Endoscopic Versus Microscopic Transsphenoidal Approach in the Treatment of Pituitary Adenomas

Protocol Submitted For M.D. thesis

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Mohammed Saleh Aladashi

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3 D	Three Dimensional
ACTH	Adrenocorticotropin Hormone
CCD	Charge Coupled Devices
CRH	Corticotropin Releasing Hormone
CS	Cavernous Sinus
CSF	Cerebro Spinal Fluid
CT	Computerized Tomography
D2	Dopamine 2
ENT	Ear Nose And Throat
FEPS	Functional Endoscopic Pituitary Surgery
FSH	Follicle Stimulating Hormone
GH	Growth Hormone
GnRH	Gonadotropin Releasing Hormone
GHRH	Growth Hormone Releasing Hormone
HD	High Definition
HE	Hematoxylin–Eosin
ICA	Internal Carotid Artery
IGF-1	Insulin Growth Factor 1
IPSS	Inferior Petrosal Sinus Sampling
IRMA	Immunoradiometric Assay
LCD	Light Coupling Diode
LH	Luteinizing Hormone
MEN	Multiple Endocrine Neoplasia
MIB-1	Mindbomb Homolog 1

MRI	Magnetic Resonance Imaging
NFA	Clinically Nonfunctioning Adenoma
OGTT	Oral Glucose Tolerance Test
PAS	Periodic Acid–Schiff
PRL	Prolactin
RER	Rough Endoplasmic Reticulum
T4	Free Thyroxin
TFT	Thin Film Transistor
TRH	Thyrotropin Releasing Hormone
TSH	Thyroid Stimulating Hormone
UFC	Urinary Free Cortisol
VEP	Visual Evoked Potentials
WHO	World Health Organization

Introduction

The pituitary gland is comprised of anterior and posterior lobes. The gland secretes eight peptide hormones, two from the posterior lobe and six from the anterior lobe. It rests in the sella turcica, a saddle-shaped concavity of the sphenoid bone. The optic nerves, chiasm and tract lay just above the diaphragma sella, through which passes the pituitary stalk. The cavernous venous sinuses, the medial wall of which form the lateral walls of the sella, contain the IIIrd, IVth and VIth cranial nerves, the ophthalmic and maxillary divisions of the trigeminal nerve, and the internal carotid arteries ***(Thapar K etal, 2004)***.

Pituitary tumors (adenomas) arise primarily from the anterior pituitary gland (adenohypophysis), and may be classified by a number of schemes, including: by endocrine function, by light and electron microscopic appearance and radiological picture ***(Thapar K etal, 2004)***. Clinically, pituitary tumors usually present either due to endocrinologic disturbance, or due to mass effect. Pituitary macroadenoma may produce headache. A small number present with pituitary apoplexy, rarely invasive adenoma may present with CSF rhinorrhea ***(Asa SL, etal,2009)***.

For patients in whom a pituitary adenoma is suspected a coordinated two step diagnostic approach is required. The first step involves establishing an endocrine diagnosis, and the second is securing an anatomic diagnosis ***(Thapar K etal, 2004)***. Assessment of pituitary function requires clinical evaluation of hormonal deficiency or excess and laboratory testing of the various pituitary target organ axes. Endocrine evaluation confirms endocrinopathy, defines it, help establish the etiology and assess the effect of treatment ***(Oyesiku, 2005)***.

The anatomic diagnosis is now provided by high-resolution, gadolinium-enhanced MRI. In certain circumstances, extracranial imaging may be required to secure the correct anatomic diagnosis and exclude an ectopic hormone-secreting tumor in the chest, abdomen, or retro- peritoneum and confirm pituitary dependant source of hormonal excess ***(Thapar K etal, 2004)***.

Although new therapeutic agents have been introduced which can control hormonal symptoms and may slow or stop the growth of some functioning adenomas; medical therapy, however, is still frequently unsuccessful for patients suffering from acromegaly, and no effective therapy is available for patients with Cushing's disease. Moreover, some patients may not tolerate the side effects of these medications, have hormonal tumors resistant to treatment, or follow-up MRI scans demonstrating continued tumor growth. In addition, non-functioning pituitary adenomas typically do not respond to pharmacological interventions, and present as macro-adenomas with symptoms of visual disturbance or hormonal deficiencies due to compression of the adjacent neurovascular structures. Stereotactic radiosurgery has been added to the list of available treatment options, but this therapy often fails to completely control tumor growth or reduce hormone levels ***(Kabil MS, etal, 2005)***.

The evolution of pituitary surgery during the last century is characterized by the development of progressively less invasive approaches to the pituitary gland that have been facilitated by simultaneous advances in medical technology.[68] The fundamental tendency to be as minimally invasive as possible with a minimum of iatrogenic traumatization and to achieve a maximum of efficiency in the treatment of a patient has existed since the beginning of surgery. The development of unconventional or

"difficult approaches", which is based on increased knowledge of microsurgical anatomy, improved preoperative diagnostic techniques, and well-adapted microsurgical instruments, definitely forms one important aspect of "refinement in microneurosurgical operating" ***(Wongsirisuwan M, etal, 2004)***.

In the last 10 years the endoscopic endonasal transsphenoidal approach has been proposed as a minimally invasive procedure for the treatment of pathologies of the sellar region ***(Cappabianca P. etal, 2004)***. Endoscope-assisted transsphenoidal operations refer to microscopic procedures in which the endoscope is used as an adjunct to the microscopic removal of a tumor. The manner in which the endoscope is used adjunctively, however, can vary significantly. The endoscope may simply be used to perform an anterior sphenoidotomy prior to inserting the nasal speculum and using the microscope. The endoscope may also be used during the microscopic tumor resection to inspect for areas of tumor residue out of the line of sight of the microscope ***(Jane JA,etal, 2005)***.

The refinement of minimally invasive endoscopic techniques has resulted in 'pure' endoscopic endonasal trans-sphenoidal surgery, which is a new approach for the removal of pituitary tumors. This procedure is performed via a wide anterior sphenoidotomy with detachment of the septum from the sphenoid face, and avoids the use of a transsphenoidal retractor and any intraoral or nasal incisions. Straight and angled endoscopes are used throughout the procedure to provide a wide view of the sella and are manipulated by a co-surgeon ***(Rosen MR, etal, 2006)***.

For the most of pituitary adenoma; surgery is done by a transsphenoidal approach, while some of them are still done by a craniotomy, according to the tumor size, locations and symptoms ***(Kuroki A, etal, 2003)***. Many different approaches for treating

lesions in the anterior fossa or sellar region have been described. Improvements in microsurgical techniques and instruments, such as the use of endoscopy and neuronavigation, have made keyhole exposure for cerebral surgery possible. The effects of keyhole surgery are less traumatic, preserving cerebral integrity as much as possible, while limiting brain exposure. The supraorbital approach is a typical approach for keyhole surgery applied to anterior cranial fossa lesions ***(Zhang MZ, etal, 2004)***.