Endoscopic Sellar, Suprasellar And Parasellar Surgery With Image Guidance

Thesis

Submitted for fulfillment of MD Degree in Otorhinolaryngology

By

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2014

Acknowledgement

Above all, I would like to thank ***GOD*** who made all things possible. He was always there for me throughout my life. Without Him, I could not have completed this work.

I would like to acknowledge and extend my heartfelt gratitude to the following persons who have made the completion of this work possible.

I want to thank ***my dear parents*** who have given me their obvious support and love throughout my life for which my mere expression of thanks does not suffice.

This work would not have been possible without the help, support and patience of my principal supervisor, ***Prof. Dr. Hesham Negm***, Professor of Otolaryngology, Faculty of Medicine, Cairo University, not to mention his advice, vital encouragement and support.

The good advice, support and friendship of my second supervisor, ***Prof. Dr. Hussam El-Bosraty***, Professor of Otolaryngology, Faculty of Medicine, Cairo University, has been invaluable on both an academic and a personal level, for which I am extremely grateful.

Many thanks for my third supervisor, ***Prof. Dr. Hazem Abdel Badiea***, Professor of Neurosuergery, Faculty of Medicine, Cairo University, for his understanding, assistance and expert guidance.

Also I would like to thank all the staff members in the Otolaryngology Department, Faculty of Medicine, Cairo University, for their support and assistance.

Last, but by no means least, I would like to thank my colleagues and my friends for their kindness, friendship, encouragement and support.

The library facilities and computer facilities of the Cairo University have been indispensable.

My apologies if I have accidentally omitted anyone to whom acknowledgement is due.

I hope that readers will very much enjoy this work as well as find it educative.

Thank you all.

Mina Safwat Fahim

Abstract

This study was conducted on 20 patients presented with sellar, suprasellar and parasellar pathologies admitted in the Otorhinolaryngology and Neurosurgery departments, Faculty of Medicine, Cairo University in the period between January 2013 and July 2014.Patients were divided into 2 groups:1-Study group: 10 patients underwent endoscopic transsphenoidal surgery using IGS & 2-Control group: 10 patients underwent surgery without using IGS.The IGS group had 1 major complication; a mean intraoperative blood loss of 840 mL, a mean total operative time of 166 minutes and mean actual operative time of 130.5 minutes. The non-IGS group had 3 major complications; a mean intraoperative blood loss of 818 mL; a mean total operative time of 154 minutes and mean actual operative time of 138 minutes.

Keyword:IGS- Suprasellar- RCC-CTA

Contents

List of Abbreviations

IGS	Image Guided System
CT	Computed Tomography
CTA	CT Angiography
MRI	Magnetic resonance imaging
RCC	Rathke cleft cyst
CSF	Cerebrospinal fluid
FESS	Functional Endoscopic Sinus Surgery
ILD	Intraoperative localization device
LEDs	Light emitting diodes
PET	Positron emission tomography
ICA	Internal Carotid Artery

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Aim of the work

The aim of this work is to evaluate the efficacy of image-guided systems in endoscopic sellar, suprasellar and parasellar surgeries.

Introduction

The sella is located in the center of the cranial base. Access to the sella is limited from above by the optic nerve, optic chiasm and circle of Willis, laterally by the cavernous sinuses and internal carotid arteries, and from behind by the brain stem and basilar artery ***(Rhoton, 2000)***.

Suprasellar region lies above the sellar region. Several critical structures traverse this area, including the circle of Willis, optic nerves and optic chiasm, hypothalamus, pituitary infundibulum, and the infundibular and suprachiasmatic recesses of the third ventricle ***(Simonetta, 1999)***.

Three different compartments could be identified lateral to the sella turcica. Orbital and pterygopalatine compartments in the anterior part of the parasellar space which are usually small and connected with extracranial tissue spaces, they were filled with characteristic adipose bodies and separated by connective tissue from the remaining parasellar space, which was termed the lateral sellar compartment ***(Wolfgang et al., 2000)***.

The endoscopic endonasal approach to the sellar region is a recent evolution of the conventional transsphenoidal technique performed with the operating microscope. It is rapidly gaining wide acceptance due to its excellent capacity to explore the sphenoid sinus, the pituitary fossa and the suprasellar and parasellar spaces. The prominent features include minimal invasiveness and a close-up panoramic view, which may result in more complete removal of invasive tumors, reduced postoperative discomfort and shortened hospital stay ***(Jian et al., 2007)***. Unfortunately, the rigid-lens system provides only a two-dimensional view, requiring surgeons to localize instruments based on their depth of penetration and tactile sensation. Orientation and localization within the sphenoid sinus and sellar cavity can be problematic, especially in the setting of extensive disease, revision surgery, or bleeding. Due to the close proximity of important orbital and intracranial structures, complications from transsphenoidal surgery, although rare, can be devastating ***(Ciric et al., 1997) (Elias et al., 1999)***.

The technology of image-guided navigational systems (IGS) has served to fuel the dynamic evolution of endoscopic transsphenoidal surgery. Image-guided systems were developed to provide assistance with real-time intraoperative localization of surgical anatomy. These systems function to identify surgical instruments, calculate the location of the instrument tip in relation to the patient, and project the instrument location onto a previously obtained imaging study (a CT scan or MRI). The operator can use this information for intraoperative surgical navigation or preoperative planning using the computer workstation, which displays the patient's images simultaneously in all three anatomic planes (coronal, axial, and sagittal). Navigation technology can determine, with great accuracy, the precise location of key landmarks and critical structures during the course of an operation.

The combined use of image guidance and endoscopy is the newest advance in transsphenoidal surgery ***(Durr et al., 2005)***. The technology of image-guidance has established itself as a valuable tool for the endoscopic surgeon and its continued growth seems certain, although the proper role and indications for its application remain undefined. Obtaining maximal benefit from these systems requires a general understanding of how they work, and an appreciation of their limitations.

Image-guidance technology is an adjunct in the operating room and does not substitute for basic anatomic knowledge and surgical skill. Image-guided surgery (IGS) has also been called computer-assisted surgery, computer-guided surgery, and surgical navigation; in this thesis we will use the term IGS.

Anatomy

Surgical anatomy of the nasal cavity:

Each of the nasal cavities can be compared to a transversally flattened channel, larger at the bottom and narrowing as it proceeds upward. It has four walls and two openings ***(Alfieri and Jho, 2001)***.

The inferior wall comprises, at the front, the maxillary palatine process and, at the back, the horizontal palatine bone lamina. From anterior to posterior, the upper wall is made up of the nasal bone, frontal bone, cribriform plate of the ethmoid, anterior surface of the sphenoid bone ***(Alfieri and Jho, 2001)***.

The medial wall (Fig. 1) is made up, above, of the perpendicular plate of the ethmoid and, below, of the vomer. These two bones articulate with each other describing a broad inward angle filled with cartilage (the septal cartilage) which plays an important role in the formation of the nasal septum. The latter only rarely follows the median plane; most often it deviates somewhat to either the left or right ***(Cappabianca et al., 2001)***.

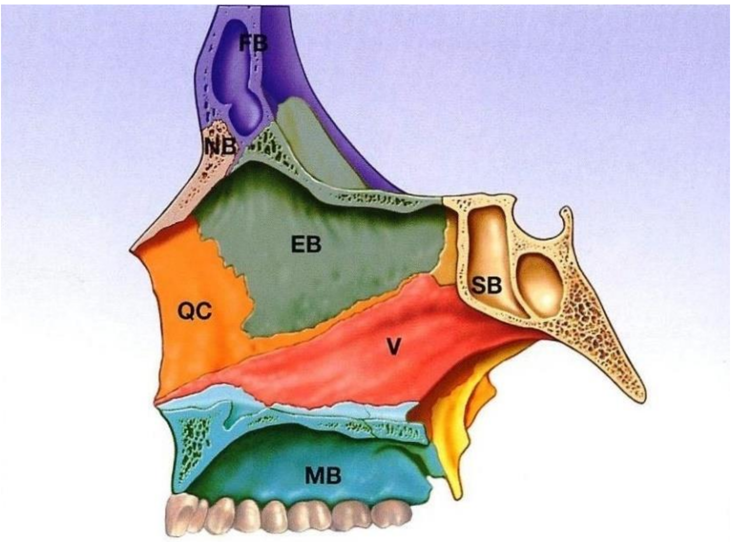

Figure 1 : Medial wall of nasal cavity (*EB*= ethmoid bone, *FB* is frontal bone, *MB* is maxillary bone, *NB* is nasal bone, *QC* is quadrangular cartilage, *SB* is sphenoid bone and *V* is vomer) ***(Cappabianca and Divitis, 2004)***