Assessment of Uterine Cervical Cancer by Means of MR Spectroscopy

Thesis

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Farah Hasan Ali

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Farah Hasan Ali

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List of Abbreviations

Abb.	Full term

ADC .....: Apparent diffusion coefficient
ATP.....: Adenosine triphosphate
B0.....: Main magnetic field
C.....: Carbon
CHO.....: Choline
CIN .....: Cervical intra epithelial neoplasia
CIS.....: Carcinoma in situ
CR.....: Creatin
DCE .....: Dynamic contrast enhasment
DNP .....: Dynamic nuclear polarization
DWI.....: Diffusion weighted imaging
ESUR.....: European Society of Urogenital Radiology
F.....: Fluorine
FOV.....: Field of view
FSE.....: Fast spin echo
HPV .....: Human papilloma virus
HSIL .....: High grade squamous intra epithelial lesion
LUCX.....: Lymphoma of uterine cervix
ML.....: Mobile lipid
MRI.....: Magnetic resonance imaging
MRS.....: Magnetic resonance spectroscopy
MSI .....: Magnetic spectrometry imaging
NAA .....: N-acetyl aspartate
P.....: Phosphorus
PET.....: Positron emission tomography
PPM .....: Parts per million
PPP .....: Pentose phosphate pathway
PRESS.....: Point resolved spatially localized spectroscopy
PSCC .....: Papillary squamous cell carcinoma

List of Abbreviations (Cont...)

Abb.	Full term
RF	*Radiofrequency*
ROI	*Region of interest*
SCC	*Squamous cell carcinoma*
SCJ	*Squamo columnar junction*
STEAM	*Stimulated echo acquisition mode*
SVC	*Single voxel spectroscopy*
TE	*Echo time*
TR	*Repetition time*
US	*Ultra sound*
WI	*Weighted image*

INTRODUCTION

The incidence of cervical cancer is higher in low-income countries due to lack of screening programs while in developed countries, the incidence dropped after implementation of the Papanicolaou smear test ***(Fields and Weiss, 2016).***

Cervical cancer is a leading cause of mortality in women worldwide usually affecting females before the age of 50.However; older women remain at risk. Cervical cancer is both preventable and treatable ***(Ferlay et al., 2013).***

Prognosis of cervical cancer is highly depended on extent of the disease at diagnosis and, therefore, accurate staging is crucial for optimal management, So magnetic resonance imaging (MRI) with its excellent soft tissue imaging characteristics now plays an important role in many aspects of tumor staging, planning and delivery of radiotherapy, post treatment response assessment and surveillance ***(Fields and Weiss, 2016).***

Unfortunately, despite advances in radiotherapy and the inclusion of chemotherapy in the standard plan for locally advances disease, local control has been unsatisfactory. This situation has changed only recently with the increasing implementation of MRI - guided brachytherapy ***(Fields and Weiss, 2016)***.

Currently, in cervical cancer patients, MRI is primarily used for the evaluation of tumor morphology and local extent, it accurately evaluates tumor features with a significant prognostic values, as tumor size, growth, parametrial infiltration and involvement of pelvic side walls or any adjacent organs as urinary bladder or rectum ***(Bourgioti et al.,2016).*** Moreover; MRI is a very valuable tool in assessing the spread of the tumor to local and distant lymph nodes. It also assesses the disease response to chemo radiation and differentiates residual or recurrent disease from radiation fibrosis. Thus, MRI is valuable in deciding the treatment strategies and the accuracy for determining tumor stage ranges from (75%-96%) ***(Mahajan et al., 2013).***

Abnormal metabolism is a key tumor hallmark. Proton magnetic resonance spectroscopy (^{1}H-MRS) allows measurement of metabolite concentration that can be utilized to characterize tumor metabolic changes, MRS interpretation is mainly based on checking the elevation of certain metabolites (such as choline) or the absence or decrease of normal metabolites (e.g., N-acetyl aspartate-NAA) ***(Figueiras et al., 2016).***

The MR spectroscopy can also be used to depict the elevated lipid resonance levels in cervical carcinomas, persistent disease following concurrent chemo radiotherapy (CCRT) ***(Lin et al., 2016).***