Role of diffusion weighted and perfusion weighted imaging in characterization of ovarian tumours

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Contents

List of figures

List of tables

Table of charts

List of abbreviations

abbreviation	Meaning
TTP	Time to peak
MRE	Maximum relative enhancement
SI max	Maximal signal intensity
WIR	Wash in rate
WOR	Washout rate
MRI	Magnetic resonance imaging
DCE-MRI	Dynamic contrast enhanced magnetic resonance imaging
DWI	Diffusion weighted imaging
SI	Signal intensity
T1WI	T1 weighted image
T2WI	T2 weighted image
CT	Computed tomography
Fig	Figure
IV	Intravenous
US	Ultrasound
Vs	Versus
PPV	Positive predictive value
NPV	Negative predictive value
Sd	Standard deviation
ROI	Region of interest
ADC	Apparent diffusion coefficient
PCO	Polycystic ovary
THRIVE	High Resolution Isotropic Volume Examination

ABSTRACT

Background: ovarian cancer is the second most common gynecological cancer and the fifth most common cancer in women. Proper management depends on proper preoperative assessment with the help of clinical examination, laboratory tests and different imaging modalities. Radiological evaluation includes ultrasonography (US), computed tomography (CT) and recently magnetic resonance imaging (MRI). Functional imaging is becoming increasingly important in the evaluation of cancer patients because of the limitations of morphologic imaging, particularly in the assessment of response to therapy. Diffusion weighted imaging (DWI) has been established as a useful functional imaging tool in neurologic applications for a number of years, but recent technical advances now allow its use in abdominal and pelvic applications.

Purpose: it was to evaluate the role of diffusion weighted and perfusion weighted MRI imaging in the characterization of ovarian tumours and differentiation between benign and malignant tumours.

Patients and Methods: this study performed on 24 patients. All patients had US finding of solid or complex adnexal lesions.

Results: DWI & dynamic MRI are significant promising tool factors for characterization of ovarian tumours and differentiation between benign & malignant lesions with high sensitivity, specificity. The sensitivity, specificity and accuracy of detection of the nature of the lesions have been increases after adding of DWI & DCE-MRI to the conventional imaging.

Conclusion: Adding of DWI & DCE-MRI to the conventional MRI improves the sensitivity and specificity of diagnosis and allows confident diagnosis and differentiation between benign and malignant lesions.

Keywords: Ovarian tumours, MRI, DWI, ADC, DCE, TTP, MRE, SI max.

Introduction

Introduction

Ovarian cancer is a leading cause of death among women. It is the second most common gynecological cancer and the fifth most common cancer in women. Unfortunately most women are diagnosed with late stage disease, which has a poor survival rate. Proper diagnosis of cancer can help finding more available treatment options and in turn better prognosis ***(Hippisley-Cox et al, 2012).***

Proper management depends on proper preoperative assessment, with the help of clinical examination, laboratory tests and different imaging modalities ***(Thomassin-Naggara et al., 2011).***

Accurate characterization of an adnexal mass as being benign can avoid unnecessary surgery especially in postmenopausal women and can help young women wishing to preserve child bearing potential to go for conservative surgery ***(Thomassin-Naggara et al, 2009).***

Ultrasonography (US) is the first-line imaging technique for adnexal masses and is particularly useful for the characterization of noncomplex masses that present a low risk of malignancy ***(Thomassin-Naggara et al, 2011).***

However, because of its major limitations in terms of spatial resolution and, more importantly, contrast resolution; it is unable to resolve in most of the cases the differential diagnosis between benign and malignant masses ***(salvatore Cappabianca et al, 2013).***

Computed tomography (CT) is the modality of choice for staging in patients with ovarian cancer. However, the poor soft-tissue contrast of CT limits its use for local staging ***(Evis Sala et al, 2013).***

MR imaging has shown to be more specific and accurate than US and Doppler assessment in preoperative characterization of complex adnexal masses. In addition, it is the best method in delineation of local spread to the pelvic organs. The signal intensity characteristics of ovarian masses make possible a systematic approach to diagnosis. Mature cystic teratomas, cysts, endometriomas, leiomyomas, fibromas, and other lesions can be accurately diagnosed on the basis of T1- weighted, T2-weighted, and fat-saturated T1-weighted MR imaging findings ***(Eman Nasr et al, 2014).***

With recent advances in ultrafast MR imaging techniques, perfusion-weighted (DCE-MRI) and diffusion-weighted (DW) imaging are available to assess discriminant microvascular and cellular characteristics in abdominal and pelvic organs. They have recently been shown to be effective in the differentiation of benign from malignant adnexal masses ***(Thomassin-Naggara et al, 2011).***

DWI is one of the promising new functional imaging techniques. As long as interpretation of DWI is combined with the conventional MR images and with realizing of the possible pitfalls, it has shown to be effective in the differentiation of benign from malignant adnexal masses ***(Thomassin-Naggara et al, 2011).***

DWI increases the contrast between lesions and surrounding tissues, and improves the detection and delineation of peritoneal implants at both initial staging and follow-up. Moreover, diffusion-weighted imaging provides quantitative information about tissue cellularity that may be used to distinguish viable tumors from treatment-related changes ***(Eman Nasr et al, 2014).***

Functional imaging (DCE-MRI) is becoming increasingly important in the evaluation of cancer patient in initial diagnosis and the assessment of response to therapy ***(C. Whittaker et al, 2009).***

Aim of The Work