ROLE OF ADVANCED MRI TECHNIQUES IN EVALUATION OF OVARIAN TUMORS

Essay

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Dina M. Farid Mohamed Nasr

M.B.B.Ch.

Under The Supervision Of

Prof. Dr. Maha Hussein Anwar Abdel Salam

Professor of Radiodiagnosis
Faculty of Medicine, Ain Shams University

Dr. Shaimaa AbdelSattar

Lecturer of Radiodiagnosis
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University
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دور التقنيات المتقدمة من الرنين المغنطيسى
فى تقييم أورام المبيض

دراسة مقدمة من الطبيب

دينا محمد فريد محمد نصر

بكالوريوس الطب والجراحة

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الأستاذ الدكتور / مها حسين أنور عبدالسلام

أستـــاذ الأشعـــة التـشخـيصيـة

كلية الطب - جامعة عين شمس

الدكتور / شيماء عبدالستار

مدرس بقسم الأشعة التشخيصية

كلية الطب - جامعة عين شمس

كلية الطب

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Summary and Conclusion

Ovarian carcinoma is an insidious disease, and patients often present with an advanced (extra pelvic) stage of disease. Despite clinical advance and improved surgical techniques, it remains the deadliest form of gynecologic malignancy.

The primary goal of imaging in the evaluation of an adnexal mass is to differentiate malignant and benign diagnoses in order to direct patients to the appropriate treatment algorithm.

Magnetic resonance (MR) imaging has also proved useful for characterizing benign and malignant ovarian tumors; moreover, it enables a specific diagnosis to be made for certain pathologic types. For example, MR imaging is well known to provide accurate information about hemorrhage, fat, and collagen**.**

Gadolinium-enhanced MR imaging serves as a problem-solving modality in cases of indeterminate adnexal masses. A combination of T1-weighted images and T1-weighted images with fat saturation helps to differentiate most common benign adnexal masses from malignant ones.

Magnetic resonance spectroscopy is a non-invasive means of obtaining metabolic information by recording signals from metabolites present in tissues, while the water signal is suppressed. Magnetic Resonance Spectroscopy (MRS) plays an important role in the differentiation of ovarian tumors by differentiating between them whether being benign or malignant.

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LIST OF ABBREVIATIONS

2D	Two Dimensional
3D	Three Dimensional
ADC	Apparent diffusion coefficient
AFP	Alpha-fetoprotein
CA125	Cancer antigen 125
Cho	Choline
Cr	Creatine
CT	Computed tomography
DW	Diffusion-weighted
EOC	Epithelial ovarian cancer
FDG	Fluoro-2-deoxy-D-glucose
FIGO	The International Federation of Obstetrics and Gynecology
FLASH	Fast low angle shot
FOV	Field of view
FSE	Fast Spin Echo
GCT	Granulosa cell tumors
HASTE	Half-Fourier single shot turbo spin echo
HCG	Human chorionic gonadotrophin
MR	Magnetic Resonance

MRI	Magnetic Resonance Imaging
MRS	MR spectroscopy
NAA	N-acetylaspartate
PET	Positron Emission Tomography
ppm	Parts per million
PRESS	Point-resolved spectroscopy in the steady state
ROI	Region of interest
SE	Spin Echo
SI	Signal intensity
SNR	Signal-to-noise ratio
SPGR	Spoiled gradient-echo
STEAM	Stimulated echo acquisition mode
STIR	Short T1 inversion recovery
T1WI	T1 weighted images.
T2WI	T2 weighted images
TI	Inversion time
TNM	Tumor, nodal and metastatic staging
TR	Repetition time
US	Ultrasound
USPIO	Ultra small superparamagnetic iron oxide
WHO	World Health Organization

INTRODUCTION

Ovarian cancer is the second most common gynecological malignancy after endometrial cancer, but accounts for more deaths than the remaining gynecological cancers added together. (**Jemal, A. et al. 2009**) The median age at diagnosis is 62 years, with the exception of Egypt, where the rate was highest for 50- to 69-year-olds. (**MECC, 2010**)

Ovarian tumors are classified as epithelial tumors, germ cell tumors, sex cord–stromal cell tumors, and metastatic tumors on the basis of tumor origin (**S.E. Jung et al, 2002**). Secondary (metastatic) tumors are an important group of ovarian tumors because treatment options differ from that of primary ovarian malignancies. (**Hricak H et al, 2000**) If it is diagnosed at an early stage, the 5 years survival rate is almost 90%; but if diagnosed at an advanced stage, as are most cases, the 5 years survival rate is < 30%. **(American Committee, 2002)** Detection of asymptomatic ovarian cancer patients remains a major clinical challenge, so imaging has become necessary in the clinical assessment of a patient with ovarian tumor. **(Taylor et al, 2001)**

Transvaginal ultrasonography (US) and computed tomography (CT) are useful imaging techniques currently used to evaluate ovarian tumors. Transvaginal US has been the foremost modality for detection and characterization of ovarian tumors. CT is commonly performed in preoperative evaluation of a suspected ovarian malignancy. Magnetic resonance (MR) imaging has also proved useful for characterizing benign and malignant ovarian tumors; moreover, it enables a specific diagnosis to be made for certain pathologic types. (**Izumi Imaoka, Akihiko Wada *et al*. 2006**)

Diffusion-weighted magnetic resonance (MR) imaging is a functional imaging technique whose contrast derives from the random motion of water molecules within tissues. (**Koh DM, Collins DJ, 2007**) Diffusion- weighted imaging yields both qualitative and quantitative information that can be helpful in differentiating benign from malignant processes. The application of diffusion-weighted imaging is useful for tumor detection, tumor characterization, and the evaluation of tumor recurrence or treatment response (**Herneth AM et al, 2003** & **Charles-Edwards EM, deSouza NM, 2006)**

The microvascular properties of tissue can be interrogated with dynamic contrast-enhanced MRI (DCE-MRI). Malignant lesions generally enhance earlier, more rapidly and more avidly than benign lesions. **Thomassinnaggara *et al.*** used myometrial enhancement as the internal reference for semiquantitatively analyzing the enhancement curve of ovarian lesions. This study concluded that the enhancement amplitude, maximal slope and initial area under the curve were discriminatory parameters of malignancy. Furthermore, among three identified enhancement patterns, a steep initial rise in the curve was specific for invasive tumors. **(Thomassinnaggara *et al.* 2008)**

Magnetic resonance spectroscopy (MRS) is a noninvasive method providing information about the biochemical metabolism which is useful in characterization and differential diagnosis of ovarian tumors. **(Okada et al, 2001)**

AIM OF WORK

The purpose of our study was to investigate the diagnostic performance of advanced MRI techniques in the evaluation of ovarian tumors

Anatomy of the Ovaries