DIFFUSION-WEIGHTED MAGNETIC RESONANCE IMAGING IN ENDOMETRIAL AND CERVICAL CARCINOMAS

Essay

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رسالة
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فى الاشعة التشخيصية

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SUMMARY

Diffusion-weighted magnetic resonance (MR) imaging is a functional imaging technique whose contrast derives from the random motion of water molecules within tissues. Although its use in intracranial imaging has been established for a number of years, problems with motion and susceptibility artifacts have limited its application in abdominal and pelvic imaging. However, the development of new imaging techniques, particularly novel methods of data acquisition and parallel imaging, has allowed much faster data acquisition with fewer artifacts, resulting in significant improvement in image quality in body applications. Because image contrast is derived from inherent differences in the restriction of the movement of water molecules, no exogenous contrast medium adminis-ration is required, so that diffusion-weighted sequences can now be included in routine patient assessment.

When diffusion-weighted MR imaging is used in gynecologic applications, cervical cancers have been shown to have significantly lower apparent diffusion coefficient (ADC) values compared with normal cervical tissue. Similar findings have been noted in endometrial cancers, with a tendency toward lower ADC values in higher-grade lesions. In addition, diffusion-weighted

LIST OF CONTENTS

Title	Page No.

LIST OF TABLES

Tab. No.	Title	Page No.

VIII

LIST OF FIGURES

LIST OF FIGURES (Cont...)

IV

V
LIST OF FIGURES (Cont...)

VI

LIST OF FIGURES (Cont...)

LIST OF ABBREVIATIONS

Abbrev.	Meaning
ADC	Apparent diffusion coefficient
AJCC	The American Joint Committee on Cancer
AUB	Abnormal uterine bleeding
CHESS	Chemical shift selective
CIN	Cervical intraepithelial neoplasia
CIS	Carcinoma in-situ
CNR	Contrast-to-noise ratio
DWI	Diffusion weighted imaging
EIN	Endometrial intraepithelial neoplasia
EPI	Echoplanar imaging
ETLs	Echo train lengths
FIGO	International Federation of Gynecology and Obstetrics
HCG	Human chorionic gonadotrophin
HIUML	Human uterine cervical malignant lymphoma
HPV	Human papilloma virus
HPF	High power field
Hz	Hertz
LMS	Leiomyosarcoma
MPG	Motion- providing gradient
MRI	Magnetic resonance imaging
MUSMN	Myxoid uterine smooth muscle neoplasms
Pap	Papanicolaou
RF	Radiofrequency
ROI	Region of interest

LIST OF ABBREVIATIONS (Cont...)

Abbrev.	Meaning
RT	Radiotherapy
SCJ	Squamocolumnar junction
SE	Spin-echo
SI	Signal intensity
SNR	Signal-to-noise ratio
T	Tesla
TE	Echo time
TR	Repetition time
UAE	Uterine arterial embolization
WI	Weighted image

ABSTRACT

Recent technical advances in diffusion-weighted imaging (DWI) greatly enhanced the clinical value of magnetic resonance imaging (MRI) of the body. DWI can provide excellent tissue contrast based on molecular diffusion and may be able to demonstrate malignant tumors. Quantitative measurement of the apparent diffusion coefficient (ADC) may be valuable in distinguishing between malignant and benign lesions.

The ADC can help to differentiate between normal and cancerous tissue in the uterine cervix and endometrium.

Also the ADC may be useful for monitoring the therapeutic outcome after chemotherapy and/or radiation therapy.

DWI demonstrates high intensity not only at the primary cancer site but also in detection of lymph node metastasis.

When added to conventional MRI findings, DWI and ADC values provide additional information and DWI may play an important role in the diagnosis of patients with gynecological diseases.

Key Words: Diffusion - ADC - Magnetic resonance imaging – uterus.

INTRODUCTION

Endometrial carcinoma is the most common female pelvic malignancy and the seventh most common neoplasm worldwide, with the highest incidence in North America and Europe. Endometrial carcinoma is staged according to the international Federation of Gynecology and Obstetrics surgical system *(Peungjesada et al., 2009)*.

Endometrial cancer is staged according to a surgical system, because clinical estimation is incorrect in over 20% of cases *(Savelli et al., 2008)*.

Endometrial carcinoma arises from the endometrial lining of the uterus. Fortunately it commonly presents with irregular vaginal bleeding so early in its growth, so most women become alerted to seek early diagnosis *(Robertson, 2003)*.

Treatment and prognosis of endometrial carcinoma is influenced by tumor morphologic prognostic factors that include depth of myometrial invasion, cervical extension, and lymph node metastasis *(Kinkel et al., 2006)*.

While cervical carcinoma is more prominent and more treatable than endometrial Carcinoma *(Yang et al., 2004)*.

It is largely preventable disease that is characterized by long lead time. The precancerous lesions gradually progress through recognizable stages before developing into invasive disease *(Saksouk, 2009).*

Prognosis of the invasive cervical carcinoma is based on the stage, size and histological grade of the primary tumor and the status of lymph nodes. Assessment of the stage of the disease is important in determining whether the patient may benefit from surgery or receive radiation therapy *(Pannu et al., 2001).*

Recently, a new magnetic resonance (MR) technique called whole body diffusion weighted imaging (DWI) has been introduced for 1.5-Tesla MR scanners *(Takahara et al., 2004).*

DWI is based on water proton free motion. Most tumor lesions are associated with architectural malformations and water diffusivity changes, so that DWI sequence can be and has been used in tumor imaging in recent several years.

Although diffusion-weighted (DW) magnetic resonance (MR) imaging has yet to be fully applied to the body, it holds great potential for abdominal imaging, especially for the detection and characterization of focal lesions. It is known that apparent diffusion coefficient