FRONTOLATERAL CRANIOTOMY THROUGH A SUPRACILIARY SKIN INCISION FOR ANTERIOR SKULL BASE AND SELLAR LESIONS

Thesis

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

[قالوا سبحانك لا علم لنا إلا ما علمتنا إنك أنت العليم الحكيم]

صدق الله العظيم

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LIST OF ABBREVIATIONS

<:	less than
>:	more than
1ry:	primary
2ry:	secondary
2nd:	second
3rd:	third
4th:	fourth
5th:	fifth
6th:	sixth
A1:	first part of the anterior cerebral artery
A2:	second part of the anterior cerebral artery
ACA:	anterior cerebral artery
A-COM:	anterior communicating artery
ACTH:	Adrenocorticotropic hormone
ADH:	anti diuretic hormone
AICA:	anterior inferior cerebellar artery
AP:	anteroposterior
AVM:	arteriovenous malformation
BA:	basilar artery
BBB:	blood brain barrier
CNS:	central nervous system
Cm:	centimeter
CRH:	corticotrophin releasing hormone
CS :	cavernous sinus
CSF:	cerebro-spinal fluid
CT:	computerized tomography
CTA:	CT-angiography
FSH:	follicle-stimulating hormone

GH:	growth hormone
GHRH:	growth hormone releasing hormone
GNRH:	gonadotropin releasing hormone
ICA:	internal carotid artery
ICP:	intracranial pressure
LH:	lutinizing hormone
M1:	first part of the middle cerebral artery
M2:	second part of the middle cerebral artery
M3:	third part of the middle cerebral artery
MCA:	middle cerebral artery
mm :	millimeter
MRA:	magnetic resonance angiography
MRS:	magnetic resonance spectroscopy
PCA:	Posterior cerebral artery
Pcom:	posterior communicating artery
PRL:	prolactin
SAH:	subarachnoid hemorrhage
SPSS:	Statistical package of social sciences
SD:	Standard deviation
SCA:	Superior cerebellar artery
T.B :	tuberculosis
T1W1:	T1-weighted image
T2W1:	T2-weighted image
U/S:	ultrasound
VS:	versus
WHO:	World Health Organization

ABSTRACT

Background: Many approaches were recommended for surgical treatment of lesions of the anterior cranial fossa and around the sella; frontal, bifrontal, frontotemporal, and frontolateral craniotomies are the most frequently used approaches. An alternative approach is the frontolateral craniotomy through eyebrow skin incision.

Objectives and aim of the work: This study evaluates the techchnique, indications, limitations, advantages and disadvantages of the frontolateral craniotomy through an eyebrow skin incision.

Patients and methods: Twenty patients with different lesions in the anterior cranial fossa and around the sella were studied clinically and radiologically and treated by this minimally invasive technique. The technique is described in details. The postoperative outcome is evaluated with casting light on the specific parameters related to the aforementioned approach.

Conclusion: The frontolateral keyhole craniotomy is a minimally invasive cosmetic approach that provides excellent exposure to a variety of intracranial lesions. This approach cannot be used for all anterior cranial fossa and sellar pathologies, but is recommended for many lesions at the frontal base and sellar region.

Keywords: Supraorbital Keyhole approach, eyebrow incision, minimally invasive skull base surgery, Preoperative planning,

INTRODUCTION

At the beginning of neurosurgical history, surgical treatment of intracranial lesions was always related to large craniotomies. These extended approaches was necessary for several reasons: poorly developed diagnostic techniques ; inaccurate localization of the lesions, the craniotomy had to be large enough to find the lesion and to allow investigation of deep-seated areas, the allowable methods of illumination were unsophisticated, and the instruments at that time were not designed for neurosurgery but for general surgery. In addition, operating teams consisted of at least three surgeons; thus, six hands and the large instruments that they held obscured the surgical field (102).

However, in recent decades, the discovery of fundamental anatomic and physiological principles and the improvement of intraoperative visualization by the operating microscope, together with refined instrumentation, allowed the evolution of microneurosurgical techniques, which together with the enormous development of preoperative and intraoperative diagnostic facilities enabled neurosurgeons to treat more complicated neurosurgical diseases through smaller and more specific approaches to achieve the greatest therapeutic effect while causing the least iatrogenic injury (79).

Concurrently, new noninvasive therapeutic options such as radiosurgery (cobalt60 systems (Gamma Knife) linear accelerator (LINAC) systems and proton beam therapy) are becoming available to patients with brain tumors. These challenges have motivated neurosurgeon to develop less invasive techniques that minimize iatrogenic injury and patient discomfort.

History of the Subfrontal Approaches

A subfrontal and transfrontal approach was first described by Francesco Durante in 1884 for resection of an olfactory groove meningioma; the postoperative course was uneventful, the patient experienced no neurological deficits (102).

The first supraorbital subfrontal exposure was reported by Fedor Kraus in the first volume of his pioneering work, *Surgery of the Brain and Spine*. Kraus created a combined skin, periosteum, and bone flap to avoid postoperative bone infection (52). Tandler and Ranzi approached this area by a similar exposure for suprasellar lesions (100).

Although the craniotomy was large, Krause and Tandler and Ranzi used an extradural route; the frontal, parietal, and temporal portions of the cortex were not exposed directly to air, as the dura was opened at the sphenoid ridge (52), (100).

McArthur removed the supraorbital arch in his frontal approach to the pituitary body, reducing postoperative complications owing to excessive retraction of the frontal lobe (62).

Harvey Cushing performed the first complete removal of a tuberculum sellae meningioma via subfrontal exposure in 1916 and reported his experiences on the resection of 28 tumors in his classic publication, coauthored by Louise Eisenhardt (22).

Heuer and Dandy made the first frontolateral approach to the optic chiasm and pituitary gland. (41) .The authors exposed a large cortical surface, causing cortical microinjuries with the possibility of subsequent postoperative epileptic seizures. One decade later, approaching the