



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



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شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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MONA MAGHRABY

Role of DWI/ADC in the Assessment of Prostate Cancer Aggressiveness and its Correlation to Gleason Score

Thesis

*Submitted for Partial Fulfillment of
Master Degree in Radiology*

Presented by

Rewan Ahmed Mohamed Hassan

M.B.B.CH. – Ain Shams University

Supervised by

Assistant Prof. Yasser Ibrahim Abd El Khalek

*Assistant Professor of Radiodiagnosis
Faculty of Medicine, Ain Shams University*

Dr. Mohamed Yosry Mohamed

*Lecturer of Radiodiagnosis
Faculty of Medicine, Ain Shams University*

Faculty of Medicine
Ain Shams University
2021

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالَ

لَسْبَحَانَكَ لَا عِلْمَ 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 **Assistant Prof. Yasser Ibrahim Abd El Khalek**, Assistant 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. Mohamed Yosry Mohamed**, 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.

Rewan Ahmed Mohamed Hassan

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List of Abbreviations

Abb.	Full term
<i>AAH</i>	<i>Atypical adenomatous hyperplasia</i>
<i>ADC</i>	<i>Apparent diffusion coefficient</i>
<i>BPH</i>	<i>Benign prostatic hyperplasia</i>
<i>CT</i>	<i>Computed tomography</i>
<i>CZ</i>	<i>Central zone</i>
<i>DCE-MR</i>	<i>Dynamic contrast enhanced magnetic resonance imaging</i>
<i>DF</i>	<i>Denonvilliers' fascia</i>
<i>DRE</i>	<i>Digital rectal examination</i>
<i>DWI</i>	<i>Diffusion weighted imaging</i>
<i>ECE</i>	<i>Extra capsular extension</i>
<i>ECS</i>	<i>Extracellular space</i>
<i>ERC</i>	<i>Endo rectal coil</i>
<i>EUS</i>	<i>External urethral sphincter</i>
<i>GS</i>	<i>Gleason score</i>
<i>ICS</i>	<i>Intracellular space</i>
<i>IUS</i>	<i>Internal urethral sphincter</i>
<i>LN</i>	<i>Lymph node</i>
<i>LPF</i>	<i>Lateral pelvic fascia</i>

List of Abbreviations cont...

Abb.	Full term
<i>MR.....</i>	<i>Magnetic resonance</i>
<i>MRI</i>	<i>Magnetic resonance imaging</i>
<i>PCa</i>	<i>Prostate cancer</i>
<i>PCA.....</i>	<i>Prostatic adenocarcinoma</i>
<i>PIN.....</i>	<i>Prostatic intraepithelial neoplasia</i>
<i>PSA</i>	<i>Prostatic specific antigen</i>
<i>PZ</i>	<i>Peripheral zone</i>
<i>ROI</i>	<i>Region of interest</i>
<i>SVI.....</i>	<i>Seminal vesicle invasion</i>
<i>TRUS</i>	<i>Trans rectal ultrasound</i>
<i>TZ.....</i>	<i>Transitional zone</i>
<i>UGS</i>	<i>Urogenital sinus</i>
<i>US</i>	<i>Ultrasound</i>
<i>WHO.....</i>	<i>World Health Organization</i>

INTRODUCTION

Prostate cancer (PCa) is considered one of the most common cancers among male population. Its incidence increases with age, ranging from 34% in the fifth decade, to 70% over the 80 years (*Manetta et al., 2019*).

Magnetic resonance (MR) imaging is a useful imaging modality that can be used in the detection of cancer prostate noninvasively. In addition to conventional T2-weighted images, multiparametric MR techniques add biologic and pathological information by the means of diffusion-weighted (DW) MR images, dynamic contrast material-enhanced (DCE) MR images, and spectroscopic images. These innovated recent functional imaging techniques can be used to increase the diagnostic accuracy of prostate cancer and predicting Gleason score (GS) that is the histological grading system used to determine prostate cancer aggressiveness and behaviour this grading system can be used to choose the appropriate treatment plan (*Peng et al., 2014*).

Diffusion weighted imaging (DWI) is a powerful MRI sequence which gives information about cellular function and micro-architecture of the human body.

Tumor tissue in general show less diffusibility than normal tissue in the case of prostate cancer, there is alteration in the glandular, epithelial and stromal components where the

healthy glandular tissue in the peripheral zone is replaced by tumor cells which are more cellular hence are less diffusible than normal tissue. Therefore, they show high-intensity signal zone on DWI images which indicates the presence of malignancy (*Manetta et al., 2019; Tamada et al., 2017*).

DWI derived ADC maps can differentiate between malignant and benign prostatic tissue. The reported ADC values of prostate cancer in the peripheral zone range between 0.93 and $1.38 \times 10^{-3} \text{ mm}^2/\text{s}$. This variability in ADC values may be related, at least in part, to the heterogeneous tissue composition of prostate cancer (*Woodfield et al., 2010*).

Gleason score which is can be obtained from Transrectal Ultrasound guided biopsy is the standardized Grading system used to determine prostate cancer aggressiveness. Gleason score includes 5 grades depending on how much the cancerous cells look like normal cells aggressive cancerous tissue have a high score. Gleason scores are also used to describe tumors as low grade (Gleason score, ≤ 6), intermediate grade (Gleason score, 7), or high grade (Gleason score, > 7) with respect to tumor aggressiveness (*Woodfield et al., 2010*).

The gathered data about prostate cancer staging from multiparametric MRI technique and histological data obtained from pathological analysis via Gleason score can be compared and correlated to each other to differentiate the aggressive cases of prostate cancer from the indolent ones. which greatly

help to formulate the treatment plans. For men who suffer from aggressive PCa variants, such as PCa with a GS ≥ 7 , whole gland treatment approaches such as radical prostatectomy or irradiation of the prostate gland are indicated. However, patients suffering from a less aggressive or “low-risk” cancer can be offered less aggressive treatment options including active surveillance or focal therapy. Therefore, if the aggressiveness of tumor can be predicted before invasive surgery, it can not only help plan these treatments to ensure all of the tumors treated sparing as much normal tissue as possible, but can also identify potentially discordant findings, such as undetected high-risk disease (*Li et al., 2014*).