



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكرو فيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم



شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



MONA MAGHRABY



Role of MRI in Early Detection of Non-Neoplastic Articular Causes of Hip Joint Disability in Adults

Thesis

*Submitted for Partial Fulfillment of
Master Degree in Radiodiagnosis*

By

Ragab Samir Ibrahim Hemida

M.B., B.Ch, Faculty of Medicine, Ain Shams University, (2017).

Under Supervision of

Prof. Dr./ Mohamed Amin Nassef

Professor of Radiodiagnosis

Faculty of Medicine, Ain Shams University

Dr./ Mahmoud Ahmed Ibrahim Hashish

Lecturer of Radiodiagnosis

Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University

2021

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

لَسْبَدَانُكَ لَا نَعْلَمُ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْعَظِيمُ

صدق الله العظيم

سورة البقرة الآية: ٣٢

Acknowledgments

*First and foremost, I feel always indebted to **Allah** the Most Beneficent and Merciful.*

*I wish to express my deepest thanks, gratitude and appreciation to **Prof. Dr./ Mohamed Amin Massef**, Professor of Radiodiagnosis, Faculty of Medicine, Ain Shams University, for his meticulous supervision, kind guidance, valuable instructions and generous help.*

*Special thanks are due to **Dr./ Mahmoud Ahmed Ibrahim Hashish**, Lecturer of Radiodiagnosis, Faculty of Medicine, Ain Shams University, for his sincere efforts, fruitful encouragement.*

I would like to express my hearty thanks to all my family for their support till this work was completed.

Ragab Samir Ibrahim Hemida

List of Contents

Title	Page No.
List of Tables.....	i
List of Figures.....	iii
List of Abbreviations.....	vi
Introduction	1
Aim of the Work	5
Review of Literature	
Anatomy of the Hip Joint	6
Imaging Techniques in Examination of the Hip Joint.....	20
Normal Cross Sectional Magnetic Resonance Imaging Anatomy of the Hip Joint	34
MR Examination Protocols & Imaging Techniques of the Hip Joint	44
Clinico-Pathological Aspects of Different Lesions Causing Hip Joint Disability in Adults	56
MRI Appearance of Specific Hip Joint Lesions	80
Patients and Methods.....	108
Results.....	115
Illustrative Cases.....	130
Discussion	145
Summary and Conclusion	154
References	157
Arabic Summary	

List of Tables

Table No.	Title	Page No.
Table 1:	Detailed parameters of our standard examination protocol	28
Table 2:	Ultrasonography scans of the hip	31
Table 3:	Hip structures to evaluate in coronal and axial planes	48
Table 4:	Pulse sequences: Imaging parameters:	49
Table 5:	Modified Outer bridge classification for cartilage damage.	55
Table 6:	The extent of the necrotic segment.	83
Table 7:	Modified Ficat Staging System for Avascular Necrosis of the Hip.	84
Table 8:	ARCO stages of osteonecrosis.	88
Table 9:	Grading of muscle tears (Kneeland 1997).	104
Table 10:	Age distribution in the studied 96 patients.	116
Table 11:	Clinical presentation of the studied 96 patients.	117
Table 12:	The affected side in the studied 61 patients with hip joint pathology.	118
Table 13:	Frequency and percentage of different hip joint pathology.	119
Table 14:	Frequency avascular necrosis grading in the studied patients.	121
Table 15:	Affected side of avascular necrosis in the studied patients.	121
Table 16:	Conventional radiography and MRI findings in cases of avascular necrosis.	122
Table 17:	Conventional radiography and MRI findings in cases of osteoarthritis.	123
Table 18:	Conventional radiography and MRI findings in inflammatory cases.	124
Table 19:	MRI findings in Femoroacetabular impingement and labrum tear cases (total 10 cases), cases.	125
Table 20:	Conventional radiography and MRI findings in cases of transient osteoporosis.	126

List of Tables *cont...*

Table No.	Title	Page No.
Table 22:	Diagnostic accuracy of MRI in the studied 61 patients with hip joint pathology.....	127
Table 23:	Overall diagnostic accuracy of conventional radiography versus MRI in the total studied 96 patients dependent on statistical analysis.	129

List of Figures

Fig. No.	Title	Page No.
Figure 1:	Proximal end of femur: posterior aspect.	8
Figure 2:	Hip joint articular surfaces.	10
Figure 3:	The gross anatomy of the hip joint capsule.	12
Figure 4:	Ligaments of hip joint (anterior and posterior).	14
Figure 5:	Muscles around the hip joint.....	16
Figure 6:	Arteries of femoral head and neck.	18
Figure 7:	Positioning for an AP hip view.	21
Figure 8:	Positioning for a frog-leg lateral view.	22
Figure 9:	A: Multiplaner reconstructions (MPR) in coronal, sagittal & axial respectively. B: 3D reconstruction before and after hip disarticulation.	23
Figure 10:	Intra-articular injection in a right hip joint under fluoroscopic guidance. Puncture site (<i>white arrow</i>) is at the superior part of the anatomical neck of the femur but the middle part could have been chosen (<i>white arrowhead</i>)....	26
Figure 11:	(B): Sagittal-oblique imaging over the proximal femur shows the femoral head (H), femoral neck (N), and collapsed anterior joint recess (<i>arrowheads</i>). Note the acetabulum (A) and fibrocartilage labrum (<i>arrows</i>). I, iliopsoas	32
Figure 12:	Bone scan of the pelvis with bilateral avascular necrosis of the femoral head shows marked increased uptake of radiopharmaceutical agent on both hips.	33

List of Figures cont...

Fig. No.	Title	Page No.
Figure 13:	MR axial T1WI at the level of the of the acetabulum, (A) without and (B) with intra-articular injection of gadolinium	35
Figure 14:	MR axial T1WI at the level of the femoral head.	36
Figure 15:	MR Axial T1WI at the level of the greater trochanter.....	37
Figure 16:	MR lateral sagittal T1WI.....	38
Figure 17:	MR mid sagittal T1WI.	39
Figure 18:	MR medial sagittal T1WI.	40
Figure 19:	MR T1WI anterior coronal image.....	41
Figure 20:	MR T1WI mid coronal image.....	42
Figure 21:	Pelvis MRI	47
Figure 22:	(A) image: Coronal T1 WI, and (B) image: Axial T1 WI.	50
Figure 23:	(A) image: Coronal STIR, and (B) image: Axial PD.	54
Figure 24:	Avascular necrosis of hip joint.....	57
Figure 25:	Pipkin classification of posterior hip dislocations.....	60
Figure 26:	A image: normal hip joint, and B image: osteoarthritis of hip joint	63
Figure 27:	Differences between transient osteoporosis and avascular necrosis of femoral head	69
Figure 28:	Types of stress fracture.....	70
Figure 29:	Avascular necrosis	81

List of Figures cont...

Fig. No.	Title	Page No.
Figure 30:	Avascular necrosis	82
Figure 31:	Early stage of Avascular necrosis	83
Figure 32:	(a-e): Right-side osteoarthritis.....	91
Figure 33:	MRI of the right hip joint rheumatoid arthritis	94
Figure 34:	(A, B& C): Idiopathic Transient Osteoporosis	96
Figure 35:	(A, B&C): A 68-year-old woman with a subchondral insufficiency fracture (SIF) of the right femoral head	97
Figure 36:	(A&B): A 59-year-old woman with a subchondral insufficiency fracture (SIF) of the right femoral head, which resulted in rapid destruction of the hip joint	98
Figure 37:	(A, B&C): A 23-year-old woman with subchondral insufficiency fracture (SIF) of the left femoral head	99
Figure 38:	(A&B): Comparison of band images in subchondral insufficiency fracture (SIF) (A) image and osteonecrosis (AVN) (B) image	100
Figure 39:	Pigmented villonodular synovitis.....	101
Figure 40:	Iliopsoas burse	102
Figure 41:	Muscle tear and hematoma	103
Figure 42:	Anteior labral tear	105
Figure 43:	Superior labral tear	106
Figure 44:	Sex distribution in the studied 96 patients.	115
Figure 45:	The different hip joint pathologies (total no. = 61 patients).....	119

List of Abbreviations

Abb.	Full term
3D	Three-dimensional
AL	Acetabular labrum
APV	Antero-posterior view
AVN	Avascular necrosis
CT	Computed tomography
FAI	Femoroacetabular impingement
FV	Femoral vessels
GM	Gluteus maximus muscle
IIfL	Iliofemoral ligament
IP	Iliopsoas muscle
Iscl	Ischiofemoral ligament
ITOH	Idiopathic Transient Osteoporosis of the Hip
MPR	Multiplaner reconstructions
MR	Magnetic resonance
MRI	Magnetic resonance imaging
OA	Osteoarthritis
OI	Obturator internus muscle
OZ	Orbicular zone
PD	Proton density
PDSE	Proton density-weighted spin echo images
RA	Rheumatoid Arthritis
RF	Rectus femoris muscle
S	Sartorius muscle
SD	Standard deviations
SIF	Subchondral insufficiency fracture
SN	Sciatic nerve
SNR	Signal-to-noise ratio
SPSS	Statistical Package for Social Studies

List of Abbreviations cont...

Abb.	Full term
STIR	Inversion Recovery
T1-SE	T1-weighted spin echo images
T1W	T1-weighted
T2-SE	T2-weighted spin echo images
T2W	T2-weighted
TFL	Tensor fascia lata
TL	Teres ligament
TOH	Transient osteoporosis of the hip

Role of MRI in Early Detection of Non-Neoplastic Articular Causes of Hip Joint Disability in Adults

ABSTRACT

Background: Painful hip is a common problem in the absence of a known acute trauma, it can be a diagnostic problem as it can be attributed to many causes. The most common causes are avascular necrosis, transient osteoporosis, osteoarthritis, FAI or inflammatory causes.

Aim of the work: The aim of this study is to clarify the role of MRI in diagnosis of the etiology of hip pain in adults that causes hip joint disability and to compare between the accuracy of both conventional radiography and MRI in various abnormalities and conventional MRI and MR arthrography in FAI and labrum tear.

Patients and Methods: This study was conducted on 96 symptomatic patients (55 males and 41 females with age ranged from 18 to 68 years) diagnosed clinically with hip joint disability due to certain hip pathology at Orthopedic and Physiotherapy Departments and referred to Radiodiagnosis Department of Ain shams University Hospitals.

Results: After statistical analysis of the results depending on the final outcome of the cases, it was found that MRI is more sensitive and specific than conventional radiography in detection of different hip joint pathologies with MRI sensitivity, specificity, and total accuracy ranging from 80 to 100% and conventional radiography sensitivity and specificity and total accuracy ranging from 50 to 90 %.

Conclusion: MRI has become an essential imaging modality in musculoskeletal system in general and in hip region specifically. It is a non-invasive technique with no radiation hazards, informative and essential in painful hip.

Keywords: MRI, Early Detection, Non-Neoplastic Articular, Hip Joint Disability