



جامعة عين شمس
كلية الطب
قسم جراحة المخ والأعصاب

التدخل الجراحي عبر الجيب الاسفيني في علاج اورام الغده النخاميه

رسالة مقدمة لكلية الطب - جامعة عين شمس
ايفاء جزئيا لشروط الحصول على درجة الماجستير
في جراحة المخ والأعصاب

مقدمة من

الطبيب/ مصطفى ابراهيم محمد عزيز المازني
بكالوريوس الطب والجراحة
كلية الطب- جامعة طنطا

المشرفون

أ.د/ محمد اشرف غباشي
أستاذ جراحة المخ والأعصاب
كلية الطب- جامعة عين شمس

أ.م.د/ خالد محمد فتحي سعود
أستاذ مساعد جراحة المخ والأعصاب
كلية الطب- جامعة عين شمس

د/ هشام انور عبد الرحيم
مدرس جراحة المخ و الأعصاب
كلية الطب- جامعة عين شمس

كلية الطب
جامعة عين شمس
٢٠١٢



Transsphenoidal Surgery for Pituitary Adenoma Removal

*Thesis Submitted
For Partial Fulfillment of master Degree
In Neurosurgery*

BY

Mostafa Ibrahim Mohamed Aziz EL-Mazny
M.B.B.CH.

Supervisors

Professor Dr.
Mohamed Ashraf Ghobashy
*Professor of Neurosurgery
Faculty of Medicine
Ain Shams University*

Ass. Prof. Dr
Khaled Mohamed Fathy Saoud
*Assistant Professor of Neurosurgery
Faculty of Medicine
Ain Shams University*

Dr.
Hisham Anwar Abdel Rahiem
*Lecturer of neurosurgery
Faculty of Medicine
Ain Shams University*

Ain Shams University
Faculty of Medicine
2012

Acknowledgement

*First and foremost, thanks to **GOD***

the most beneficent and most merciful.

*I wish to express my sincere appreciation and deepest gratitude to **Prof. Dr. Mohamed Ashraf Ghobashy** Professor of Neurosurgery Faculty of Medicine Ain Shams University. He devoted his time, effort and experience most generously throughout this work.*

*I would like to express my gratitude and deep appreciation to **Ass. Prof. Dr. Khaled Mohamed Saoud** Assistant Professor of Neurosurgery, Faculty of Medicine Ain Shams University, for his kind help, great interest, continuous supervision and constructive encouragement.*

*I am deeply grateful to **Dr. Hisham Anwar Abdel Rahiem** lecturer of neurosurgery Faculty of Medicine Ain Shams University, to whom, I owe a very special debt. Without his wisdom, close and continuous supervision, creative thoughts, constructive criticism, relentless support and patience I would not have achieved any of what I have achieved today.*

*Last, but not least, I am very grateful to **My Mother & My Sisters** who supported me to finish this work.*

Contents

| | |
|---|-----|
| <input type="checkbox"/> Acknowledgment | |
| <input type="checkbox"/> Abstract | |
| <input type="checkbox"/> List of figures | II |
| <input type="checkbox"/> List of tables | V |
| <input type="checkbox"/> List of abbreviations | VI |
| <input type="checkbox"/> Review of literature | 1 |
| <input type="checkbox"/> Introduction | |
| <input type="checkbox"/> Anatomy | |
| <input type="checkbox"/> Surgical Anatomy of the Nose | |
| <input type="checkbox"/> Surgical Anatomy of the Sphenoid Sinus | |
| <input type="checkbox"/> Surgical Anatomy of the Hypophysis Cerebri | |
| <input type="checkbox"/> Pathology | |
| <input type="checkbox"/> Clinical Presentation | |
| <input type="checkbox"/> Neurophthalmological Evaluation | |
| <input type="checkbox"/> Neuroimaging | |
| <input type="checkbox"/> Surgical procedures | |
| <input type="checkbox"/> Aim of the work | 68 |
| <input type="checkbox"/> Patients and Methods | 69 |
| <input type="checkbox"/> Results | 91 |
| <input type="checkbox"/> Illustrative Cases | 99 |
| <input type="checkbox"/> Discussion | 107 |
| <input type="checkbox"/> Summary and conclusion | 119 |
| <input type="checkbox"/> References | 124 |
| <input type="checkbox"/> Arabic summary | |

List of Figures

| | | |
|----------------|--|-----------|
| Fig. 1 | Osteology of the right lateral nasal wall | 4 |
| Fig .2 | Lateral wall of the nasal cavity | 5 |
| Fig .3 | Dissection of the sphenopalatine artery | 6 |
| Fig .4 | Sellar region | 8 |
| Fig .5 | Relations of the sphenoid sinus | 10 |
| Fig .6 | Anatomical variations of the sphenoid sinus pneumatization | 11 |
| Fig .7 | Schematic representation of horizontal sections through the sphenoid bone | 12 |
| Fig .8 | Bulges & Recesses into the sphenoid sinus walls | 13 |
| Fig .9 | Anatomical variations in the course of the internal carotid artery in relation to the sphenoid sinus | 14 |
| Fig .10 | Anatomy (A) schematic midline sagittal view of sella turcica, pituitary gland, and infundibulum (B) schematic coronal view of the cavernous sinuses, ICA, cranial nerves | 15 |
| Fig .11 | A summary of the vasculature of the hypothalamic median eminence, infundibulum and the other regimes of the hypophysis cerebri | 18 |
| Fig .12 | The "equilateral pyramid" of the suprasellar region | 19 |
| Fig .13 | Structures found on the sides of the pyramid | 20 |
| Fig .14 | Anterior view of gland | 21 |
| Fig .15 | Sagittal sections (left) and superior views (right) of the sellar region showing the optic nerve and chiasm, and carotid artery | 22 |
| Fig .16 | PRL producing cells | 26 |
| Fig .17 | Localization and probable identification of masses by pattern of field loss. | 37 |

| | | |
|----------------|---|-----------|
| Fig .18 | The anterior chiasmal syndrome | 39 |
| Fig.19 | Hemifield slide phenomena | 40 |
| Fig .20 | Dynamic MRI before (A) and after 30 (B) of bolous CE show micro adenoma | 42 |
| Fig .21 | Pituitary macroadenoma (A) T1-weighted images without and (B) T1 with contrast | 43 |
| Fig .22 | CT scan on coronal plane; Presence of multiple septa within the sphenoid sinus | 44 |
| Fig. 23 | Sagittal CT reconstructions. (a) "Sellar", (b) "presellar", and (c) "conchal "-type sphenoid sinus | 45 |
| Fig. 24 | The protocol of transsphenoidal approach for pituitary adenoma | 51 |
| Fig .25 | 0° angled lens, 30° angled lens, 45° angled | 52 |
| Fig .26 | Endoscopic shaft. | 53 |
| Fig .27 | Irrigation sheath and pump. | 53 |
| Fig. 28 | A) Pneumatic Holding Arms, B) Mechanical Holding Arms | 53 |
| Fig. 29 | Micro drill, Foot control, handpiece and standard attachment, Curved extended minimal access attachments. | 54 |
| Fig. 30 | Positioning of the patient's head on the operating table | 56 |
| Fig .31 | Access to the sphenoid ostium through the center of the middle nasal turbinate | 57 |
| Fig .32 | Nasal phase | 58 |
| Fig .33 | Sphenoid phase | 59 |
| Fig .34 | Sellar phase | 60 |
| Fig .35 | Opening the lateral sellar dura with a straight micro-blade or scalpel risks injury to the cavernous ICA | 65 |

| | | |
|----------------|--|------------|
| Fig.36 | T1 and T2 weighted MRI with contrast (coronal and sagittal views) showing pituitary macroadenoma. | 79 |
| Fig.37 | The protocol of transsphenoidal approach for pituitary adenoma. | 87 |
| Fig .38 | seller repair with fat grafting and duraseal | 89 |
| Fig .39 | Operative time | 95 |
| Fig .40 | Coronal MRI with contrast & sagittal MRI T ₁ weighted image showed giant pituitary adenoma with suprasellar extension and optic chiasm compression. In case 1 | 99 |
| Fig .41 | Coronal & sagittal MRI with contrast. Showing total tumor excision. In case 1 | 100 |
| Fig .42 | Coronal MRI T ₁ weighted image & sagittal MRI with contrast showed giant pituitary adenoma with suprasellar extension and optic chiasm compression. In case 2 | 101 |
| Fig .43 | Coronal & sagittal MRI with contrast. The tumor was totally excised. In case 2 | 102 |
| Fig .44 | Coronal MRI T ₁ weighted image & sagittal MRI with contrast showed giant pituitary adenoma with suprasellar and sphenoid sinus extensions and optic chiasm compression. In case 3 | 103 |
| Fig .45 | Coronal & sagittal MRI with contrast. The tumor was totally excised. In case 3 | 104 |
| Fig .46 | Coronal MRI with contrast & sagittal MRI T ₁ weighted image showed pituitary adenoma with optic chiasm compression. In case 5. | 105 |
| Fig .47 | Coronal & sagittal MRI with contrast. Showing total tumor excision, the pituitary gland & its stalk looks free. In case 5 | 106 |

List of Tables

| | | |
|-----------------|---|-----------|
| Table 1 | Tumors of Pituitary WHO Classification (2004) | 25 |
| Table 2 | Classification and characteristics of pituitary adenoma types. Modified from Arafah & Nasrallah with the permission from the Society for Endocrinology, data also from Sane in Välimäki <i>et al.</i> 2009 p.100 and Melmed 2003. | 34 |
| Table 3 | Sex distribution | 91 |
| Table 4 | Age distribution | 91 |
| Table 5 | Symptoms and signs | 92 |
| Table 6 | Hormonal activity of the functioning adenomas | 93 |
| Table 7 | Hormonal activity of the pituitary adenomas. | 93 |
| Table 8 | CT of the sphenoid sinus | 93 |
| Table 9 | Tumor enhancement | 94 |
| Table 10 | Tumor intensity on T2 WI MRI | 94 |
| Table 11 | Tumor extension | 94 |
| Table 12 | Field changes | 95 |
| Table 13 | Approach & Technique | 95 |
| Table 14 | Intraoperative finding | 96 |
| Table 15 | Complications | 96 |
| Table 16 | Prognosis | 97 |
| Table 17 | Hormonal profile follow-up | 97 |
| Table 18 | Post operative visual field (after one month) | 98 |
| Table 19 | Tumor removal | 98 |
| Table 20 | Post operative follow-up MRI (after six months) | 98 |

List of Abbreviations

| | |
|------------------|---|
| ACTH | AdrenoCortico Tropic Hormone |
| ADH | Anti Diuretic Hormone |
| Ca | Calcium |
| CBC | Complete Blood Count |
| CRH | Corticotropin Releasing Hormone |
| CS | Cushing Syndrome |
| CSF | Cerebro Spinal Fluid |
| CT | Computerized Tomography |
| DDAVP | 1-deamino-8-D-arginine vasopressin (desmopressin) |
| DI | Diabetes Insipidus |
| DM | Diabetes Mellitus |
| DMZ | Dexamethasone Suppression Test |
| EETS | Endoscopic Endonasal Transsphenoidal |
| F | Female |
| Fig | Figure |
| FSH | Follicular Stimulating Hormone |
| GH | Growth Hormone |
| GH-sec MA | Growth Hormone secreting Macro Adenoma |
| H&E | Hematoxylin And Eosin |
| HT | Hypothalamus |

| | |
|-------------------|-----------------------------------|
| HTN | Hypertension |
| ICA | Internal Carotid Artery |
| IGF | Insulin Like Growth Factor |
| IHA | Inferior Hypophyseal Artery |
| IM | Intramuscular |
| IV | Intravenous |
| LH | Luteinizing Hormone |
| Lt | Left |
| M | Male |
| MRA | Magnetic Resonance Angiogram |
| MRI | Magnetic Resonance Imaging |
| MRV | Magnetic Resonance Veinogram |
| PA | Prothrombin Activity |
| PRL | Prolactin |
| PRL-sec MA | Prolactin secreting Macro Adenoma |
| PT | Prothrombin Time |
| RBS | Random Blood Sugar |
| Rt | Right |
| SC | Subcutaneous |
| SHA | Superior Hypophyseal Artery |
| T3 | Tri-iodo tyrosine |
| T4 | Tetra- iodo tyrosine |

| | |
|------------|-----------------------------|
| TSH | Thyroid-stimulating hormone |
| TSS | Transsphenoidal surgery |
| WHO | World Health Organization |

Abstract

Pituitary tumors account for 15% of all primary brain tumors, which can be approached through either transcranial or transsphenoidal routes.

This study will include patients who are admitted to the neurosurgery department at Nasr City Insurance Hospital, Ain Shams University Hospital and Tanta University Hospital, during the period from May/2011 to July/2012.

20 patients were operated using the microscopic transsphenoidal approach with mean follow up of 12 months. 9 were functioning adenomas and 11 were non-functioning with varying degree of extension to the cavernous sinus. The most common complication was CSF leak (10%), transient DI (5%) and epistaxis (15%).

The result of this study support the safety and the efficacy of this approach to treat pituitary adenoma; however long term follow up is needed.

Introduction

Historically, the first successful removal of a pituitary tumor was performed by Schloffer in 1907, using an extracranial transsphenoidal approach through a superolateral nasoethmoidal route. Although Hirsch from Vienna pioneered in 1909 an inferolateral endonasal approach, Harvey Cushing ingeniously introduced a new method that combined the advantages of previous technical modalities; he deserves the credit for having standardized an oronasal midline rhino septal transsphenoidal approach. He routinely used this method during a 20-year period for over 247 cases of pituitary tumor, remaining faithful to an early statement that "the important factor seems to me a direct extracranial midline approach by the shortest possible route. (**Hardy J, 1996**)

Pituitary tumors are common lesions believed to account for 10-15 % of all primary brain tumors. The pituitary tumors are the third most common primary intracranial tumors. (**Thapar K et al., 1995**)

The pituitary gland consists of the adenohypophysis (anterior lobe) which constitutes the major portion (three fourths) of the pituitary gland and neurohypophysis (posterior lobe) which constitutes only (one fourth) of the gland. (**Gibo H et al., 1993**)

The pituitary gland lies within a bony depression called the sella turcica within the sphenoid bone at the base of the brain. Access to the sella is limited from above by the optic nerves and chiasm and the circle of Willis, It is from the hypothalamus that hypothalamic tropic factors are released to descend down the pituitary stalk to the pituitary gland where they stimulate

the release of pituitary hormones. While the pituitary gland is known as the 'master' endocrine gland, both of the lobes are under the control of the hypothalamus; the anterior pituitary receives its signals from the parvocellular neurons and the posterior pituitary receives its signals from magnocellular neurons. **(Gibo H et al., 1993)**

The pituitary adenomas arise from adenohypophysis may be microadenomas or macroadenomas. The former are less than 1 cm in diameter, and the latter are more than 1 cm in diameter. It may be functioning or non functioning. The former is manifested early than the later due to endocrinological manifestations. Pituitary tumors cause symptoms by secreting hormones (prolactin, PRL, responsible for amenorrhea-galactorrhea in women and decreased libido in men; growth hormone, GH, responsible for acromegaly; adrenocorticotrophic hormone, ACTH, responsible for Cushing's syndrome; thyroid-stimulating hormone, TSH, responsible for hyperthyroidism), depressing the secretion of hormones (hypopituitarism), or by mass-related effects (headaches, visual field abnormalities...). **(Chanson P, et al., 2004).**

Diagnosis of pituitary adenoma has been established on the basis of clinical examination, neuroimaging studies and endocrinological testing. MRI with Gadolinium is the most useful modality for imaging the pituitary gland, sellar and parasellar region and to assess the site of the tumor, exact location, extension into the cavernous sinus and the degree of edema. **(John T, et al., 2008).**