
Ia2	0	
Ib1	44	
Ib2	64	
IIa	72	
IIb	80	
IIIa	40	
IIIb	16	
IV	84	

Table 3 shows that maximum stage was IV seen in 21% followed by IIb in 20% and Ib2 in 16%. The difference was significant ($P< 0.05$).

DISCUSSION

Cervical cancer is particularly harmful to women in developing countries, and screening its level is very important. However, two imaging techniques, CT and MRI, play a vital role in the early stage of cancer, treatment strategy and treatment of response evaluation. The tumor can demonstrate a wide variety of morphologic features and may be exophytic, infiltrating, or endocervical with a barrel shape [13]. In young women, cervical carcinoma usually originates from the squamo-columnar junction and tends to be more exophytic, whereas in older women it originates more

often in the endocervical canal. The bulk of the lesion is centered at the level of the cervix, with either protrusion into the vagina or invasion of the lower myometrium. Prolapsed submucous fibroids are distinctly more hypointense at T2- weighted imaging than cervical carcinomas [14]. The present study was conducted to assess MR imaging staging in uterine cervical carcinoma. In this study, MRI showed high rate of detection (96 %) as compared to CT scan and USG with failure of detection only in lesion staged Ia1 or Ia2 which represents microscopic involvement of carcinoma of cervix. CT scan proved unrewarding with respect to lesion differentiation due to lack of contrast difference with adjacent tissue. USG showed presence of bulky cervix without any clear demarcation of lesion during early stages [15]. The size of the tumor (ie, whether greater or less than 4 cm in diameter) has a great impact on the choice of therapy, and there is good correlation between MR imaging findings and macroscopic measurements. However, the size of the lesion may rarely be overestimated at T2-weighted imaging due to inflammation or edema. The shape and direction of growth should be noted because they are important for brachytherapy planning [16]. We observed that CT scan was able to detect nodes in 80 % cases. USG failed to demonstrate enlarged nodes in 6 cases. Lymph node disease detection is based only on a size criterion, the most widely accepted being a transverse diameter exceeding 10 mm. Lymph nodes are best detected with T2-weighted imaging, at which they demonstrate intermediate signal intensity and are well differentiated from the hypointense muscles and blood vessels. A slightly hyperintense ring flow artifact is often found in the iliac veins and should not be confused with adenopathy. When treatment planning changes due to a suspicious increase in the volume of a lymph node, biopsy should be performed because the node may be falsely positive due to inflammation [17]. We found that maximum stage was IV seen in 21% followed by IIb in 20% and Ib2 in 16%. Shirazi AS. et al. [18] reviewed the diagnostic performance of computed tomography (CT) and magnetic resonance imaging (MRI) in staging of cervical carcinoma. The specificities for rectum invasion were comparable. Differences in patient sample size, publication year, methodological criteria, and MRI techniques had no effect on the summary estimates. They concluded that for overall staging of cervical carcinoma, MRI is more accurate than CT. Luo et al. compared sensitivity, specificity and diagnostic accordance rate, the diagnostic value and clinical significance of MRI, CT and MRI combined with CT in the diagnosis of lymph node metastasis of early cervical cancer. The sensitivity, specificity and diagnostic accordance rate of MRI in the diagnosis of lymph node metastasis of early cervical cancer in stage Ia-Ib were 75.00, 72.92 and 77.50%, respectively, which were significantly higher than those of PET/CT in the same period ($P<0.05$). The sensitivity, specificity and diagnostic accordance rate of MRI combined with CT in the diagnosis of early cervical cancer in stage Ia-Ib were 78.13, 87.50 and 83.75%, respectively, which were significantly higher than those of MRI or CT alone ($P<0.05$). However, the sensitivity, specificity and diagnostic accordance rate of MRI combined with CT in the diagnosis of lymph node metastasis of early cervical cancer in stage IIa-IIb were 91.66, 82.81 and 88.13%, respectively, which were significantly higher than those of MRI or CT alone ($P<0.05$). MRI is superior to CT in the diagnosis of lymph node metastasis of early cervical cancer. However, the diagnostic efficiency of combined scans of the two is far higher than that of MRI or CT alone, which has more diagnostic value. In clinic, MRI and CT should be combined to improve the diagnostic accuracy of diseases [19]. Chung H, et al. [20] also recommended MRI is as the best modality for image-guided brachytherapy due to its high image resolution and clear target volume definition. Therefore, our study has a small and insufficient number of patients to show a solid conclusion about the correlation between clinical and MRI stagings. Also, because this study is a retrospective review, we cannot standardize MRI protocol and time interval between clinical staging and pretreatment MRI examination, which might result in inaccurate comparison between clinical and MRI stagings.

CONCLUSION

In patients with cervical cancer, pretreatment MRI provides higher spatial soft tissue resolution which can define pelvic tumor extent, including a more accurate assessment of tumor size (due to multiplanar evaluation), parametrial invasion, pelvic sidewall invasion, and adjacent pelvic organ invasion. Authors found that MRI is highly sensitive in detection of early stage of carcinoma of cervix.

REFERENCES

1. Small W Jr, Bacon MA, Bajaj A, Chuang LT, Fisher BJ, Harkenrider MM, Mileshkin LR, Viswanathan AN et al.: Cervical cancer: A global health crisis. Cancer 2007; 123:2404-2412.
2. Denny L. Cervical cancer: Prevention and treatment. Discov Med 2012; 14:125-131.
3. Dornhöfer N, Höckel M. New developments in the surgical therapy of cervical carcinoma. Ann NY Acad Sci 2008; 1138:233–252.
4. Hosaka M, Watari H, Mitamura T, Konno Y, Odagiri T, Kato T Et al. Survival and prognosticators of node- positive cervical cancer patients treated with radical hysterectomy and systematic lymphadenectomy. Int JClin Oncol 2011; 16:33-38.
5. John R. Thornbury. MRI of carcinoma of the cervix –Urologic radiology 2009.
6. Jena A, Oberoi R et al. Parametrial invasion in carcinoma of cervix: Role of MRI measured tumour volume BJR 2005.
7. McVeigh, Patrick et al. - Diffusion-weighted MRI in cervical cancer, European Radiology 2008;18:1058-1064.

8. Greco A, Mason P Et al. Staging of carcinoma of the uterine cervix: MRI-surgical correlation, Clinical Radiology 1989;40(4):401-5.
9. Vanzulli, Sironi S. - MRI in stage I carcinoma of the uterine cervix: evaluation of residual uninvolved myometrium and pericervical tissues, European Radiology 2004, 190-196.
10. Camisao CC, Lombardelli KV et al. MRI parameters as a predictor of outcomes in advanced cervical carcinomas – Journal of Clinical Oncology 2008.
11. Ho CM, Chien TY et al. Staging of cervical cancer: comparison between magnetic resonance imaging, computed tomography and pelvic examination under anesthesia J Formos Medical Association 1992;(10):982-90.
12. Kim SH, Choi Bi Et al. Preoperative staging of uterine cervical carcinoma: comparison of CT and MRI in 99 patients J of Computed assisted tomography 1993;17(4):633- 40.
13. Hancke K, Heilmann V Et al. Pretreatment staging of cervical cancer: Is imaging better than palpation? Role of CT and MRI in preoperative staging of cervical cancer: single institution results for 255 patients Ann Surg Oncology 2008;15(10):2856-61.
14. Okamoto Y, Tanaka YO et al. MR imaging of the uterine cervix: imaging – pathologic correlation. Radiographics 2003; 23:425-455.
15. Dhoot NM, Kumar V, Shinagare A, Kataki AC, Barmon D, Bhuyan U Evaluation of carcinoma cervix using magnetic resonance imaging: correlation with clinical FIGO staging and impact on management. J Med Imaging Radiat Oncol. 2012; 56(1):58–65.
16. Nicolet V, Carignan L, Bourdon F, Prosmanne O. MR imaging of cervical carcinoma: a practical staging approach. Radiographics. 2000; 20(6):1539–1549.
17. Ozsarlak O, Tjalma W, Schepens E, Corthouts B, Beeck OB, Van ME et al. The correlation of preoperative CT, MR imaging, and clinical staging (FIGO) with histopathology findings in primary cervical carcinoma. Eur Radiol. 2003; 13(10):2338–2345.
18. Shirazi AS, Razi T, Cheraghi F, Rahim F, Ehsani S, Davoodi M.Diagnostic accuracy of magnetic resonance imaging versus clinical staging in cervical cancer. Asian Pac J Cancer Prev. 2014; 15(14):5729–5732.
19. Bipat S, Glas AS, van der Velden J, Zwinderman AH, Bossuyt PM, Stoker J. Computed tomography and magnetic resonance imaging in staging of uterine cervical carcinoma: a systematic review. Gynecol Oncol. 2003; 91(1):59–66.
20. Chung H, Ahn HS, Kim YS, Lee EJ, Ryu HS, Chang KH, Kim SJ. The value of cystoscopy and intravenous urography after magnetic resonance imaging or computed tomography in the staging of cervical carcinoma. Yonsei Med J. 2001; 42(5):527–531.