ROLE OF MAGNETIC RESONANCE SIALOGRAPHY IN DIAGNOSIS OF SALIVARY GLAND DISEASE

Thesis

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Dedication

To my great Family:

M y Parents

My lovely Wife &

Children

My Brother & Sister

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رسالة

مقدمة توطئة للحصول على درجة الدكتوراه فى الأشعة التشخيصية

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سورة البقرة
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LIST OF ABBREVIATIONS

2 D	**:** Two dimensional
3 D	**:** Three dimensional
ADC	**:** Apparent diffusion coefficient
CISS	**:** Constructive interference in steady-state
CS	**:** Conventional sialography
CT	**:** Computed Tomography
DWEPI	**:** Diffusion – weighted echo-planar imaging
EXPRESS	**:** Extended - phase conjugate - symmetry rapid spin-echo sequence
FASE	**:** Fast asymmetric spin echo
FFT	**:** Fast Fourier transform
FOV	**:** Field of view
FSE	**:** Fast spin echo
GRASE	**:** Gradient and spin echo
HASTE	**:** Half-Fourier acquisition single shot turbo spin echo
HR-MRS	**:** High – resolution MR sialography
MIP	**:** Maximum intensity projection
MRS	**:** Magnetic resonance sialography
NMV	**:** Net magnetization vector
RARE	**:** Rapid acquisition with relaxation enhancement
RF	**:** Radiofrequency
SE	**:** Spin echo
SNR	**:** Signal to noise ratio
SSTSE	**:** Single shot turbo spin echo
STIR	**:** Short T1 inversion recovery
TE	**:** echo time
TE eff	**:** effective echo time
TI	**:** Inversion time
TR	**:** Repetition time
TSE	**:** Turbo spin echo
US	**:** Ultrasonography

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INTRODUCTION

The salivary glands are; pair of parotid; pair of submandibular and pair of sublingual glands ***(Grainger and Allison, 1997).***

Different diseases affect the salivary glands such as; inflammatory diseases, autoimmune diseases and neoplastic diseases ***(Cotran et al., 1994).***

Imaging of the main salivary glands and ducts can be performed with conventional sialography, sonography, computed tomography and magnetic resonance imaging ***(Jager et al., 2000)***.

Because of its excellent delineation of ductal system, conventional sialography currently is still considered the standard modality for assessing ductal abnormalities ***(Becket et al., 2000)***.

In the recent years, rapid technical development has improved accuracy of non-invasive radiological methods including ultrasonography and magnetic resonance imaging. These methods have been widely replacing conventional invasive examinations in scientific research as well as in clinical practice ***(El-Miedany, 2004; Takagi et al., 2005 and Tanaka et al., 2008)***.

The introduction of Magnetic resonance sialography protocol by ***Lomas et al. (1996)*** was the first step towards non-invasive fast easy technique for demonstration of the duct

system.This technique is based on principles of MR hydrography , in which T2-Weighted pulse sequences are used to image static fluid . Consequently, stationary saliva within the salivary gland ducts could be seen to have high signal intensity while solid organs had low signal intensity. In addition flowing blood had little or no measurable signal ***(Gadodia et al., 2010)***.

MR sialography has several advantages over conventional X-ray sialography. These include the absence of any requirement to cannulate the duct and the lack of ionizing radiation. Because the technique is completely non-invasive, it is likely to enable a more accurate assessment of duct caliber, and duct orifice abnormalities will not be obscured as they are with the conventional method. The examination is not contra-indicated by infection. Because saliva is the contrast medium for the technique, a complete ductal occlusion does not preclude imaging the upstream section of the duct system. Finally, this technique does not rely on any manual skills related to cannulation and has been implemented on a widely available conventional clinical MR system ***(Lomas et al., 1996 and Heverhagen et al., 2000)***.

MR sialography had been used in the examination of patients with salivary duct diseases including the evaluation of sialolithiasis, duct stenosis and sialadenitis ***(Varghese et al., 1999; Kalinowski et al., 2002; Morimoto et al., 2004 and Tanaka et al., 2007)***.

AIM OF THE WORK

This study aims to:

Assess the role of Magnetic Resonance Sialography in imaging of salivary gland diseases by using conventional sialography as a gold standard.

SALIVARY GLANDS

Saliva serves multiple and important functions. It plays a key role in taste, chewing, speech, digestion and oral health. Saliva is a solvent for the chemical taste components of the food, a lubricant for all oral mucosal surfaces as well as the food bolus, and a supersaturated reservoir of biominerals, such as calcium, phosphate and fluoride, which continually bathes the teeth, facilitating their mineralization. Saliva also buffersainst sudden drop in oral PH that can cause teeth to lose their superficial mineral substance. Saliva contains antimicrobial agents that directly kill pathogens ***(Berg et al., 2003; De almeida et al., 2008 and Garcia-Godoy & Hicks, 2008).***

Three major, paired salivary glands produce the majority of saliva: the parotid, the submandibular and the sublingual glands. In addition 600-1,000 minor salivary glands line the oral cavity and oropharynx, contributing a small portion of total salivary production ***(Silvers and Som, 1998)***.

Embryology:

The major salivary glands develop from the 6^{th} – 8^{th} weeks of gestation as an outpouching of oral ectoderm into the surrounding mesenchyme ***(Silvers and Som, 1998)***.

The growth of the bud is stimulated by underlying ectomesenchyme. This cord of cells branches several times and