

Role of MRI perfusion and diffusion in Characterization of ovarian tumors

Essay

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

[قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ
الْحَكِيمُ]

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Contents

	Page
List of Abbreviations	i
List of Tables	ii
List of Figures	iii
Introduction and Aim of the Work	1
Chapter 1: anatomy of the ovaries and their normal MRI appearance.....	4
Chapter 2: Pathology of ovarian tumors.	19
Chapter 3: Pelvic MRI technique.....	37
Chapter4: MRI manifestations of ovarian tumors and role of diffusion and perfusion MR	61
Summary and Conclusion	94
References	96
Arabic Summary	--

List of Abbreviations

AFP	: Alpha feto protein
ADC	: Apparent diffusion coefficient
DWI	: Diffusion weighted image
DCE	: Dynamic contrast enhanced
Dt	: Lag time
FIGO	: Federation of gynecology and obstetrics
FOV	: Field of view
FT	: Tissue blood flow
FS	: Fat suppression
GRE	: Gradient Echo
IAUC	: Initial area under the curve
JZ	: Junctional zone
MR	: Magnetic resonance
PW	: Perfusion weighted
ROI	: Region of interest
SI max	: Maximum absolute enhancement
SI rel	: Maximum relative enhancement
WIR	: Wash in rate
TSE	: Turbo spin echo
TNM	: Tumor, node, metastasis
Vb	: Blood volume fraction

List of Tables

<i>Table</i>	<i>Title</i>	<i>Page</i>
1	Classification of different ovarian tumors according to histological origin	19
2	Classification of different ovarian tumors according to gross appearance	22
3	TNM staging systems for ovarian tumor.	34
4	FIGO staging criteria for cancer of the ovary, fallopian tube, and Peritoneum	35
5	Parameters of different MRI sequences	39
6	Different MR sequences for evaluating the adnexa	40
7	Interpretation of DWI Findings	46
8	Schematic for characterizing ovarian masses based on conventional MRI features	61
9	Criteria of benign and malignant tumors of the ovaries by conventional MR images	66

List of Figures

<i>Fig.</i>	<i>Title</i>	<i>Page</i>
1	Embryological origin of the ovaries	4
2	Components of ovary	7
3	Ligaments of the ovaries	9
4	The ovarian fossa at the posterolateral pelvic side wall	10
5	Arterial supply of the ovaries	11
6	Venous drainage of ovary	12
7	Lymphatic drainage of ovary	12
8	Normal zonal anatomy in a premenopausal woman	13
9	Axial T1WI Fat Suppression (FS) with IV contrast administration demonstrate faint ovarian enchantment	14
10	Ovaries of a 23-year-old woman	15
11	Normal ovarian appearance during Premenopausal period	16
12	Ovaries in Postmenopausal woman	18
13	Ovaries of a 64-year-old woman	18
14	Gross specimen of resected ovarian Transitional cell tumor	21
15	Gross specimen of resected ovarian dysgerminoma	21
16	Macroscopic specimen of ovarian choriocarcinoma	22
17	Macroscopic specimen of ovarian yolk sac tumor	23
18	Gross specimen of ovarian fibroma	24

<i>Fig.</i>	<i>Title</i>	<i>Page</i>
19	Gross specimen of ovarian thecoma	24
20	Gross specimen of resected ovarian Serous cyst adnoma	25
21	Gross specimen of a large adenexal mass representing a large ovarian teratoma with intralesional hair within	26
22	Gross specimen of resected ovarian mucinous cyst adnoma	27
23	Gross specimen of resected ovarian endometroid tumor	28
24	Gross specimen of resected ovarian clear cell tumor	29
25	Granulosa cell tumor adult type	30
26	Gross specimen of sertoli leydig tumor	31
27	Shows technique of how sagittal cuts are taken	40
28	Shows technique of how axial cuts are taken	41
29	Shows Technique of how coronal cuts are taken	41
30	Diagram showing diffusion of water molecules	43
31	A 63-year-old woman with a left ovarian cystadenocarcinoma	45
32	Right ovarian fibroma in a 37-year-old woman	47
33	Definition of regions of interest (ROIs)	51
34	Types of perfusion curves	52

<i>Fig.</i>	<i>Title</i>	<i>Page</i>
35	Analysis of perfusion by using IAUC	53
36	Showing how can we use WIR as semi-quantitative analysis	55
37	Pharmacokinetic model: Brix modified model with 4 quantitative parameters	57
38	Regions of interest (ROI)	58
39	False-positive perfusion result	59
40	Water signal in T1WI and T2WI	62
41	Fat shows high signal intensity on T1 WI with drop of signal in FATSAT sequence	63
42	Hemorrhagic fluid	63
43	Thick mucinous material	64
44	Brenner tumor in a 70-year-old woman	67
45	Dysgerminoma in a 16-year-old girl	68
46	Serous cystadenoma	69
47	Ovarian serous cystadenocarcinoma	70
48	Mucinous cystadenoma in an 83-year-old woman	71
49	Mucinous cystadenocarcinoma	72
50	Confluent bilateral ovarian endometrioid carcinoma	73
51	Dermoid cyst	74
52	40 year old female patient presented with a-complex right ovarian tumor	78
53	A 27-year-old woman with an ovarian fibrothecoma	79
54	Treatment response of primary high-grade serous ovarian cancer	81

<i>Fig.</i>	<i>Title</i>	<i>Page</i>
55	A 49-year-old woman with peritoneal dissemination from ovarian serous adenocarcinoma	82
56	Left ovarian cystic lesion with papillary projection	86
57	Well defined cystic lesion with hemorrhage	87
58	Bilateral dermoids	89
59	Pre-operative pelvic MRI	90
60	Ovarian fibroma right adnexal mixed cystic solid mass	91
61	Left adnexal cystic lesion with posterior wall nodule	93

Introduction

Female Gynecologic malignancies include cervical cancer, endometrial cancer, and ovarian cancer. Ovarian cancer is one of the most common female gynecologic malignancy, however it remains the leading cause of death among these diseases and is the fourth leading cause of cancer deaths in women. (*Jeong et al, 2010*)

Adnexal masses are common and challenging diagnostic problem because overlapping imaging features of benign and malignant tumors. (*Anthoulakis et al., 2014*)

Determination of a degree of suspicion of malignancy is critical and is based mainly on imaging appearance. (*Jeong et al., 2010*)

Magnetic resonance (MR) imaging is better reserved for problem solving masses when US findings are equivocal because, it is more accurate for diagnosis. (*Jeong et al., 2010*)

MRI has the capabilities to locate solid masses and is used for diagnosis of malignant ovarian tumors with an overall accuracy of 88–93 % and high sensitivity of 92 %, specificity of 85 %, MRI has the technical capabilities for preoperative determination and predicting the benign or malignant nature of ovarian masses. (*Li et al., 2015*)

A new MRI technique Perfusion MR provides advanced abilities for functional imaging, Post-processing can be carried out in the form of visual analysis and by description of the curves. (*Thomassin-Naggara et al., 2013*)

Perfusion is used to characterize the tumor vasculature in a tumor. Thus, malignant lesions show intense quick enhancement after contrast injection compared to benign lesions due to the extensive vascular system associated with malignant tumors (*Li et al., 2015*)

Diffusion allows excellent delineation of malignant tumors because it shows suppression of background noise. We found that the combination of DWI and conventional non-enhanced MRI identified additional locations of pelvic tumors and improved the degree of confidence for interpretation.

Other advantages of DWI include its non-invasive and cost effectiveness. DWI does not involve radiation exposure and oral or intravenous administration of contrast material, and is comfortable for the patient. In patients with gynecological malignancies, DWI can play a major role in the detection of tumor recurrence within the pelvis as well as disseminated peritoneal recurrence. (*Kitajima et al., 2015*)

Perfusion and diffusion MRI analysis can characterize sonographically indeterminate masses and help the radiologist to improve lesion characterization especially for benign masses helping the clinician to avoid unnecessary surgeries. (*Thomassin-Naggara et al., 2014*).

Aim of the Work

To discuss the value of MRI Diffusion and perfusion
in characterization of ovarian tumors

Ovaries

The ovaries are paired organs of the female reproductive system, They lie within the ovarian fossa on the posterior wall of the true pelvis.

Ovarian embryology:

The ovaries develop on the posterior abdominal wall adjacent to the kidneys then descend into the pelvis as the kidneys ascend. The paramesonephric ducts in absence of the male hormones differentiate into female genital system including the ovaries, the uterus and upper two thirds of the vagina. The ovaries are the only truly intraperitoneal adnexal structures. The ovaries lie against Lateral pelvic walls, each is enclosed within the mesovarium of the broad ligament (Fig.1). (Schneck *et al.*, 2012)

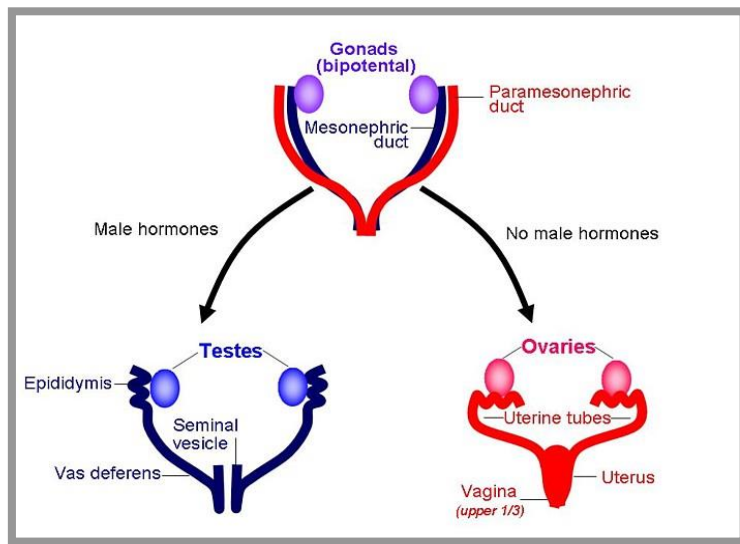


Fig. (1): Embryological origin of the ovaries (*Quoted from Tanaka et al., 2004*)