Biomedical Research 2017; 28 (12): 5360-5363 *ISSN 0970-938X*
www.biomedres.info

Contrastive analysis of the value of multisliecs helieal CT (MSCT) and magnetic resonance imaging (MRI) in preoperative staging of cervical cancer.

Shouqiang Jia[1,2], Ying Li[2], Wenjian Xu[1*]

[1]Department of Radiology, the Affiliated Hospital of Qingdao University, Qingdao, Shandong, PR China

[2]Department of Radiology, the People's Hospital of LaiWu City, LaiWu, Shandong, PR China

Abstract

Objective: This research was aimed to explore the value of multisliecs helieal CT (MSCT) and Magnetic Resonance Imaging (MRI) in preoperative staging diagnosis of cervical cancer.
Methods: From January 2015 to January 2017, a total of 150 patients with cervical cancer were selected from our hospital as the study objects with all confirmed by surgery pathology. All patients were treated with MSCT and MRI examination before the operation, preoperative staging diagnosis of cervical cancer among the patients was implemented based on their test results, diagnosis effects of the two detection methods for preoperative staging of cervical cancer were analysed.
Results: With the confirmation of surgery pathology, among 150 cervical cancer patients there were 25 confirmed as the stage of I, 53 II, 42 III, 30 IV. Accordance rate of stage I-III is higher in terms of MRI examination than the result of MSCT test and the difference in between has statistical significance (P<0.05). The detection accuracy of MRI test was significantly higher than that of MSCT of statistical difference (P<0.05) in terms of the examination of tumors with a diameter less than 3 cm while there was no difference in detection accuracy of the two examinations about the indicators of tumors with a diameter of no less than 3 cm, P>0.05.
Conclusion: MRI has better effects in preoperative staging diagnosis of cervical cancer than MSCT.

Keywords: Cervical cancer, Multisliecs helieal CT (MSCT), Magnetic resonance imaging (MRI), Preoperative staging, Diagnosis.

Accepted on April 24, 2017

Introduction

Cervical cancer is the fourth most common female malignant tumor and the most common malignant tumor originating from female reproductive tract. In 2013, 49,560 new cases of cervical cancer were diagnosed and 8190 patients died of this disease [1]. The accurate staging is the key for the selection of proper treatment strategy. Molecular imaging techniques, which originated from radiopharmacology, have shown potential in enhancing the diagnosis and treatment of various human diseases including cancer [2].

In the clinical treatment of solid tumors, novel molecular imaging techniques, such as MSCT, MRI and PET, have been shown to play pivotal roles in accurate diagnosis and staging [2]. However, each method showed both merits and drawbacks in clinical practice.

MSCT and MRI are two commonly used imaging methods in the diagnosis of gynecologic diseases. MSCT is based on the principle of CT but with higher efficiency in collecting X-ray signal than conventional CT [3]. MRI, which is derived from Nuclear Magnetic Resonance (NMR), is a medical imaging technique based on the magnetic properties of certain atomic nuclei [4]. The hazards of X-rays limited the clinical application of MSCT [3]. Although MRI avoids the use of X-rays, this method is still challenged by the risks and discomfort caused by the scans [5]. At present, researches on diagnosis effects of the two methods remain inconsistent in current clinical trials [6,7].

Under the above background, 150 cervical cancer patients in our hospital were given preoperative MSCT and MRI test and preoperative staging effects of the two detection modes were compared and specific diagnosis process was retrospectively analysed as follows.

Materials and Methods

General data

From January 2015 to January 2017, a total of 150 patients with cervical cancer were selected from our hospital as the study objects with all confirmed by surgery pathology.

Enrolment condition

The individuals were confirmed as cervical cancer patients by surgery pathology and patients have more or less signals of symptoms like irregular vaginal bleeding, rising of vaginal secretions, dysuria, lower abdomen pain and menopause before treatment; Patients were given imaging examination within one month; patients were approved by the hospital ethics association and voluntary to take part in treatment and study.

Exclusion condition

Taboos were examined by MSCT and MRI; Patients had serious illness of important organs like heart, lung, kidney, spleen and stomach; Patients had other gynecological diseases or malignant tumors; Patients were allergic to contrast media; Patients had difficulties in cooperating with research with disturbance of consciousness. The selected patients were aged between 23 and 76 with an average of 48.7 (s=7.6) with a disease course of 3 months to 7 years, 2.4 years on average (s=1.6). Cancer type: 36 cases of adenocarcinoma, 105 cases of squamous carcinoma, 9 cases of adenosquamous carcinoma; 66 cases of tumor diameter<3 cm, 84 cases of ≥ 3 cm.

Methods

All patients were given MSCT and MRI detection: MSCT detection: In this study, all patients were tested through OPTIMA660 type 64 128 layer spiral CT machine produced by American GE company with the maintenance of supine position, filling bladder before the test and a moderately full bladder. They were firstly given conventional CT scan from the site of lower margin of pubic bone to iliac crest bone- bottom up scanning. Relevant parameters of CT examinations were set as: tube voltage 120 kv, tube current 200-300 mA, thick layer 5-10 mm, pitch 1 mm and pitch 1.5 mm. Patients were given enhancement scan after the ending of plain scan and 80-100 ml non-ionic contrast medium iohexol (Yangtze River Pharmaceutical Industry co., ltd, approved by H10970323) was injected into patients' veins through high pressure injector to form radiography, 300 mg/ml, at the injection rate of 3-4 ml/s with delayed scan. Scan space was set 3 mm and matrix 256 × 256, computer imaging tracer was implemented, automatic arterial phase scan was conducted when the patients' abdominal aorta CT value reached170~180 hu followed by parenchymal phase scan 65 s later and the imaging of bladder as well as ureter180 s later [8,9]. Size, site, form, status of surrounding tissues and organs and condition of hydronephrosis were observed after the examination.

MRI detection

All patients in this study were tested through Signa Hde 1.5 T MR Scanner produced by American GE Company with the maintenance of supine position, filling bladder before the test and a moderately full bladder and a scanning of body coil. Patients were given multiple body position scanning with a thick layer of 5 mm and a layer spacing of 1-2 mm, 20 ml Gd-DOTA (Guerbet, Imported drug registration number: H20110119) was injected to the veins of patients to perform conventional angiography. T1WI SE sequence, with TR/TE as 645/11,T2WI TSE sequence with TR/TE as 4000/72,T2WI STIR(fat suppressed sequence) with TR/TE as 5270/96, sagittal view T2WI TSE STIR with TR/TE as 5430/96, FOV as 30 cm [10,11].

All patients received elective surgery treatment, according to actual results of imaging examination and focus tissues of the patients were collected after the surgery to perform pathological examination, and the focus tissues were treated with conventional dyeing, fixation and conventional microscopy, and finally actual pathologic classification was determined according to the result of pathological examination [12].

Observation index

The staging results of cervical cancer of MSCT and MRI test with pathological results as the gold standard, stage: I-IV stages. Stage I: Invasive carcinoma can only be found in cervix. Stage II: cancer cells spread out beyond uterus but haven't reach the lower third of the vagina or pelvic sidewall. Stage III: spread of cancer cells reached the lower third of the vagina or pelvic sidewall. Stage IV: cancer cells spread out beyond pelvic.

Statistical approach

The staging results of cervical cancer were described as percentage and χ^2 test and was applied with statistical significant of P<0.05. Statistical software: SPSS 19.0 and Microsoft office excel.

Results

Staging results analysis of cervical cancer of MSCT and MRI test

With the confirmation of surgery pathology, among 150 cervical cancer patients there were 25 confirmed as the stage of I, 53 II, 42 III, 30 IV. As to MRI examination, there was no difference in total accordance rate of preoperative staging results compared with pathological findings, χ^2=3.030, P>0.05. But the accordance rate of stage I-III and the total accordance rate were higher than the result of MSCT test of statistical significance(P<0.05) shown in Table 1.

Table 1. *Staging results analysis of cervical cancer by MSCT and MRI test (n (%); n=150).*

Group	I (n=25)	II (n=53)	III (n=42)	IV (n=30)	Total accordance rate
MSCT	16 (64.0)	44 (83.0)	36 (85.7)	28 (93.3)	124 (82.7)
MRI	24 (96.0)*	51 (96.2)*	42 (100.0)*	30 (100.0)	147 (98.0)*
χ^2	20.054	4.97	6.462	2.069	20.193
P	<0.05	<0.05	<0.05	>0.05	<0.05

Note: In comparison with MSCT group. *P<0.05

Examination effects of MSCT and MRI in terms of tumors with different diameters

MSCT result showed 63 cases<3 cm, 87 ≥ 3 cm; MRI result showed 70 cases<3 cm, 80 ≥ 3 cm. The detection accuracy of MRI test (95.5%) was significantly higher than that of MSCT (83.3%) of statistical difference in terms of the examination of tumors with a diameter<3 cm, χ^2=5.114, (P<0.05). There was no difference in detection accuracy of the two examinations about the indicators of tumors with a diameter of ≥ 3 cm, 91.7% for MRI and 90.5% for MSCT, χ^2=0.073, P>0.05. Detection accuracy of tumors with different diameters showed no significant difference in MRI (93.3%) and MSCT test (87.3%), χ^2=3.092, P>0.05, shown in Tables 2 and 3.

Table 2. *MSCT results of tumors with different diameters.*

Method		Pathological findings		Total
		Diameter<3 cm	Diameter ≥ 3 cm	
MSCT	Diameter<3 cm	55	8	63
	Diameter ≥ 3 cm	11	76	87
Total		66	84	150

Table 3. *MRI results of tumors with different diameters.*

Method		Pathological findings		Total
		Diameter<3 cm	Diameter ≥ 3 cm	
MRI	Diameter<3 cm	63	7	70
	Diameter ≥ 3 cm	3	77	80
Total		66	84	150

Discussion

Cervical cancer has a gradually rising trend in current clinical incidence and has become one of the important factors that cause women to die of tumor diseases, posing a serious threat to patient's life safety and quality. Surgery, chemotherapy and radiotherapy are commonly used in the clinical treatment of cervical cancer. With further deeper researches, treatment effect of cervical cancer remains different in terms of different stages, and treatment ways of patients at different stage exist certain differences. So to strengthen the understanding of the disease staging of patients and timely choose appropriate surgical timing and treatment plan according to the actual status of the patients become the foundation of improving the prognosis of patients [13,14]. Pathological examination is the gold standard when it comes to the current clinical diagnosis of cervical cancer, but it also may cause moderately larger trauma to the patients and is likely to result in unnecessary damages among patients [15]. Previous preoperative staging diagnosis of cervical cancer mainly includes comprehensive diagnosis like physical examination, endoscopy and as X-rays with the poorer effects and the possibility of missed diagnosis and misdiagnosis [16-18]. Imaging examination is the current detection method commonly used in the clinical trial and MSCT and MRI are two common ways of cervical disease detection. MSCT is the diagnosis method forming on the basis of CT examination with advantages of clear imaging, simple operation, non-invasion, faster imaging rapidity than CT and the capability of providing CT image reconstruction data of various thick layers at one time [19]. MRI is the diagnosis way receiving electromagnetic signal by way of magnetic resonance display to reconstruct fault information of the body with the advantages of being simple, fast and nonradioactive [20]. Although the application of MSCT in the diagnosis of cervical cancer has not been reported yet, a previous clinical study which aimed to investigate the efficacy of MSCT in lung cancer screening has shown that the routine application of MSCT screening is questionable due to the high early recall rates [21]. Compared with MSCT, MRI is more popular imaging technique that has been widely used in the diagnosis of various human diseases including solid tumor. MRI has been shown to be highly accurate in the diagnosis of women with early-stage cervical cancer [22]. In the local staging of cervical cancer, MRI showed good agreement with three-dimensional sonography [23]. Based on previous studies, we may conclude that MRI is better technique is the diagnosis of cancer than MSCT. Consistent results were found in our study. It was found that the accordance rate of stages I-III and the total accordance rate of were higher in terms of MRI examination than in terms of MSCT test, illustrating that MRI had better effects in preoperative staging diagnosis of cervical cancer than MSCT. And MRI had higher detection accuracy of tumors with diameter<3 cm compared with the result of MSCT examination, showing that MRI had better effects in testing minute lesions. MSCT inspection mainly implements three-dimensional reconstruction and enables to multi-angle test the lesions to clearly understand the infiltration status and local lesions. And MRI examination can provide a variety of signals with higher resolution of soft tissues, able to clearly reveal small lesions; And the early cervical cancer is shown as equidensity or low signal in MSCT detection without significant difference with normal tissues, thus making it more possible to cause misdiagnosis or missed diagnosis while the signals of early cervical cancer in MRI test are strikingly different from those of normal tissues, enabling to effectively reduce the misdiagnosis and improve diagnosis effectiveness [24-27].

In conclusion, our study compared the applications of the MSCT and MRI in the diagnosis of cervical cancer. MRI showed higher accuracy in the determination of both preoperative staging and tumor diameters of cervical cancer compared with MSCT. In order to get more accurate conclusions, further clinical studies with lager samples sizes and participants with different background are still needed.

References

1. Ries LAG, Harkins D, Krapcho M. SEER cancer statistics review, 1975-2003. Nat Cancer Inst 2006.
2. Hussain T, Nguyen QT. Molecular imaging for cancer diagnosis and surgery. Adv Drug Deliv Rev 2014; 66: 90-100.
3. Goldman LW. Principles of CT: multislice CT. J Nucl Med Technol 2008; 36: 57-68.
4. Dale BM, Brown MA, Semelka RC. MRI: basic principles and applications. John Wiley Sons 2015.
5. Heilmaier C, Theysohn JM, Maderwald S. A large-scale study on subjective perception of discomfort during 7 and 1.5 T MRI examinations. Bioelectromagn 2011; 32: 610-619.
6. Zhang HS. Comparison of value of MS CT and MRI in the preoperative staging diagnosis of cervical cancer. Chinese J Woman Child Health Res 2014; 25: 111-113.
7. Pangyong. Cinical analysis of MSCT in the diagnosis of cervical lymph node metastasis. China Health Care Nutrition 2013; 23: 795.
8. Yu Y. The value of CT and MRI in diagnosis of cervical lymph node metastasis. Hainan Med Coll 2014; 25: 541-543.
9. Zhu Y, Zhao H, Cheng G. Contrast research on CT and MRI localization of locally advanced cervical cancer in three dimensional conformal brachytherapy. Chinese J Rad Oncol 2015; 28: 408-413.
10. Zhang Q, Lian P. Clinical research value of preoperative CT and MRI diagnosis of invasive cervical cancer. Chinese J CT MRI 2016; 14: 104-106,113.
11. Xia S, Zhang X, Wu J. Application analysis of MSCT and MRI in preoperative staging of invasive cervical cancer. J Med Imag 2014; 24: 672-674.
12. Xie Z. Analysis of clinical value of CT and MRI in the diagnosis of cervical cancer. Chinese Foreign Med Res 2014; 12: 71-73.
13. Lu C, Cheng K. Clinical value of multislice computed tomography (CT) and magnetic resonance imaging (MRI) in preoperative staging of invasive cervical cancer. China Dig Med 2016; 11: 28-29.
14. Yang D. Application of CT, MRI and positron emission tomography CT in the diagnosis of cervical cancer. J Int Oncol 2014; 41: 220-223.
15. Sun D. Clinical value analysis of CT and MRI in the diagnosis of cervical cancer. Med Innov China 2015; 13: 146-149.
16. Chen L. Application of CT and MRI perfusion imaging in the diagnosis of parametrial infiltration and lymph node metastasis. Shanghai Inst Pharm Industry 2015; 36: 50-54.
17. Wang ZH. Contrastive analysis of diffusion weighted imaging and multilayer spiral CT in the diagnosis of cervical cancer. J Commun Med 2015; 13: 40-42.
18. Yao F, Cao Y, Kong D. Value comparison of CT and MRI in the diagnosis of cervical cancer. China Health Stand Manag 2015; 5: 192-193.
19. Li X, Qing SD. Contrastive analysis of CT and MRI in the diagnosis of cervical cancer. China Med Pharm 2014; 3: 102-104.
20. Hu G. Clinical value analysis of preoperative CT and MRI in the diagnosis of invasive cervical cancer. Womens Health Res 2016; 23: 221-224.
21. Becker N, Motsch E, Gross ML. Randomized study on early detection of lung cancer with MSCT in Germany: results of the first 3 years of follow-up after randomization. J Thorac Oncol 2015; 10: 890-896.
22. Epstein E, Testa A, Gaurilcikas A. Early-stage cervical cancer: tumor delineation by magnetic resonance imaging and ultrasound-a European multicenter trial. Gynecol Oncol 2013; 128: 449-453.
23. Arribas S, Alcazar JL, Arraiza M. Three-dimensional transvaginal sonography and magnetic resonance imaging for local staging of cervical cancer. J Ultrasound Med 2016; 35: 867-873.
24. Sheng Y, He Z. Application of MSCT and magnetic resonance imaging (MRI) in the preoperative staging of invasive cervical cancer. Clin Med Res Pract 2017; 2: 125-126.
25. Zhang S. Clinical value analysis of MRI in diagnosis and new staging of cervical cancer. World Latest Med Inform 2015; 15: 17-18.
26. Jiang Q, He G. Application study of ultrasonography and MRI in cervical cancer staging. Chinese J CT MRI 2016; 14: 101-103.
27. Tong Y, Ni X, Wang M. Application value of MRI diffusion weighted imaging in prediction of cervical cancer radiation sensitivity. Chinese J CT MRI 2015; 12: 58-60.

*Correspondence to

Wenjian Xu

Department of Radiology

The Affiliated Hospital of QingdaoUniversity

PR China