



Endoscopic Hippocampectomy via Trans-orbital and Middle Temporal Gyrus Corridors: Anatomy, Techniques, Outcomes, and Surgical Considerations

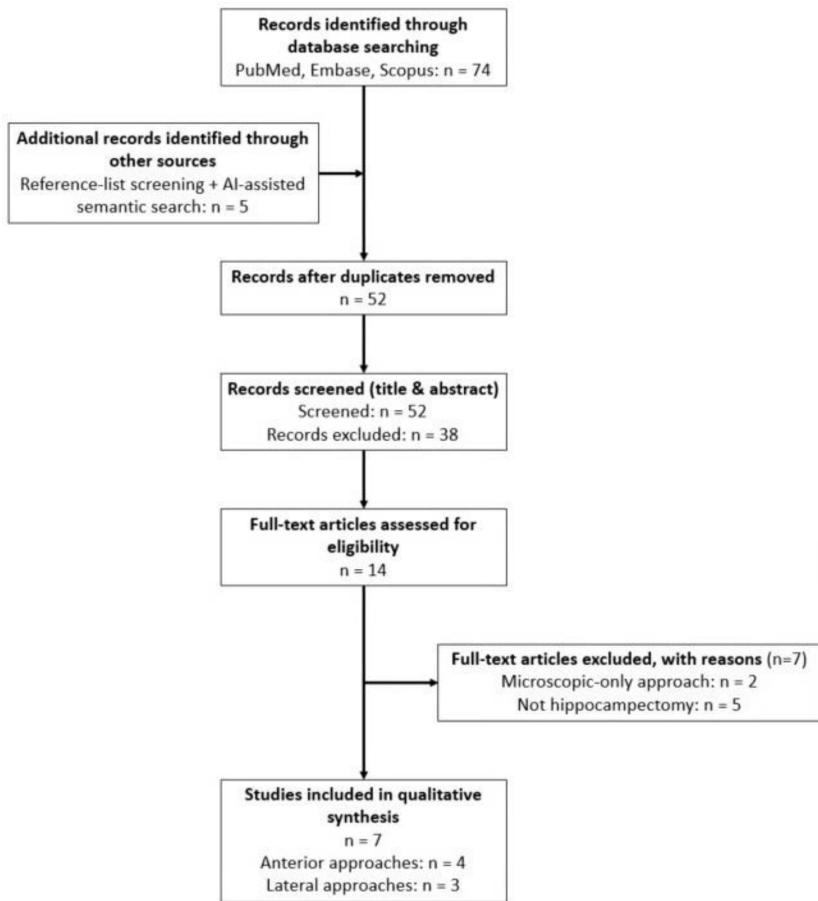
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Introduction

- Mesial temporal lobe epilepsy (MTLE) is the most common focal epilepsy and is often drug-refractory.
- Traditional open hippocampectomy/ATL provides good seizure control but may cause visual field, cognitive, and cortical complications.
- Endoscopic techniques enable less invasive corridors to the hippocampus: **trans-orbital approach (TOA)** and **trans-middle temporal gyrus approach (TMTA)**.
- **Aim:** Compare TOA vs TMTA regarding anatomical feasibility, reported clinical outcomes, and approach-specific risks.

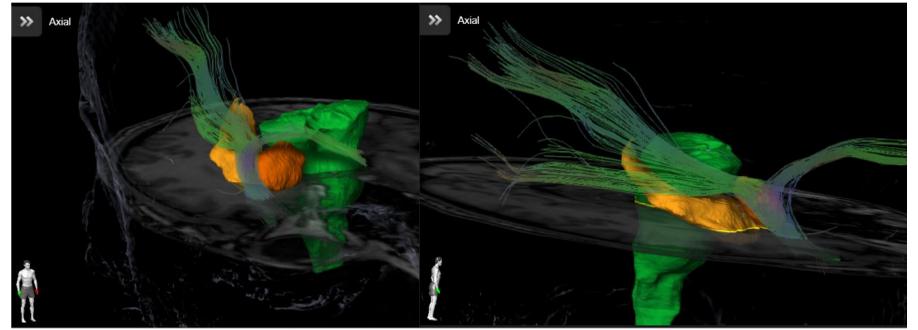
Methods and Materials

- AI-assisted systematic search of **PubMed/Embase/Scopus** from inception to **May 2025**.
- Included: pure endoscopic or endoscope-assisted hippocampectomy via **TOA** or **middle temporal gyrus corridor**, with extractable anatomical/clinical data.
- Cadaveric feasibility + clinical series/case reports reviewed (seizure outcome, visual field, complications).
- DTI tractography performed (Brainlab Elements) to illustrate trajectories relative to **Meyer's loop**.
- Narrative synthesis (no meta-analysis due to heterogeneity); PRISMA diagram prepared.



• PRISMA flow diagram summarizing the study selection process for inclusion in this review.

Results



A: Anatomical relationships of the hippocampus, amygdala, and Meyer's loop in the trans-orbital approach (TOA). The surgical trajectory can avoid Meyer's loop.

B: Anatomical relationships of the hippocampus, amygdala, and Meyer's loop in the trans-middle temporal approach (TMTA). The surgical trajectory is obscured by Meyer's loop, increasing the risk of injury.

First author	Approach	Subject	n patients	Seizure control rate	Visual field defect rate
Chen (2014)	anterior (TOA)	Cadaveric	NA	NA	NA
Chen (2015)	anterior (TOA)	Clinical	2	Seizure-free	Not reported
Mandel (2017)	anterior (TOA)	Clinical	8	Seizure-free	Not reported
Gonzalez-Martinez (2023)	anterior (TMA)	Clinical	3	Seizure-free	Not reported
Lau (2022)	lateral (TMTA)	Cadaveric	NA	NA	NA
Silbergeld (1995)	lateral (TMTA)	Cadaveric	NA	NA	NA
Uda (2021)	lateral (TMTA)	Clinical	1	Seizure-free	Not reported

Category	Trans-orbital approach (TOA)	Trans-middle temporal approach (TMTA)
Surgical route	Access via orbital rim through lateral orbital wall	Direct access through middle temporal gyrus cortex
Cortical/white-matter involvement	Minimal disruption; preservation of temporal neocortex and white matter	Cortical entry via middle temporal gyrus; partial resection of temporal cortex and white matter
Temporal cortex disruption	Minimal (no neocortical entry)	Moderate (cortical entry required)
Meyer's loop risk	Relatively low (trajectory avoids optic radiation)	Higher risk due to proximity of entry point
Vascular Structures at risk	Zygomatic vessels; risk to orbital vasculature	Vein of Labbé; temporal lobe vasculature
Cranial nerve/skull base risk	Higher (risk to CN III/IV/VI, orbital structures, cavernous sinus)	Lower
Distance/trajectory	Longer, angled route through orbit	Shorter, more direct route
Surgical Accessibility and extent of resection	Up to 97% hippocampal exposure possible (cadaveric studies)	Selective hippocampus and amygdala resection feasible
Cosmesis/Invasiveness	Minimally invasive; eyelid crease incision with excellent cosmetic outcome	Requires scalp incision and craniotomy; more invasive
Postoperative complications	Potential orbital injury, globe displacement	Risk of visual field loss (Meyer's loop), cognitive or language deficits
Clinical indications	Medial temporal pathologies (hippocampus, amygdala); when cosmesis and neocortical preservation are priorities	Broader range including lateral temporal lesions; when wider exposure is needed

Conclusions

- Endoscopic TOA and TMTA appear **feasible and safe** minimally invasive alternatives for hippocampectomy in early literature.
- **TOA:** minimizes cortical disruption but carries **orbital risks**; **TMTA:** offers broader/direct access but may increase risk to **visual pathway/neocortex**.
- Larger prospective, multicenter studies with standardized outcomes are required to define comparative efficacy and indications.

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