# بسم الله الرحمن الرحيم


MONA MAGHRABY

# شبكة المعلومات الجامعية

# التوثيق الالكتروني والميكروفيلم

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التوثيق الإلكتروني والميكروفيلم

# جامعة عين شمس

# التوثيق الإلكتروني والميكروفيلم

# قسم

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علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

# يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

***MONA MAGHRABY***

# Role of diffusion weighted MRI in imaging of Panceatic masses

*Thesis*

Submitted for Partial Fulfillment of M.D. Degree
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# List of Abbreviations

| | |
|---|---|
| **ACC** | Acinar Cell Carcinoma |
| **ACTH** | Adrenocoricotropic Hormone |
| **ADC** | Apparent Diffusion Coefficient |
| **AIP** | Autoimmune Pancreatitis |
| **ANP** | Acute Necrotizing pancreatitis |
| **AUC** | Area Under the ROC Curve |
| **BD** | Branch Duct |
| **CNR** | Contrast-to-Noise Ratio |
| **CP** | Chronic Pancreatitis |
| **DW** | Diffusion-Weighted |
| **EPI** | Echo-Planar Imaging |
| **ERCP** | Endoscopic Retrograde Cholangio-pancreaticography |
| **FN** | False Negative |
| **FOV** | Field-of View |
| **FP** | False Positive |
| **IPMN** | Intraductal Papillary Mucinous Neoplasm |
| **IPMNs** | Intraductal Papillary Mucinous Neoplasms |
| **IR** | Inversion Recovery |
| **IV** | Intravenous |
| **MCNs** | Mucinous Cystic Neoplasms |
| **MD** | Main Pancreatic Duct-type |
| **MEN1** | Multiple Endocrine Neoplasia type 1 |
| **MEN1** | Multiple Endocrine Neoplasia Type 1 |
| **MPD** | Main Pancreatic Duct |
| **MR** | Magnetic Resonance |

# List of Abbreviations

| | |
|---|---|
| **MRCP** | Magnetic Resonance Cholangio-pancreatography |
| **NPV** | Negative Predictive Value |
| **PanIN** | Pancreatic Intraepithelial Neoplasia |
| **PanNET** | Pancreatic Neuroendocrine Tumor |
| **PNENs** | Pancreatic Neuroendocrine Neoplasms |
| **PPV** | Positive Predictive Value |
| **ROC** | Receiver Operator Characteristic |
| **ROI** | Region of Interest |
| **SCNs** | Serous Cystic Neoplasms |
| **SMA** | Superior Mesenteric Artery |
| **SMV** | Superior Mesenteric Vein |
| **SPNs** | Solid Pseudopapillary Neoplasms |
| **SSFSE** | Single-Shot Fast Spin-Echo |
| **STIR** | Short Tau Inversion-Recovery |
| **THRIVE** | T1-weighted High-Resolution Isotropic Volume Examination |
| **TI** | Inversion Time |
| **TN** | True Negative |
| **TP** | True Positive |
| **VHL** | Von Hippel-Lindau |
| **VP** | Ventral Pancreatic |

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# INTRODUCTION

Pancreatic cancer is the fourth most common cause of cancer-related mortality worldwide, as the five-year survival rate is less than 5% and the mortality rate has not declined over the last few decades. Therefore, pancreatic cancer seems to remain one of the greatest challenges in the fight against cancer in the 21$^{st}$ century. One of the main causes of the poor prognosis of pancreatic cancer is the difficulty of its early diagnosis. As pancreatic cancer typically develops with few symptoms in the early stage and there are not many specific, well-known risk factors a side from smoking and family history, the appropriate screening and early diagnosis of pancreatic cancer is quite challenging. Therefore, only 10% to 20% of diagnosed patients have a chance of successful resection and possible cure, and even in patients with resectable disease, the survival rate is only 23% ***(Eun and Jeong, 2014).***

One crucial consideration in the treatment of patients suspected of having pancreatic tumors is how to proceed diagnostically. So far, ultrasonography (US) and contrast-enhanced computed tomography (CT) have been widely used to diagnose pancreatic pathology. However, in previous series, differentiating benign lesions from pancreatic cancer was considerably difficult. This dilemma is clinically relevant and to overcome this dilemma, the development of sensitive and specific imaging modalities is highly desirable ***(Hänninen et al., 2002).***

Magnetic resonance imaging (MRI) has a well-established role in the evaluation of patients with pancreatic masses. MR diffusion-weighted imaging (DWI) is a technological improvement of MRI. DW sequence can evaluate the diffusion of water molecules (Brownian motions) within biological tissues. All factors that tend to narrow the extracellular compartment or modify water exchanges through cell membranes lead to an impairment of the diffusion of water molecules. Tissues with restriction of water diffusion present high signal intensity on DW images and low signal intensity on the apparent diffusion coefficient (ADC) map, diffusion restriction can be also quantified through the calculation of the ADC value within specific regions of interest (ROIs) ***(Riccardo et al., 2015).***

In general, rapidly growing tumors are characterized by increased tissue cellularity and cellular density. With the increased amount of diffusion barriers, the motion of diffusion capacity is restricted and water diffuses from extracellular components to the intracellular space, resulting to low ADC values and high signal intensity on DWI. However high ADC values are attributed to the free motion of water molecules in fluid-rich biologic environments ***(Thomas et al., 2012).***

Diffusion-weighted magnetic resonance imaging has been used for diagnosis of diseases of the central nervous system for two decades being a particularly important tool in the diagnosis of ischemic stroke and the musculoskeletal system for one decade ***(Bruegel et al., 2008).***

During recent years, DWI of diseases of the lower abdomen, e.g. prostate, urinary bladder, uterus and rectum,

has presented promising results. DWI of the upper abdomen has been a technical challenge due to respiration, bowel peristalsis, blood flow and long acquisition times ***(Ichikawa et al., 2007).***

The implementation of ultrafast imaging techniques, such as parallel imaging, has made DWI of the upper abdomen a feasible option and has been found to be useful in differentiation of malignant from benign liver lesions. Many studies indicate that DWI is promising also in pancreatic imaging ***(Matsuki et al., 2007).***