Cranio-facial Approaches to Anterior and Middle Cranial Fossa Skull Base Tumors

THESIS

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LIST OF ABBREVIATIONS

ACF	Anterior cranial fossa
ACA	Anterior cerebral artery
ACP	Anterior clinoid process
AChA	Anterior choroidal artery
AE	Arcuate eminance
Angio.	Angiography
B	Biopsy
BA	Basilar artery
BAERs	Brainstem auditory evoked potentials
C	Clivus
CPA	Cerebellopontine angle
COZ	Cranio-orbitozygomatic
CS	Cavernous sinus
CSF	Cerebrospinal fluid
CPc	clival portion of the carotid protuberance
CPs	sellar portion of the carotid protuberance
CT	Computerized tomography
D	Debulking
DCL	Disturbed conscious level
EAC	External auditory canal
ED	Extradural
ED/ID	Extra/intradural
ES	Ethmoid sinus
FW	Flexner–Wintersteiner
GG	Geniculate ganglion
GSPN	Greater superficial petrosal nerve
GTR	Gross total resection
H/A	Headache
HW	Homer–Wright
IAC	Internal auditory canal
ICA	Internal carotid artery
ICP	Intracranial pressure
ID	Intradural
IOM	Intra-operative cranial nerve monitoring
IT	Infratemporal fossa
JNA	Juvenile nasopharyngeal angiofibroma
KPS	Karnofsky performance scale

LSC	Lateral semicircular canal
MCA	Middle cerebral artery
MCF	Middle cranial fossa
MEP	Motor evoked potentials
Mi	Middle
MRA	Magnetic resonance angiography
MRI	Magnetic resonance imaging
MRV	Magnetic resonance venography
MS	Maxillary sinus
NF1	Neurofibromatosis-1
NF2	Neurofibromatosis-2
NO	Nasal obstruction
OCR	Optico-carotid recess
ON	Optic nerve
OP	Optic protuberance
OphthA	ophthalmic artery
PB	Petrous bone
PC	Prepontine cistern
PCA	Posterior cerebral artery
PCoA	Posterior communicating artery
PCP	Posterior clinoid process
PF	Parapharyngeal fossa
PS	Planum sphenoidale
S	Sella
SC	Suprasellar cistern
SCC	semicircular canal
SCA	Superior cerebellar artery
SPECT	Single photon emission computerized tomography
SS	Sphenoid sinus
SSEP	Somatosensory evoked potentials
TS	Tuberculum sellae
WHO	World health organization
Xe-CT	Xenon CT

INTRODUCTION

Skull base tumors are by definition tumors that arise from or are located in the bony structures at the base of the skull. They may originate from a variety of extracranial or intracranial tissues, or directly from the skull base. The usual extracranial sources include area such as the paranasal sinuses, nasopharynx, and surrounding connective tissues whose tumors secondarily invade the skull base. The intracranial sources include basal meningiomas, pituitary tumors, and metastatic tumors that erode into the base of the skull. Osteosarcomas, chordomas and chondrosarcomas are tumors that originate directly from the skull base ***(Britz W G and Johnson F, 2000).***

Several advances have occurred that have significantly altered the management of these tumors. Newer imaging techniques have led to improved delineation of the tumors regarding the size and the extent and its relationships with adjacent critical structures, thus aiding in the preoperative evaluation and surgical planning. This information is largely obtained from preoperative imaging investigations, which are typically magnetic resonance imaging (MRI), x-ray, computed tomography (CT), digital x-ray angiography and magnetic resonance angiography (MRA). The operating surgeon therefore requires all modalities in order to obtain the most complete information on the internal anatomy. The surgeon must mentally combine the information from the different modalities to appreciate the interrelationships of the different structures. The surgeon must also mentally reconstruct the three-dimensional (3D) relationships of structures from the 2D slices, which can be time consuming and occasionally misleading ***(Gandhe J A et al, 1994).***

Craniofacial approaches have been the standard surgical treatment for resection of such tumors. Advances in surgical techniques have resulted in the development of multiple different approaches that often involve a multidisciplinary team including neurosurgeons, plastic surgeons, maxillofacial surgeons, and otolaryngologists. The

different approaches are used to obtain access to and exposure of skull base tumors in different locations, based on preoperative imaging studies and surgical planning. There are 3 standard approaches to access such tumors: transbasal, transfacial, and transsphenoidal and each of them provide various angles and degrees of access along the skull base. Advancement in neuroanesthesia and surgical aids as the microscope has allowed for improved surgical technique, and more feasibility for radical tumor resection ***(Liu K J et al, 2003).*** What are still not clear are the indications for the various procedures and the degree to which radical removal should be undertaken. We still must individualize and decide about the course of therapy after considering all the factors presented by any patient ***(Long D M, 1996).***

In making decision, close cooperation between the neurosurgeon and head and neck surgeon is essential. No specific radiological criteria for preoperative selection of any approach. The only absolute criteria of the need for craniotomy were thought to be cribriform plate involvement, dural enhancement suggesting dural invasion, or frank intradural extension of tumor. The criteria generally used for a transfacial approach were invasion of the floor of the maxillary sinus, invasion of the base of the nasal septum, involvement of the soft tissues of the face, and orbital involvement requiring orbital exenteration ***(McCutcheon IE, 1996).***

Although these approaches provide wide exposure for radical tumor removal and improvement of oncological outcome and survival, there is a high incidence of postoperative morbidity ***(Lawton MT, et al, 1995).*** Operative morbidity includes high risk of postoperative cerebrospinal fluid (CSF) leakage, meningitis, intracranial infections and neurological sequelae. The recent advances in cranial base reconstruction provide us with more predictable, functional, and aesthetic results, which have helped to reduce postoperative morbidity rates. To date, many studies have reported the clinical outcomes of anterior cranial base surgery but only a few have focused on the risk factors for postoperative complications ***(Nibu K, et al, 1998).***When the decision is to do combined approach, the transcranial approach