Endoscopic Transtuberculum Transplanum Approach to Suprasellar Meningiomas

Thesis
Submitted for Partial Fulfillment of PhD degree in Neurosurgery

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2018

Acknowledgment

First and foremost, I feel always indebted to ALLAH, the Most Kind and Most Merciful.

I'd like to express my respectful thanks and profound gratitude to Prof. Dr. Hossam El Huseiny Khalil, Professor of Neurosurgery, Faculty of Medicine – Ain shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.

I am also delighted to express my deepest gratitude and thanks to Prof. Dr. Omar Yousef Hammad, Professor of Neurosurgery, Faculty of Medicine – Ain shams University, for his kind care, continuous supervision, valuable instructions, constant help and great assistance through out this work.

I am deeply thankful to Prof. Dr. Hamdy Ibrahim Khalil, Professor of Neurosurgery, Faculty of Medicine – Ain shams University, for his great help, active participation and guidance.

I wish to introduce my deep respect and thanks to
Prof. Dr. Salah Mostafa Hamada, Assistant Professor of Neurosurgery, Faculty of Medicine – Ain Shams University, for his kindness, supervision and cooperation in this work.

I would like to express my hearty thanks to all my family for their support till this work was completed.

Last but not least my sincere thanks and appreciation to all patients participated in this study.

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List of Abbreviations

Abb.	Full term
ACA	Anterior cerebral artery
AcoA	Anterior communicating artery
BA	Basilar artery
CSF	Cerebrospinal fluid
DI	Diabetes Insipidus
GTR	Gross total resection
ICA	Internal carotid artery
OCR	Optico-carotid recess
PCA	Posterior cerebral artery
PEA	Posterior ethmoidal artery
SCA	superior cerebellar artery
SIS	superior inter-cavernous sinus
VA	Vertebral artery

INTRODUCTION

"There is today nothing in the whole realm of surgery more gratifying than successful removal of a meningioma with perfect functional recovery, especially should a correct pathological diagnosis have been previously made. The difficulties are admittedly great, sometimes insurmountable, and though the disappointments still are many, another generation of neurological surgeons will unquestionably see them largely overcome" a quote by Harvey Cushing the man who resected the first suprasellar meningioma via a transcranial approach in 1916.

Suprasellar meningiomas arising from planum sphenoidale, chiasmatic sulcus, tuberculum sellae and diaphragma sellae, are about 10% of intracranial meningiomas and constitute such a challenge for skull base surgeons due to their location and relation to critical neurovascular structure mainly the optic apparatus and the anterior cerebral artery (ACA) complex[40]. Visual manifestations are the most common presentation of suprasellar meningiomas. Ideally, suprasellar meningioma surgery should aim at alleviating visual signs and symptoms, or at least saving any residual visual function, and achieving Simpson grade I resection with no or minimal morbidities[31]. The introduction of the microscope in neurosurgery markedly improved the outcomes of surgical resection of suprasellar meningiomas. Various transcranial

approaches are well described in the literature used to tackle suprasellar meningiomas, most commonly performed are anterior subfrontal approaches and lateral transsylvian (pterional) approach. In the past few years, with the major breakthroughs in endoscopic skull base surgery and the advent of endoscopic extended transsphenoidal approaches, the endoscopic transtuberculum transplanum approach was presented as a viable option or alternative to the microsurgical transcranial route[46]. Some authors suggest that if visual outcome was the sole predictor for choice of the approach to suprasellar meningiomas, the endoscopic endonasal route will be superior to open transcranial route, given superior visual outcome following endoscopic approaches[40]. Radiosurgery and fractionated stereotactic radiotherapy has evolved in recent years, with conventional radiotherapy providing long term control rates reaching 80% and fractionated stereotactic radiotherapy showing promising results with shorter follow up periods[34]. More recent reports suggest that Simpson grade may not be a statistically significant predictor for outcome in modern neurosurgical era[34]. Some authors suggest that tumors extending lateral to the optic and carotids, making GTR not feasible, is not an absolute contraindication for endoscopic endonasal route[40]. These findings highlight the importance of further studies of extended endoscopic approach to suprasellar meningiomas with larger number of patients & long term follow up to further assess feasibility & define the criteria for proper patient selection to optimize the outcomes.

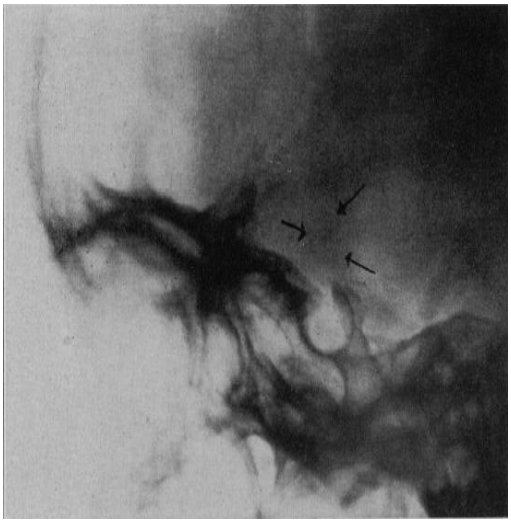
AIM OF THE WORK

The objective of this study is to add another case series to the small number of cases reported in the literature for endoscopic approaches to suprasellar meningiomas, in an effort to help assess its feasibility with special emphasis on visual outcome. The study also aims at defining the criteria for proper patient selection to endoscopic endonasal approaches to suprasellar meningiomas.

REVIEW OF LITERATURE

History & evolution of surgical approaches to suprasellar meningiomas

Cushing and Eisenhardt published their historical paper in 1929 where they classified suprasellar meningiomas in to four stages according to their size. Stage I & II were defined as being asymptomatic thus not encountered in their series. Stage III & IV were symptomatic & thus treated surgically. Cushing and Eisenhardt further elucidated the "chiasmal syndrome" in suprasellar meningiomas, first described in 1927 by Holmes and Sargent. Chiasmal syndrome is defined as primary optic atrophy with bitemporal field defects in the presence of normal sellae in palin x-ray skull (**Fig 1**)[10].



ARCHIVES of OPHTHALMOLOGY

Volume 1 (old series Volume 58) JANUARY, 1929 Number 1

MENINGIOMAS ARISING FROM THE TUBERCULUM SELLAE

WITH THE SYNDROME OF PRIMARY OPTIC ATROPHY AND BITEMPORAL FIELD DEFECTS COMBINED WITH A NORMAL SELLA TURCICA IN A MIDDLE-AGED PERSON *

HARVEY CUSHING, M.D.
AND
LOUISE EISENHARDT, M.D.
BOSTON

Figure (1): Plain x-ray skull from Cushing and Eisenhardt seminal study in 1929. Arrows are pointing to suprasellar shadow with normal appearing sella, which characterizes the chiasmal syndrome.[10]

Al-Mefty reclassified suprasellar meningiomas as those arising via arachnoid cap cells from the planum sphenoidale, tuberculum sella, diaphgrama sella, and anterior clinoid process[1]. de Divitiis later distinguished clinoidal meningiomas from other suprasellar meningiomas[21]. Kinjo et al. in 1995 classified diaphragma sellae meningioma into 3 types: 1) **Type A**, arising from the upper leaf of the diaphragma sellae anterior to the pituitary stalk; 2) **Type B**, arising from the upper leaf of the diaphragm sellae posterior to the pituitary stalk; and 3) **Type C**, arising from the inferior leaf of the diaphragm sellae. Type C tumors involve the sella and cause enlargement, mimicking a pituitary adenoma[24].

Various prognostic scoring systems have been proposed to classify these tumors all included tumor size while variably including optic canal invasion, vascular invasion, brain invasion, peritumoral edema, previous surgery, previous radiation, and duration of visual symptoms in their schemes. S. Magill et al. recently proposed a classification system, which evaluates tumor size, optic canal involvement & vascular encasement which they proposed can help for choice of surgical approach & predict post-operative outcome (**Fig 2**)[33]. However though, these proposed classification schemes have yet to be externally validated, widely adopted, or prospectively used to guide surgical approaches.