Rule of DWI MRI in characterization of enlarged cervical lymph node

Thesis

Submitted for partial fulfillment of master degree in Radiodiagnosis

By

Haider Saeed Shandal AL-Khafaji

Supervised by

Prof. Dr. Khaled Esmat Allam

Professor of Radiodignosis faculty of medicine
Ain Shams University

Dr. Marwa El-Sayed Ebd Elrahman

Lecturer of Radiodiagnosis faculty of medicine
Ain Shams University

2017

بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

Acknowledgement

First of all I cannot give a word to fulfill my deepest thanks to"**ALLAH**",the most gracious and the most merciful for lighting me the way not only through this work but also throughout my whole life.

I would like to express my deep thanks and ever lasting gratitude to **Prof. Dr. Khaled Esmat Allam,** Professor of radiodignosis factuality of medicine, Ain Shams University, for his continuous scientific guidance, enriching me with his vast experience, unlimited help and supervision throughout the entire work.

I would also like to thank and express my extreme indebtedness to **Dr. Marwa El-Sayed Ebd Elrahman**, Lecturer of radiodiagnosis factuality of medicine, Ain Shams University, for her kind supervision, constant help and very generous cooperation.

Abstract

A lymph node or lymph gland, is an ovoid or kidney-shaped organ of the lymphatic system, and of the adaptive immune system, that is widely present throughout the body. They are linked by the lymphatic vessels as a part of the circulatory system. Lymph nodes are major sites of B and T lymphocytes, and other white blood cells. Lymph nodes are important for the proper functioning of the immune system, acting as filters for foreign particles and cancer cells .

Lymphadenopathy or adenopathy is disease of the lymph nodes , in which they are abnormal in size, number, or consistency, lymphadenopathy of an inflammatory type (the most common type) is lymphadenitis, producing swollen or enlarged lymph nodes, infectious lymphadenitides affecting lymph nodes in the neck are often called scrofula

DWI is one of the evolving functional MR imaging when added and interpreted together with the conventional MR imaging, the specificity and accuracy of conventional MR imaging finding havw showen to be increased.

Keywords: Benign lymph node, malignant lymph node, diffusion weighted imaging

List of Contents

List of Figures

Fig. No.	Title	Page No.

List of Figures *(Cont ..)*

Fig. No.	Title	Page No.

List of Table

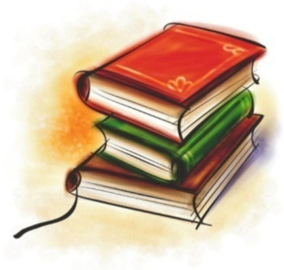
Table No.	Title	Page No.

List of abbreviation

Abbre. No.	Title	Page No.
ADC	Apparent diffusion coefficient	
AIDS	Auto immune deficiency virus	
ALL	Acute lymphocytic leukemia	
CLL	Chronic lymphocytic leukemia	
CRS	Congenital rubella syndrome	
CSD	Cat-scratch disease	
CT	computerized tomography	
DWI	Diffusion weighted image	
EBV	Epstein-Barr virus	
EPI	Echo planner imaging	
FDG	Fluorodeoxyglucose	
FNAC	Fine needle aspiration cytology	
FOV	Field of view	
FSE	Fast spin echo	
GE	Gradient Echo	
HCMV	Human Cytomegalo virus	
HIV	Human immune deficiency virus	
HL	Hodgkin's lymphoma	
HSV	Herpes Simplex virus	
LAP	Lymphadenopathy	

List of abbreviation (Cont..)

Abbre. No.	Title	Page No.
LN	Lymph node	
MR	Magnetic resonance	
NHL	Non-Hodgkin's lymphoma	
NPV	Negative predictive value	
P.I	Pulsatility index	
PET	Positron emission tomography	
PPV	Positive predictive value	
R.I	Resistivity index	
ROC	Receiver operating characteristic	
ROI	Region of interest	
RS	Reed–Sternberg cells	
SD	Standard deviation	
SLL	Small lymphocytic lymphoma	
SPECT	Single photon imaging computerized tomography	
SPSS	Statistical Program for Social Science	
SS	Single shot	
STIR	Short time inversion recovery	
TB	Tuberculosis	
U/S	Ultrasound	
USPIO	Ultra small super paramagnetic iron oxide	
WHO	The World Health Organization	



Introduction

Introduction

The detection of cervical nodes metastasis is very important for the prognosis and the treatment of head and neck tumors. Up to today parameters used by conventional imaging techniques are shape, size, extracapsular spread and an abnormal inner architecture. The size is certainly the most used criterion for the diagnosis, whereas the presence of central necrosis is the most reliable sign of malignity ***(King AD et al., 2004).***

Conventional imaging, such as Ultrasound (US), computed tomography (CT) and magnetic resonance (MR) can be used in the detection of enlarged cervical nodes, depending upon the morphologic criteria of the lymph node including the maximum short axial diameter, presence of necrosis, loss of LN hilum, heterogeneous enhancement, and perinodal infiltration ***(Holzapfel et al., 2009)***

Metabolic imaging using single photon emission-CT (SPECT) and positron emission tomography (PET) can help in this differentiation but they are limited by low spatial resolution and variable physiological fluro-deoxyglucose (FDG) uptake in anatomical structures and inflammatory lymph nodes. Ultrasound guided fine needle aspiration cytology (FNAC) is invasive with false negative results due to operator-dependency ***(Fukui et al., 2005).***

Diffusion-weighted MRI (DWI) is a non-invasive functional technique which allows the characterization of tissues and lesions by difference in microstructure ***(Harriet 2010; Ishikawaet al., 2004).***

The process based on the analysis of water motion as architectural changes in the water molecule movement will alter the apparent diffusion coefficient and the signal intensity in DWI and apparent diffusion coefficient maps ***(Woodhams et al., 2011).***

Principles of Diffusion MRI & ADC calculation: Diffusion is a physical process that results from the thermally driven, random motion of water molecules ***(Fukui et al., 2005).***

In the malignant tissue the apparent diffution of water is decrease.

In such an environment, water diffusion is said to be relatively “restricted.”

By contrast, in cystic or necrotic tissues, the apparent diffusion of water protons is relatively “free.” Thus, DW MR imaging is unique in its ability to provide information that reflects tissue cellularity and the integrity of cellular membranes ***(Bammer et al., 2003).***

Extracranial application of diffusion-weighted magnetic resonance imaging (MRI) has gained increasing importance in recent years. As a result of technical advances, this new non-invasive functional technique has also been applied in head and neck radiology for several clinical indications. In cancer imaging, diffusion-weighted MRI can be performed for tumour detection and characterization, monitoring of treatment response as well as the differentiation of recurrence and post-therapeutic changes after radiotherapy. Even for lymph node staging promising results have been reported recently ***(Harriet 2010).***

Aim of the Work