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RESEARCH

Medial temporal lobotomy in the treatment of medial temporal lobe epilepsy: a case series of 12 patients

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Abstract

Purpose This case series aimed to investigate the safety and efficacy of medial temporal lobotomy (MTL) in the treatment of medial temporal lobe epilepsy (MTLE).

Methods We presented our experience with 12 MTLE patients who underwent MTL in our center from January 2018 to July 2021. The MTL technique involves suction-based removal of the amygdala, effectively severing the fibrous connections between the medial temporal lobe structures and the surrounding cortex while maintaining the integrity of the medial temporal lobe structures without removing the hippocampus as in selective amygdalohippocampectomy.

Results Among the 12 MTLE patients, five were men and seven were women. Mean age was 18.7 years-old, ranging from 6 to 41 years-old. All surgeries were completed successfully. Although one patient developed a transient mild disturbance of consciousness that fully resolved, no patient experienced intracranial hemorrhage, cerebral infarction, hemiplegia, aphasia, or visual field defect. Mean follow-up was 3.25 years, ranging from 6 to 41 years. The Engel classification for seizure outcomes at the last follow-up was as follows: class I, 9 patients (75.0%); class II, 1 patient (8.3%); and class III, 2 patients (16.7%).

Conclusion Our preliminary results show that MTL is safe and effective. Future studies are warranted to validate our outcomes.

Keywords Medial temporal lobotomy · Medial temporal lobe epilepsy · Selective amygdalohippocampectomy

Introduction

Medial temporal lobe epilepsy (MTLE) is the most common type of refractory epilepsy [1]. In MTLE cases, selective amygdalohippocampectomy (SAH) is the one of the most commonly used surgical procedure performed [2–5]. SAH reduces seizure incidence by excising epileptic foci in the medial temporal lobe structures, which include the amygdala, uncinate gyrus, hippocampus, and parahippocampal gyrus [6]. Damage to the temporal lobe neocortex is avoided with this approach because the resected structures are located medially. Therefore, the neurocognitive function can be preserved [7]. Although direct neocortical damage is avoided, surrounding blood vessels, white matter tracts, and cranial nerves may be injured, resulting in intracranial hemorrhage, cerebral infarction, visual field defect (VFD), or other neurological deficits [8].

Medial temporal lobotomy (MTL) is based on the concepts of "isolated epileptogenic foci" and "disconnection of

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the medial temporal lobe structures from other brain areas“ [9], which can effectively control seizures. This article presents our surgical methods and summarizes our experience with 12 MTLE patients who underwent MTL.

Methods and materials

Patients

From January 2018 to July 2021, data of 12 patients (five men and seven women) with refractory MTLE receiving MTL in our center were collected retrospectively and consecutively. Mean patient age was 18.7 years (range, 6–41). Mean disease duration was 5.3 years (range, 0.75–18 years).

MTLE was diagnosed according to International League Against Epilepsy criteria [10]. Video electroencephalography and magnetic resonance imaging (MRI) were performed before surgery. Seizure characteristics and the results of diagnostic studies were used to determine the medial temporal lobe location of epileptogenic foci. In patients whose foci were difficult to localize, surgery to place cortical or deep electrodes for stereotaxic electroencephalography was performed. For patients where preliminary clinical symptom evaluation, imaging, and video-electroencephalography (VEEG) failed to definitively localize the epileptogenic foci, Stereoelectroencephalography (SEEG) was utilized for further monitoring. The SEEG electrode implantation strategy was individualized based on preliminary evaluations, including seizure onset zones identified by scalp EEG, imaging findings, and clinical characteristics. The monitoring protocol involved using SEEG to record at least three seizures, after which monitoring was terminated. Detailed analyses of both ictal and interictal EEG data were then performed to identify the epileptogenic foci. Targeted brain regions typically included the hippocampus, amygdala, and medial temporal structures, with extensions to lateral temporal or other suspected epileptogenic networks as needed. Patient characteristics are presented in Table 1. Based on MRI and pathological examination of a surgical specimen, the underlying cause of MTLE was hippocampal sclerosis in nine patients and ganglioglioma in three.

Surgical procedure

Surgery was performed using intraoperative electrophysiological monitoring with the patient under general anesthesia in the supine position. The head was turned 60° to the opposite side and tilted 10° to 20° posteriorly to place the zygomatic arch at the highest point of the surgical field (Fig. 1a). A linear scalp incision starting at the zygoma and curving slightly backwards was used. After the temporal muscle had been split, a small craniectomy centering over the medial temporal gyrus was performed. Then the dura was incised and retracted. For dominant-side cases, a cortical incision was made in the superior temporal sulcus anterior to the precentral sulcus; for non-dominant-side cases, the incision was anterior to the central sulcus (Fig. 1b). By

Table 1 Patient characteristics

No.	Gender	Age(y)	Hemispheric dominance	disease duration (y)	Features	examination	Cause
1	Male	33	Left	2.75	Focal impaired awareness, oroalimentary automatism and non-motor autonomic seizures	MRI+SEEG	Left hippocampal sclerosis
2	Female	13	Left	3.5	Focal impaired awareness and distal automatisms seizures	MRI+SEEG	Left hippocampal sclerosis
3	Female	24	Left	18	Focal to bilateral oroalimentary automatism and gestural automatisms seizures	MRI+SEEG	Left hippocampal sclerosis
4	Female	6	Right	1.5	Focal impaired awareness and autonomic seizures	MRI+SEEG	Left amygdala ganglioglioma
5	Male	34	Left	9	Focal impaired awareness, oroalimentary automatism and autonomic seizures	MRI+SEEG	Left hippocampal sclerosis
6	Female	10	Left	2	Focal to bilateral tonic-clonic seizures	MRI+SEEG	Left hippocampal sclerosis
7	Male	19	Left	6	Focal impaired awareness seizures with affective symptom	MRI+VEEG	Left hippocampal sclerosis
8	Male	10	Left	2	Focal impaired awareness seizures	MRI+SEEG	left hippocampal sclerosis
9	Male	13	Left	1.67	Focal impaired awareness and non-motor autonomic seizures	MRI+VEEG	Left hippocampal sclerosis
10	Female	6	Left	1.25	Gyratory seizures	MRI+VEEG	Right hippocampal ganglioglioma
11	Female	15	Left	0.75	Focal impaired awareness seizure	MRI+VEEG	Right amygdala ganglioglioma
12	Female	41	Left	15	Focal impaired awareness and autonomic seizures	MRI+SEEG	Right hippocampal sclerosis

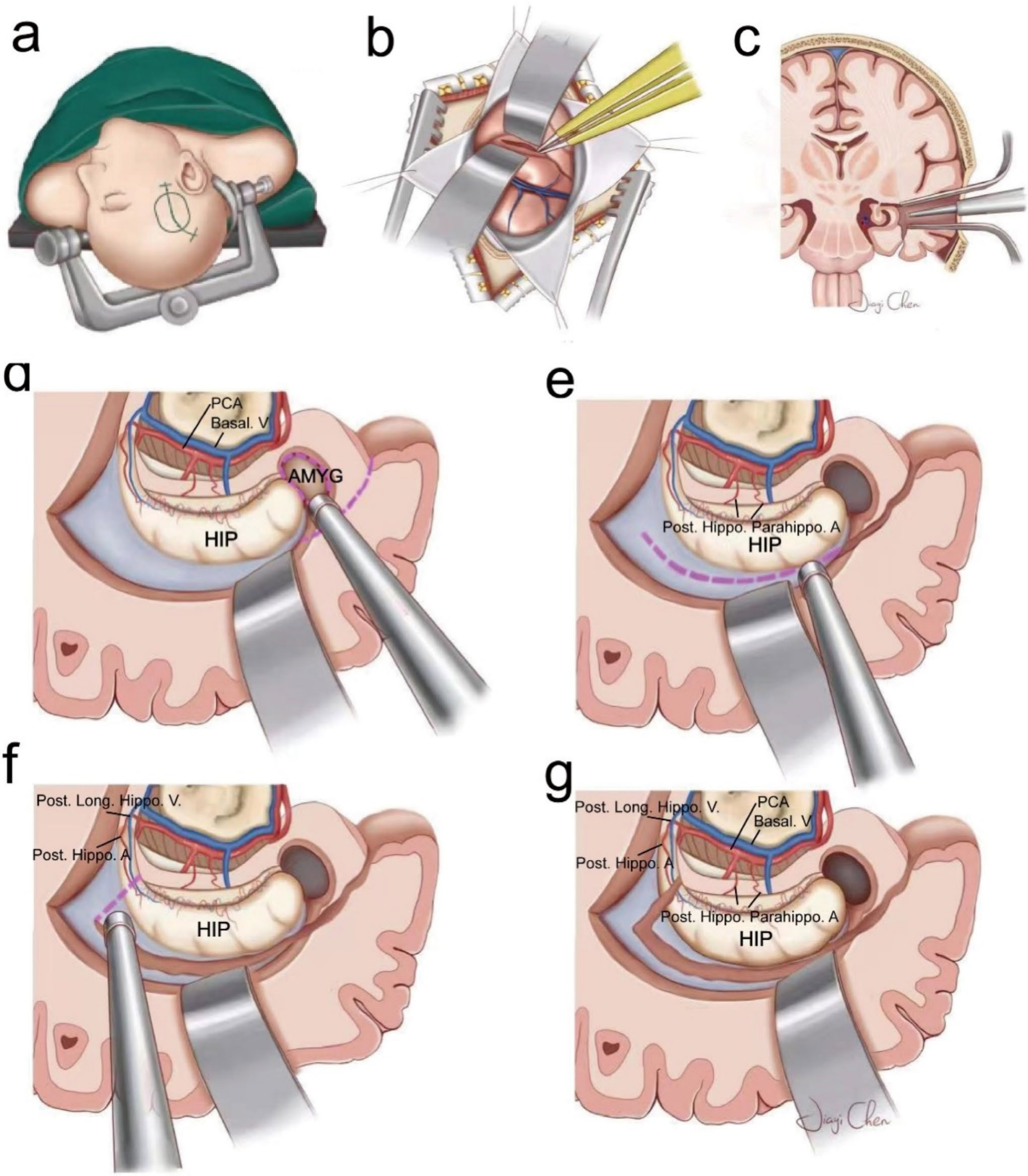

Fig. 1 Schematic diagrams show MTL procedures. **(a)** Patient position. **(b)** Bone flap and dural suspension. **(c)** Corridor from the superior temporal sulcus to temporal horn and the lateral disconnection of the hippocampal complex (coronal view). **(d)** Amygdala aspiration. **(e)** Lateral disconnection of the uncus. **(f)** Lateral disconnection of the hippocampal complex (axial view). **(g)** Posterior disconnection of the hippocampal complex. AMYG: Amygdala. HIP: Hippocampus

using an aspirator, a corridor was fashioned down from the incision to the lateral wall of the temporal horn (Fig. 1c). A series of anatomical landmarks, including the collateral eminence, choroid plexus, hippocampal fimbria and choroidal fissure were identified.

The medial temporal structures were disconnected except the amygdala, which was aspirated (Fig. 1d). The medial limitation of aspiration was the choroidal fissure to prevent basal ganglia injury. For the suspected neoplasm within medial temporal structures, it was routinely excised rather than disconnected. Then a sagittal dissection initiated on the lateral part of the temporal horn anterior wall towards the rhinal sulcus was performed (Fig. 1e). At this point the uncal gyrus had been disconnected from the lateral side, the next step was to disconnect anterior structures from the superior side by a horizontal section passing through the cavity formed by removal of amygdala.

The posterior part of medial temporal structures, including hippocampus and adjacent parahippocampal gyrus, were completely disconnected by two steps. Firstly we extended posteriorly the sagittal dissection performed in disconnecting uncal gyrus. In the coronal view, it was carried out from the lateral part of the collateral eminence down to the collateral sulcus (Fig. 1f). This manipulation was distant from choroid plexus and posterior cerebral artery, which could be better protected in this procedure than in the standard SAH. Then we transected the hippocampus and the parahippocampal gyrus at the junction of the hippocampus body and the tail. This transection plane was approximately the same as the coronal plane through the lateral mesencephalic sulcus (Fig. 1g). All medial temporal lobe structures had been disconnected (the uncus, the hippocampus and the parahippocampus) or removed (the amygdala) at this moment. As the procedure did not involve the medial part of the medial temporal structures, the disconnected structures have well preserved blood supply such as middle hippocampal artery.

Evaluation and follow-up

Final pathological diagnosis, postoperative complications, and antiepileptic drug use were recorded. MRI was reviewed before discharge to evaluate the surgical result. Patients were followed clinically for at least 6 months after discharge via outpatient clinic visits or telephone calls according to their condition. Follow-up MRI was performed at least once during follow-up. Seizure outcome was evaluated using the Engel classification (class I, no seizures or non-disabling partial seizures only; class II, ≤3 seizures per year; class III, >75% reduction in seizure frequency or decline in seizure intensity with improvement in quality of life; class IV, no improvement in seizure frequency or improvement in frequency with no improvement in quality of life).

Results

All 12 surgeries were performed successfully. One patient (case 12) developed mildly disturbed consciousness on the first day after surgery that resolved on the third day. She was discharged from the hospital on the fourteenth day after surgery. Mean follow-up was 3.25 years (range, 2.25–4.0). Follow-up clinical data are shown in Table 2.

In all patients, seizure frequency, duration, and intensity decreased in varying degrees immediately after surgery. Engel classification at the last follow-up was I in 9 patients; antiepileptic drug use was discontinued in four. Among the remaining patients, Engel classification was IIA in 1 patient (case 11), and IIIA in 2 patients (cases 6 and 8). No surgical complications such as intracranial hemorrhage, cerebral

Table 2 Follow-up clinical data

No.	Gender	Age(y)	Follow-up time(y)	Engel	current medication	Postoperative complications
1	Male	33	3.17	I	Discontinued	None
2	Female	13	3.5	I	Discontinued	None
3	Female	24	3.75	I	Lamotrigine, Sodium valproate	None
4	Female	6	3.25	I	Discontinued	None
5	Male	34	2.25	I	Carbamazepine	None
6	Female	10	3.25	III	Oxcarbazepine, Nitrazepam	None
7	Male	19	3.5	I	Discontinued	None
8	Male	10	3.0	III	Levetiracetam	None
9	Male	13	3.33	I	Carbamazepine	None
10	Female	6	4.0	I	Oxcarbazepine	None
11	Female	15	3.5	II	Levetiracetam	None
12	Female	41	2.5	I	Carbamazepine, Sodium valproate	mild disturbance of consciousness, recovered on the 3rd day

infarction, or VFD occurred. Two patients' (case 2 and 5) follow-up images are presented in Figs. 2 and 3.

Discussion

The medial temporal lobotomy proposed in this study is a further modification of the previous SAH. The accesses for craniotomy into the medial temporal lobe region are the same, and the three most common choices for surgical access are transcortical access, trans-lateral fissure access, and trans-subtemporal access. The transmedial temporal gyrus approach is usually chosen for medial temporal lobotomy, based on the consideration of avoiding excessive strain on brain tissue and damage to blood vessels through the superior temporal sulcus.

SAH is the most effective surgical treatment for MTLE but has a postoperative intracranial hemorrhage rate of 1.2% [11]. Delev et al. reported that choroidal artery injury during hippocampal resection is associated with an increased incidence of intracranial hemorrhage and cerebral infarction [12]. Additionally, previous research indicates that 58.3% of patients undergoing SAH experience asymptomatic temporal and frontal lobe infarctions [13]. The anterior/parahippocampal, middle, and posterior hippocampal arteries are located in the subarachnoid space and supply the hippocampus [14]. Instead of removing medial temporal structures, MTL disconnects the hippocampus and parahippocampal gyrus from other areas of the brain in a subpial fashion, which preserves and avoids injury to the hippocampal arteries. This reduces the risks of intracranial hemorrhage and cerebral infarction. No obvious bleeding observed on CT on the first day after surgery illustrated that no blood vessels were damaged. MRI showed that the hippocampal structure remained 2 years after surgery and there was no ischemic focus, which indicated that the blood supply was well protected (Fig. 2). No patient in our series experienced hemorrhage or infarction, suggesting that MTL might be instrumental in preventing vascular-related complications. Future clinical studies with larger patient cohorts are needed

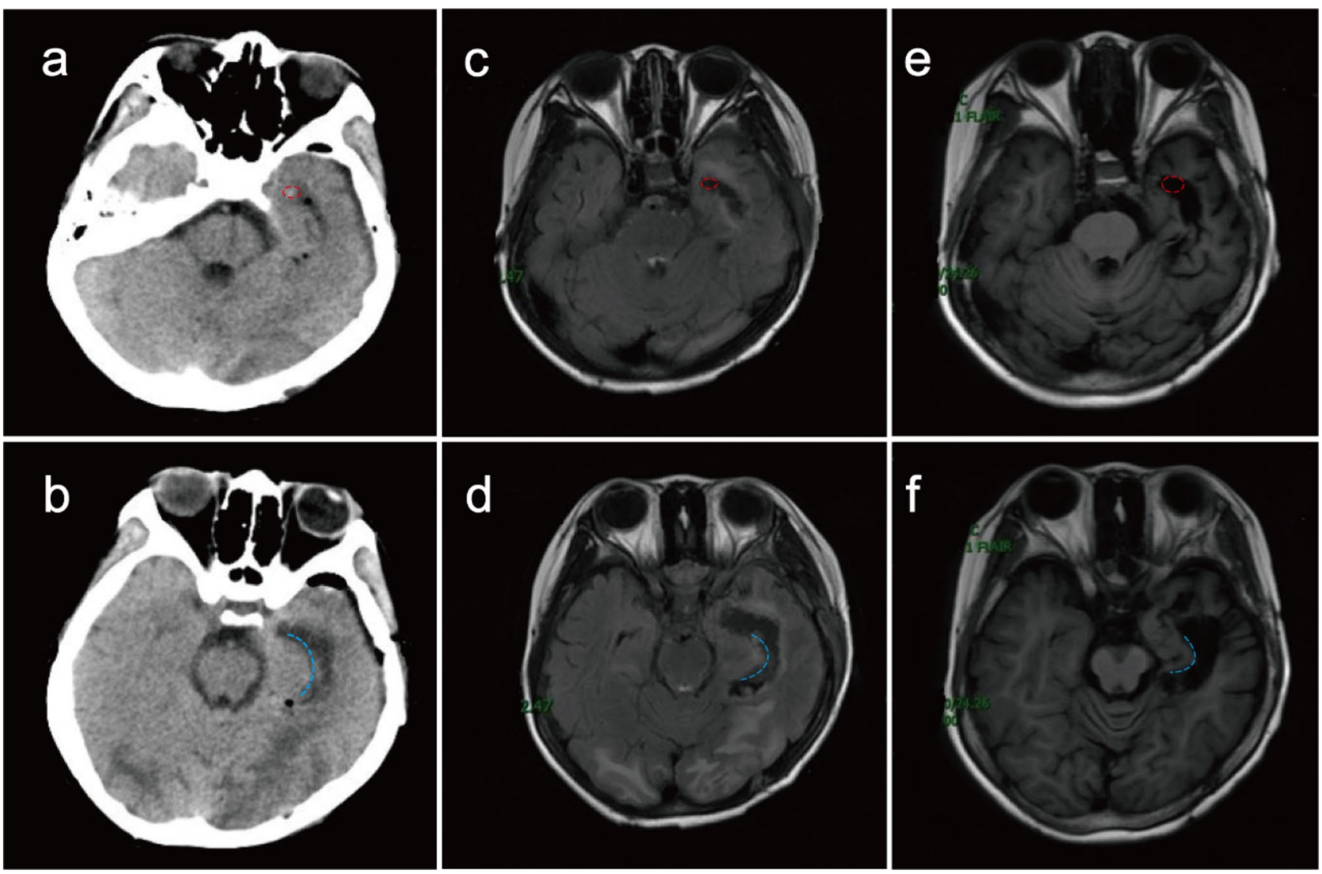

Fig. 2 Images of case 2 **(a)** and **(b)** Axial CT on the first day after surgery showed that the amygdala was aspirated (red circle) and the medial temporal lobe structures were severed (blue line) and no obvious bleeding was observed. **(c)** and **(d)** Axial MRI in one week after surgery showed that the amygdala was sucked out (red circle) and the connection between the hippocampus and temporal cortex was severed (blue line). **(e)** and **(f)** Axial MRI in two years after surgery showed that the cavities of the amygdala (red circle) and the detachment were formed (blue line) while the hippocampal structure remained normal. There was no obvious ischemic focus, indicating that our protection of hippocampal blood supply was effective

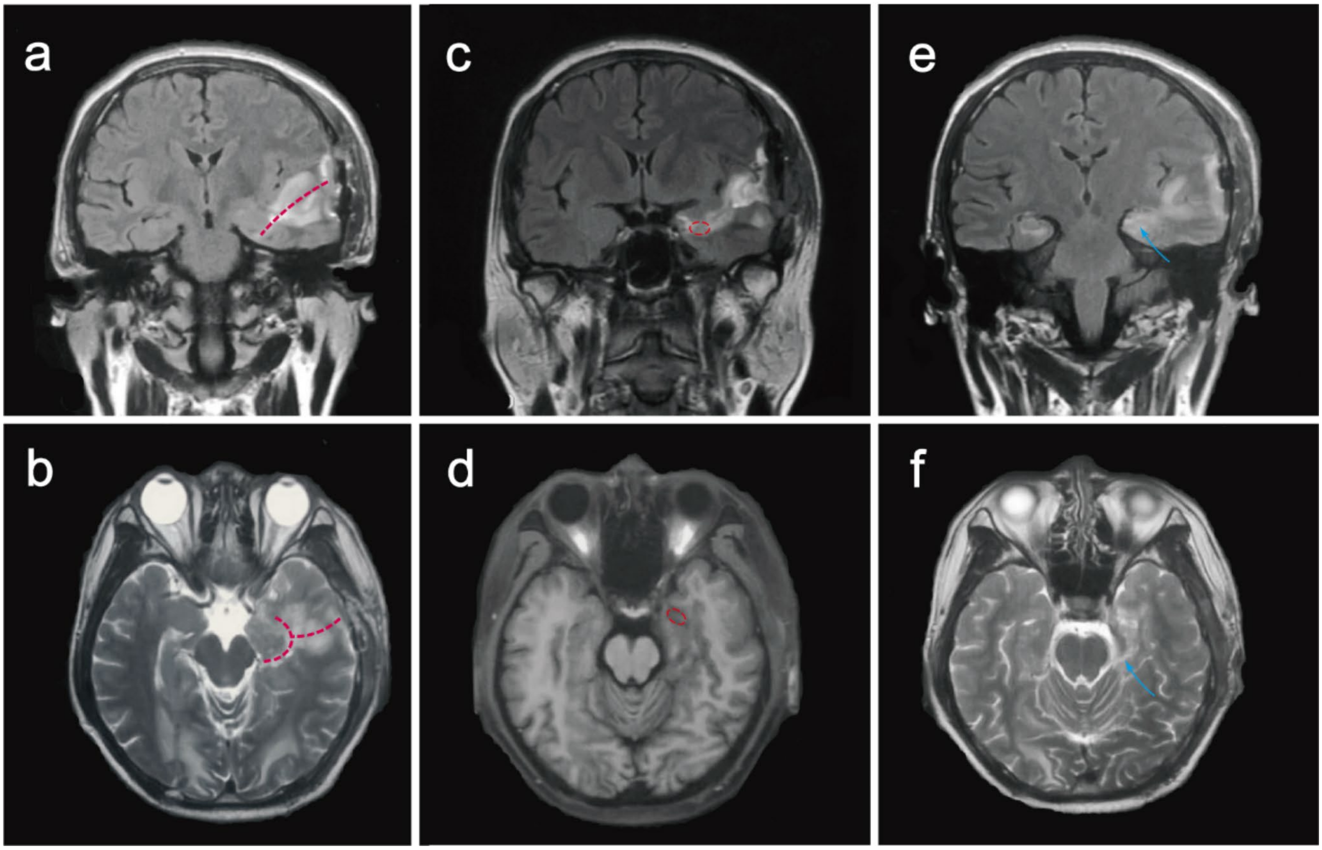

Fig. 3 Images of case 5 **(a)** and **(b)** Coronal and axial MRI in one week after surgery showed the surgical route (red lines) via the medial temporal gyrus. **(c)** and **(d)** Coronal and axial MRI at one week after the surgery showed the extent of amygdala resection (red circles). **(e)** and **(f)** Coronal and axial MRI at one week after the surgery showed the lateral disconnection of the hippocampus (blue arrows)

to confirm the superiority of this technique in minimizing hemorrhagic complications.

VFD is a common complication of MTLE surgery [15]. Reported VFD incidence after SAH is as high as 28.2% [16]. The direct cause is the intraoperative injury to Meyer's loop of the optic radiation and the severity is significantly correlated with the extent of temporal lobectomy [17]. Meyer's loop covers the roof of the temporal horn and extends anteriorly to the anterior wall by several millimeters [18]. Therefore, opening the ventricle at the superior wall may injure the optic radiation. With our MTL technique, the medial temporal gyrus is incised to enter the inferior horn of the lateral ventricle. The lateral sulcus is then incised down to the bottom of the temporal lobe, where the lateral cortex was cut off. The coronal incision is made from the bottom of the lateral ventricle to the bottom of the temporal lobe where the tail of the hippocampus was cut off, which decreases the risk of injury to the optic radiation and Meyer's loop. In the present study, none of the 12 patients had visual field defects, probably because the medial temporal lobe was disconnected to avoid damage to the vessels and thus avoid visual field defects caused by ischemia in the optic tract, lateral geniculate, or posterior temporal lobe white matter. However, because of the limitations of the small number of cases, the lack of ophthalmologic examination, and the possibility that the surgical procedure to expose the hippocampus may still damage the Meyer collaterals to some extent, medial temporal lobotomy may have a limited effect on reducing visual field defects.

The crucial portions of MTL are amygdala excision and disconnection of the fibers that connect the medial temporal lobe structures and the surrounding cortex. The epileptic foci in MTLE are usually located in the amygdala, hippocampus, and parahippocampal gyrus [19]. Compared to the anterior temporal lobotomy [20], the present procedure reduces the operation of dissection of the anterior temporal lobe and only operates on the amygdala and hippocampus, simplifying the surgical steps while having comparable efficacy. Compared to the amygdalohippocampotomy [21, 22] proposed by Goncalves-Ferreira, the present procedure differs in that the amygdala is aspirated subdurally instead of being dissected. Because of the extensive connections around the amygdala, complete dissection is technically challenging and can be used for experienced teams; however, inadequate dissection can lead to suboptimal postoperative results, so amygdala aspiration is an effective option for less experienced teams. Supporting this, multivariate regression analysis of MTLE patients in a previous study indicated that extensive amygdala ablations is associated with better seizure control outcomes [23]. Moreover, other studies have shown that disconnecting the limbic system and temporal cortex is essential for seizure control [24–26].

Therefore, the preoperative examination and evaluation of the patients in this group of cases clearly showed that the epileptogenic focus was located in the medial temporal lobe and the aim of MTL is to disconnect the hippocampus and parahippocampal gyrus from the temporal lobe neocortex after amygdala removal to completely isolate the epileptic foci. Previously reported seizure control rates for SAH range between 68% and 93.2% [27–30]. Engel class I seizure outcome was achieved with MTL in 75% of patients in the current study. These results suggest that the proposed MTL technique simplifies the procedure in this study, with efficacy comparable to that of the widely used SAH technique. Therefore, it holds promise for potential clinical application.

This case series has several limitations. Because of its small sample size, statistical analysis was not performed. In addition, its retrospective nature is subject to inherent bias. Also, the lack of specialized ophthalmic examination and the missing of preoperative and postoperative neuropsychological comparisons are limitations of this study. Furthermore, all surgeries were performed by one surgeon; therefore, the results may not be generalizable.

In conclusion, MTL involves the removal of the amygdala and disconnection of the fibers connecting the medial temporal lobe structures and surrounding cortex. MTL may reduce the risk of temporal cortex injury and other common complications of epilepsy surgery compared with SAH and have a role in surgical treatment of MTLE. Future large-scale studies with long-term follow-up are warranted.

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Author contributions Xiong and Du conceived, designed, and supervised the study. Yang, Zhou and Cai drafted the manuscript. Ruan, Chai and Xu collected the data. Shen and Pu performed data analysis. All authors contributed to the article and approved the submitted version.

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Data availability No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate Our study was conducted in accordance with the Declaration of Helsinki. Since this retrospective study did not involve patient privacy and no identifiable information in the text, it was granted an ethical exemption from the Ethics Committee of Wuhan Children's Hospital, and the informed consent of patients is not required.

Consent for publication Not applicable.

Competing interests The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. Baran O, Balak N, Baydin S, Aydin I, Kayhan A, Evran S et al Assessing the connectional anatomy of superior and lateral surgical approaches for medial temporal lobe epilepsy. J Clin Neurosci. 2020 2020-11-01;81:378–89.
2. Alonso VM, Lew SM, Morino M, Sarmento SA Microsurgical techniques in temporal lobe epilepsy. Epilepsia. [Journal Article; Review]. 2017 2017/4/1;58 Suppl 1:10–8.
3. Muzumdar D, Patil M, Goel A, Ravat S, Sawant N, Shah U Mesial temporal lobe epilepsy - an overview of surgical techniques. Int J Surg. [Journal Article; Review]. 2016 2016/12/1;36(Pt B):411–419
4. Asadi-Pooya AA, Rostami C History of surgery for temporal lobe epilepsy. Epilepsy behav. [Journal Article; review]. 2017 2017/5/1;70(Pt A):57–60
5. Kovanda TJ, Tubbs RS, Cohen-Gadol AA Transsylvian selective amygdalohippocampectomy for treatment of medial temporal lobe epilepsy: Surgical technique and operative nuances to avoid complications. Surg Neurol Int. 2014 2014-01-20;5:133.
6. Wheatley BM Selective amygdalohippocampectomy: the trans-middle temporal gyrus approach. Neurosurg Focus. [Journal Article; Review]. 2008 2008-09-01;25(3):E4
7. Ives-Deliperi V, Butler JT Randomised controlled trial of naming outcomes in anterior temporal lobectomy versus selective amygdalohippocampectomy. J Neurol Neurosur Ps. [Letter; Randomized Controlled Trial]. 2021 2021-09-01;92(9):1020–1021
8. Spencer D, Burchiel K Selective amygdalohippocampectomy. Epilepsy Res Treat. 2012 2012-01-20;2012:382095.
9. Engel JJ Evolution of concepts in epilepsy surgery. Epileptic Disord. [Historical article; Journal Article]. 2019 2019-10-01;21(5):391–409
10. Fisher RS The New Classification of Seizures by the International League Against Epilepsy 2017. Curr Neurol Neurosci. [Journal Article; Review]. 2017 2017-06-01;17(6):48
11. Tebo CC, Evins AI, Christos PJ, Kwon J, Schwartz TH Evolution of cranial epilepsy surgery complication rates: a 32-year systematic review and meta-analysis. J Neurosurg. [Journal Article; Meta-Analysis; Research Support, N.I.H., Extramural; Review; Systematic Review]. 2014 2014-06-01;120(6):1415–1427
12. Delev D, Hakvoort K, Kruger MT, Blume C, Clusmann H, Neuloh G Choroidal artery ischemic events after temporal lobe epilepsy surgery: clinical outcome, quality of life, and surgical pitfalls. J Neurosurg. 2022 2022-02-01;136(2):536–542
13. Martens T, Merkel M, Holst B, Bruckner K, Lindenau M, Stodieck S et al (2014) Vascular events after transsylvian selective amygdalohippocampectomy and impact on epilepsy outcome. Epilepsia. 2014(5/1):763–769
14. Tatu L, Vuillier F (2014) Structure and vascularization of the human hippocampus. Front Neurol Neurosci. [Journal Article; Review] 2014–01–20:34:18–25

15. Faust K, Vajkoczy P Distinct displacements of the optic radiation based on tumor location revealed using preoperative diffusion tensor imaging. J Neurosurg. 2016 2016-05-01;124(5):1343–1352
16. Wang C, Liu D, Yang Z, Yang Z Clinical outcomes after medial temporal lobe epilepsy surgery: anterior temporal lobectomy versus selective amygdalohippocampectomy. Zhong Nan Da Xue Xue Bao Yi Xue Ban. [Comparative Study; Journal Article]. 2018 2018-06-28;43(6):638–645
17. Barton JJ, Hefter R, Chang B, Schomer D, Drislane F The field defects of anterior temporal lobectomy: a quantitative reassessment of Meyer's loop. Brain. [Journal Article; Research Support, N.I.H., Extramural; Research Support, Non-U.S. Gov't; Research Support, U.S. Gov't, P.H.S.]. 2005 2005-09-01;128(Pt 9):2123–2133
18. Kucukyuruk B, Richardson RM, Wen HT, Fernandez-Miranda JC, Rhoton AJ Microsurgical anatomy of the temporal lobe and its implications on temporal lobe epilepsy surgery. Epilepsy Res Treat. 2012 2012-01-20;2012:769825.
19. Bartolomei F, Khalil M, Wendling F, Sontheimer A, Regis J, Ranjeva JP et al Entorhinal cortex involvement in human mesial temporal lobe epilepsy: an electrophysiologic and volumetric study. Epilepsia. [Comparative study; Journal Article]. 2005 2005-05-01;46(5):677–687
20. Smith JR, VanderGriff A, Fountas K Temporal lobotomy in the surgical management of epilepsy: technical report. Neurosurgery. 2004 2004-06-01;54(6):1531-4, 1534-6
21. Goncalves-Ferreira A, Campos AR, Herculano-Carvalho M, Pimentel J, Bentes C, Peralta AR et al Amygdalohippocampotomy: surgical technique and clinical results. J Neurosurg. 2013 2013-05-01;118(5):1107–1113
22. Goncalves-Ferreira A, Rainha-Campos A, Franco A, Pimentel J, Bentes C, Peralta AR et al Amygdalohippocampotomy for mesial temporal lobe sclerosis: Epilepsy outcome 5 years after surgery. Acta Neurochir. [Evaluation study; Journal Article]. 2017 2017-12-01;159(12):2443–2448
23. Wu C, Jermakowicz WJ, Chakravorti S, Cajigas I, Sharan AD, Jagid JR et al Effects of surgical targeting in laser interstitial thermal therapy for mesial temporal lobe epilepsy: a multicenter study of 234 patients. Epilepsia. [Journal Article; Multicenter Study; Research Support, N.I.H., Extramural]. 2019 2019-06-01;60(6):1171–1183
24. Gleichgerrcht E, Drane DL, Keller SS, Davis KA, Gross R, Willie JT et al Association between Anatomical Location of Surgically Induced Lesions and postoperative seizure outcome in temporal lobe Epilepsy. Neurology. [Journal Article; Research Support, N.I.H., Extramural]. 2022 2022-01-11;98(2):e141–e151
25. Boling WW Surgical considerations of intractable mesial temporal lobe Epilepsy. Brain Sci. [Journal Article; Review]. 2018 2018-02-20;8(2).
26. Bertram EH Temporal lobe epilepsy: where do the seizures really begin? Epilepsy Behav. [Journal Article; Research Support, N.I.H., Extramural; Review]. 2009 2009-01-01;14 Suppl 1:32– 7.
27. Martens T, Merkel M, Holst B, Bruckner K, Lindenau M, Stodieck S et al Vascular events after transsylvian selective amygdalohippocampectomy and impact on epilepsy outcome. Epilepsia. 2014 2014-05-01;55(5):763–769
28. Yasargil MG, Krayenbuhl N, Roth P, Hsu SP, Yasargil DC The selective amygdalohippocampectomy for intractable temporal limbic seizures. J Neurosurg. 2010 2010-01-01;112(1):168–185
29. Yang PF, Zhang HJ, Pei JS, Lin Q, Mei Z, Chen ZQ et al Neuropsychological outcomes of subtemporal selective amygdalohippocampectomy via a small craniotomy. J Neurosurg 2016 2016/7/1;125(1):67–74
30. Ali R, Englot DJ, Yu H, Naftel R, Haas KF, Konrad PE Experience from 211 transcortical selective amygdalohippocampectomy procedures: relevant Surgical anatomy and review of the literature. Oper Neurosurg. [Journal Article; Review]. 2021 2021/9/15;21(4):181–188