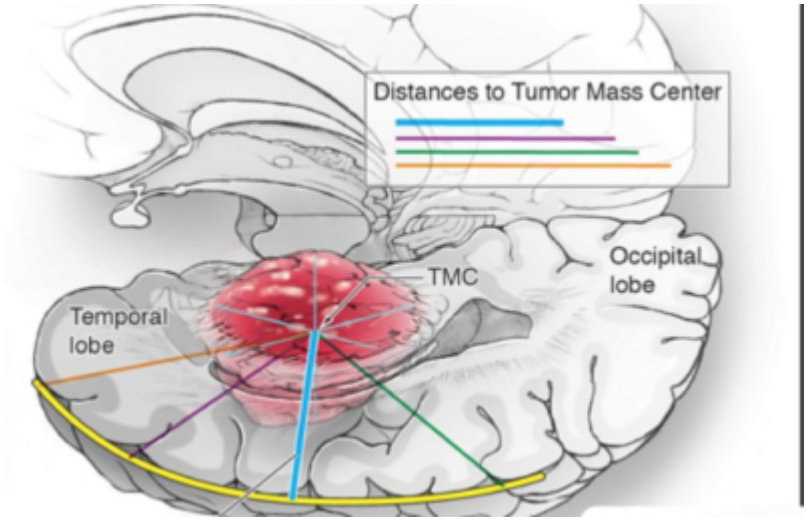
Mesial temporal lobe lesion approaches



There are several ways to safely access mesial temporal structures. The transsylvian-transcisternal approach is a good way to access the mesial structures while preserving the lateral and basal temporal structures. Actual lesions associated with epileptogenesis in focal cortical dysplasia (FCD) may be larger than they appear on magnetic resonance imaging. For this reason, evaluations to locate sufficient epileptogenic foci, including invasive studies, should be completed for FCD, and epilepsy surgery should be performed according to these results. Regardless, the ultimate goal of all epilepsy surgeries is to maximize seizure control while maintaining neurological function. Therefore, a tailored approach based on the properties of the lesion is needed [1].

For Campero et al., dividing the mesial temporal region (MTR) into 3 regions allows us to adapt the approach to lesion location. Thus, the anterior sector can be approached via the sylvian fissure, the middle sector can be approached transtemporally, and the posterior sector can be approached via the supracerebellar approach [2].

There are limited reports on the transcortical approach for the resection of tumors within this region.

Morshed et al., from the UCSF Medical Center, described the technical considerations and functional outcomes in patients undergoing transcortical resection of gliomas of the mesial temporal lobe (MTL).

Patients with a glioma (WHO grades I-IV) located within the MTL who had undergone the transcortical approach in the period between 1998 and 2016 were identified through the University of California, San Francisco (UCSF) tumor registry and were classified according to tumor location: preuncus, uncus, hippocampus/parahippocampus, and various combinations of the former groups. Patient and tumor characteristics and outcomes were determined from operative, radiology, pathology, and other clinical reports that were available through the UCSF electronic medical record.

Fifty patients with low- or high grade glioma were identified. The mean patient age was 46.8 years, and the mean follow-up was 3 years. Seizures were the presenting symptom in 82% of cases. Schramm classification types A, C, and D represented 34%, 28%, and 38% of the tumors, and the majority of lesions were located at least in part within the hippocampus/parahippocampus. For preuncus and preuncus/uncus tumors, a transcortical approach through the temporal pole allowed for resection. For most tumors of the uncus and those extending into the hippocampus/parahippocampus, a corticectomy was performed within the middle and/or inferior temporal gyri to approach the lesion. To locate the safest corridor for the corticectomy, language

mapping was performed in 96.9% of the left-sided tumor cases, and subcortical motor mapping was performed in 52% of all cases. The mean volumetric extent of resection of low- and high-grade tumors was 89.5% and 96.0%, respectively, and did not differ by tumor location or Schramm type. By 3 months' follow-up, 12 patients (24%) had residual deficits, most of which were visual field deficits. Three patients with left-sided tumors (9.4% of dominant-cortex lesions) experienced word-finding difficulty at 3 months after resection, but 2 of these patients demonstrated complete resolution of symptoms by 1 year.

Mesial temporal lobe gliomas, including larger Schramm type C and D tumors, can be safely and aggressively resected via a transcortical equatorial approach when used in conjunction with cortical and subcortical mapping [3].

Microsurgery was performed via transsylvian, transtemporal, or subtemporal approaches on 62 patients with mesial temporal lobe gliomas, 33 with localized tumors within the mesial temporal structures (type A), 19 in anterior portion (type A1), and 14 extending to posterior portion (type A2); 19 patients with multicompartmental tumors involving the mesial temporal lobe, insular lobe, and posterior frontorbital gurus (type B); 14 patients with tumors involving the temporal pole and lateral areas of the temporal horn (type C); and 6 patients with tumors infiltrating the brain stem, basal nuclei and thalamus (type D).

Trans-sylvian approach was performed in 25 cases of which total tumor removal was achieved in 14 cases, subtotal removal in 6 cases, and gross removal in 5 cases. Primary visual deficits worsened after surgery in 5 cases. Trans-temporal approach was used in 23 cases of which total tumor resection was achieved in 15 cases, subtotal resection in 5 cases, and gross resection in 3 cases. Primary visual deficits worsened after surgery in 5 cases. Four patients in which preoperative vision were good presented with visual deficits postoperatively. Subtemporal approach was used in 14 cases of which total tumor removal was achieved in 10 cases, and subtotal removal in 4 cases. All 14 patients did not develop worsened vision after surgery.

Trans-sylvian and subtemporal approaches can reduce possible harm to parenchyma and optic radiation, whereas approaches to the temporal horn through the superior and middle temporal gyri will induce damage to parenchyma and optic radiation [4].

The aim of Faust et al., was to categorize temporal lobe tumors based on anatomical, functional, and vascular considerations and to devise a systematic field manual of surgical approaches.

Tumors were classified into four main types with assigned approaches: Type I-lateral: transcortical; type II-polar: pterional/transcortical; type III-central: transsylvian/transopercular; type IV-mesial: transsylvian/trans-cisternal if more anterior (=Type IV A), and supratentorial/infraoccipital if more posterior (=type IV B). 105 patients have been operated on prospectively using the advocated guidelines. Outcomes were evaluated.

Systematic application of the proposed classification facilitated a tailored approach, with gross total tumor resection of 88 %. Neurological and surgical morbidity were less than 10 %. The proposed classification may prove a valuable tool for surgical planning [5].

Twenty formalin-fixed, adult cadaveric specimens were studied. Ten brains provided measurements to compare different surgical strategies. Approaches were demonstrated using 10 silicon-injected cadaveric heads. Surgical cases were used to illustrate the results by the different approaches. Transverse lines at the level of the inferior choroidal point and quadrigeminal plate were used to divide the medial temporal region into anterior, middle, and posterior portions. Surgical approaches to the medial temporal region were classified into four groups: superior, lateral, basal, and medial, based on the surface of the lobe through which the approach was directed. The approaches through the medial group were subdivided further into an anterior approach, the transsylvian transcisternal approach, and two posterior approaches, the occipital interhemispheric and supracerebellar transtentorial approaches.

The anterior portion of the medial temporal region can be reached through the superior, lateral, and basal surfaces of the lobe and the anterior variant of the approach through the medial surface. The posterior group of approaches directed through the medial surface are useful for lesions located in the posterior portion. The middle part of the medial temporal region is the most challenging area to expose, where the approach must be tailored according to the nature of the lesion and its extension to other medial temporal areas.

Each approach to medial temporal lesions has technical or functional drawbacks that should be considered when selecting a surgical treatment for a given patient. Dividing the medial temporal region into smaller areas allows for a more precise analysis, not only of the expected anatomic relationships, but also of the possible choices for the safe resection of the lesion. The systematization used here also provides the basis for selection of a combination of approaches [6].

Germano described a transsulcal temporal approach to mesiotemporal lesions and its application in three patients. Gross-total resection of the lesion was accomplished in all cases. An anatomical cadaveric study was also performed to delineate the microsurgical anatomy of this approach. Precise knowledge of temporal intraventricular landmarks allows navigation to the lesion without the need for a navigational system. This approach is helpful for neurologically intact patients with mesiotemporal lesions [7].

References

1)

Chong S, Phi JH, Lee JY, Kim SK. Surgical Treatment of Lesional Mesial Temporal Lobe Epilepsy. J Epilepsy Res. 2018 Jun 30;8(1):6-11. doi: 10.14581/jer.18002. eCollection 2018 Jun. Review. PubMed PMID: 30090756; PubMed Central PMCID: PMC6066696.

2)

Campero A, Ajler P, Rica C, Rhoton A Jr. Cavernomas and Arteriovenous Malformations in the Mesial Temporal Region: Microsurgical Anatomy and Approaches. Oper Neurosurg (Hagerstown). 2017 Feb 1;13(1):113-123. doi: 10.1227/NEU.0000000000001239. PubMed PMID: 28931254.

3)

Morshed RA, Young JS, Han SJ, Hervey-Jumper SL, Berger MS. The transcortical equatorial approach for gliomas of the mesial temporal lobe: techniques and functional outcomes. J Neurosurg. 2018 Apr 20:1-9. doi: 10.3171/2017.10.JNS172055. [Epub ahead of print] PubMed PMID: 29676697.

4)

Jiang ZL, Wang ZC, Jiang T. [Surgical outcomes of different approaches for mesial temporal lobe

gliomas]. Zhonghua Yi Xue Za Zhi. 2005 Sep 7;85(34):2428-32. Chinese. PubMed PMID: 16321253.
5)

Faust K, Schmiedek P, Vajkoczy P. Approaches to temporal lobe lesions: a proposal for classification. Acta Neurochir (Wien). 2014 Feb;156(2):409-13. doi: 10.1007/s00701-013-1917-4. Epub 2013 Nov 8. Review. PubMed PMID: 24201756.
6)

Campero A, Tróccoli G, Martins C, Fernandez-Miranda JC, Yasuda A, Rhoton AL Jr. Microsurgical approaches to the medial temporal region: an anatomical study. Neurosurgery. 2006 Oct;59(4 Suppl 2):ONS279-307; discussion ONS307-8. PubMed PMID: 17041498.
7)

Germano IM. Transsulcal approach to mesiotemporal lesions. Anatomy, technique, and report of three cases. Neurosurg Focus. 1996 Nov 15;1(5):e4. PubMed PMID: 15099055.