The Role of Diffusion weighted Imaging versus dynamic multiphase contrast enhanced MRI in the evaluation of uterine malignancies

Thesis

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Abstract

Recent developments in diagnostic imaging techniques have magnified the role and potential of MRI in female pelvic imaging. Functional imaging by means of dynamic multiphase contrast-enhanced magnetic resonance imaging (DCE-MRI) and diffusion weighted magnetic resonance imaging (DW-MRI) is now part of the standard imaging protocols for evaluation of the female pelvis.

In this review, we give an overview of both DCE-MRI and DW-MRI techniques, concentrating on their main clinical application in preoperative staging and their role in tailoring treatment options and therapy in patients with uterine malignancies. We were aiming to compare DW-MRI with DCE-MRI in a way to highlight the most cost effective method in management of patients with uterine malignancy.

DCE-MRI improves the accuracy of T2WI in staging of endometrial cancer. It also increases reader's confidence in assessment of parametrial infiltration and adjacent organ invasion in cancer cervix. DW-MRI is valuable in preoperative staging of patients with endometrial and cervical cancer, especially in detection of extra-uterine disease. It does increase reader's confidence for detection of recurrent disease in gynaecological malignancies and improves detection of small peritoneal implants.

Key words: endometrial carcinoma, cervical carcinoma, dynamic contrast enhanced MRI, Diffusion weighted MRI, functional imaging.

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Introduction

Endometrial carcinoma is the most common gynecological malignancy and the sixth most common neoplasm worldwide. It typically presents with abnormal uterine bleeding in 75% to 90% of patients ***(Jemal et al, 2011).***

Uterine cervical cancer is the fourth most common female malignancy and has a high mortality rate. Most women with cervical cancer are diagnosed before the age of 50. However; older women remain at risk. More than 20% of new cases are diagnosed in women over 65. Cervical cancer in women younger than age 20 is rare ***(Ferlay et al, 2015).***

Preoperative knowledge of loco-regional tumor extent may indirectly affect patient survival. Therefore, gaining knowledge of morphologic prognostic factors of cancer and of their inclusion in treatment planning could be an important step in further improving prognosis ***(Morrow et al, 1998).***

Uterine carcinoma is usually staged and managed on the basis of criteria proposed by the International Federation of Gynecology and Obstetrics (FIGO). However, the FIGO staging system is sometimes inaccurate, in spite of the fact that accurate staging is essential for appropriate treatment planning ***(Hori et al, 2009).***

Advances in magnetic resonance imaging (MRI) technology provide excellent soft tissue contrast resolution with multiplanar capabilities when evaluating the female pelvis ***(Peungjesada, 2009).***

The role of MRI in patients with histologically proven endometrial cancer is to evaluate the depth of myometrial and cervical invasion and detect pelvic lymph node involvement preoperatively thereby helping to determine the need for lymph node dissection. ***(Peungjesada, 2009).***

In cervical carcinoma, MRI now has an established role in staging the primary tumor, monitoring response to treatment, detecting complications and recurrence, and in planning radiotherapy. It has played a vital role in the development of fertility-sparing surgery in young women with cervical cancer ***(Reznek and Sahdev, 2005).*** Moreover, imaging findings of advanced disease can change patient management from potentially curative to palliative ***(Peungjesada et al, 2009).***

Functional imaging by means of dynamic multiphase contrast-enhanced magnetic resonance imaging (DCE-MRI) and diffusion weighted magnetic resonance imaging (DW-MRI) is now part of the standard imaging protocols for evaluation of the female pelvis ***(Sala et al, 2010).***

DCE-MRI improves the accuracy of T2WI in staging of endometrial cancer and is highly accurate in evaluating the depth of myometrial invasion as the majority of tumours are hypovascular compared to the adjacent enhancing myometrium ***(Sala et al, 2010).***

In case of cervical carcinoma, it can demonstrate tumor extension into the lower part of the uterus, parametrium, and paracervical fat as well as differentiate tumour recurrence from radiation fibrosis in patients with cervical cancer ***(Sala et al, 2010)***