5. Microanatomy and Operative Techniques for Transtemporal Lateral Skull Base Surgery

Carolina Neuroscience Institute
Takanori Fukushima

Lesions of the petroclival, posterior cavernous sinus, and the inferior posterior skull base areas have been accessed by many different surgical approaches. Understanding of the complex anatomy and safe and secure microsurgical techniques have been a new challenge to the neurosurgeons to specialized skull base procedures. The operative approaches to this area can be classified as:

- Orbital/Temporal Cavernous Sinus approach
- Extended middle fossa-Rhomboïd approach
- Transmastoid/Retro labyrinthine or translabyrinthine approach
- Transoptic, transcondylar or petrosectomies

The most popular skull base approach in neurosurgery has been a combined transpetrosal approach. The most important and key element of these lateral skull base surgeries is the understanding of the anatomy and dissection of the mastoid and middle fossa. This presentation illustrates various anatomical landmarks and step-wise dissection of the transtemporal approaches to the lateral skull base.

Transmastoid approach covers the area from the temporal tegmen down to the infratemporal occipital condyle region and includes the neuro-otological structures of external and internal auditory canal, semi-circular canals, Fallopian canal, and facial nerve, sigmoid sinus, and jugular bulb. Precisedrillingtechniqueswithcuttingburrs,extracoarse diamond and coarse diamond burrs are critical to skeltonize the facial nerve, semi-circular canals, and the presigmoid dura. We need to understand the key anatomical structure which is easily damaged by drills, such as Fallopian canals, facial recess, and endolymphatic sac. Maximum resection of the petrous ridge to skeltonize maximum toward blue lines of the superior and posterior semi-circular canals is crucial.

For translabyrinthine approach, we need to understand the anatomical structure of the vestibular aqueduct, vestibule, transverse crest and the Bill's bar.

Middle fossa approach: the initial technique involves the maximum flattening of the subtemporal bone and the extradural dissection to identify the foramen of ovale, foramen spinosum, and the greater superficial petrosal nerve. One important technical point is the skeltonization of the trigeminal third branch to the infratemporal soft
tissue to elongate the dural sleeve of the trigeminal third branch, that enables anterior translocation of the posterior border of the trigeminal system to expose widely the greater petrosal nerve and the petrous apex. This exposure will be connected to the transmastoid approach and the surgeon will know the exact location of the superior semi-circular canals and maximum removal of the petrous ridge.

The key issue of this extended middle fossa approach is the identification of the geniculate ganglion and the secure exposure of the internal auditory canal. The surgeon needs to understand what is the posterior medial triangle and post meatal and premeatal skull base triangles. In order to perform the total anterior petrosectomy, exposure of the inferior petrosal sinus and further drilling towards the clivus and the exposure of the Dorello's tube is the crucial element of this procedure. All of these surgical procedures will provide in minimally invasive way, the access to the multiple cranial nerves and to the brainstem lesion.

Technical hints of these procedures will be presented with hand-out materials and surgical videotapes.