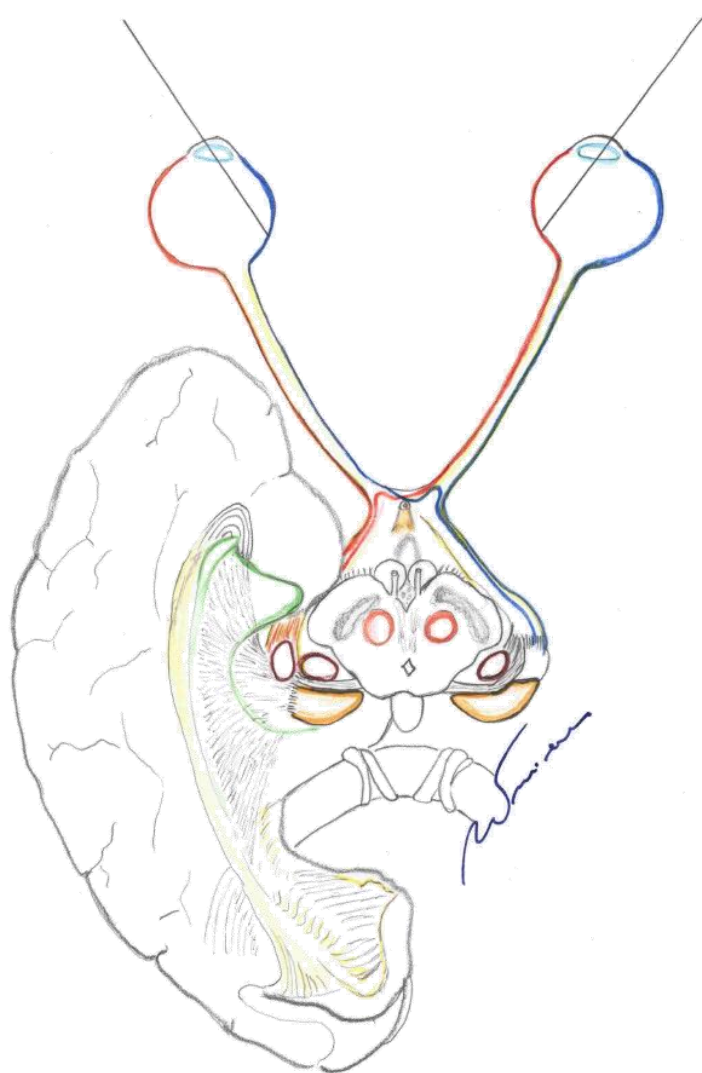


ABSTRACTBAND



48. Jahrestagung der Sektion Mikrochirurgie und Neuroanatomie (SMCNA) der Deutschen Gesellschaft für Neurochirurgie (DGNC)

26.–27. April 2019 | Frankfurt am Main

www.sektionstagung-mikroneurochirurgie.de

Mikochirurgische Anatomie des intrakraniellen vorderen optischen Systems dargestellt durch frontolateralen supraorbitalen Zugang und die Ergebnisse Visus-erhaltender mikrochirurgischer OP's bei 12 Kindern

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Die meisten Tumore des intrakraniellen vorderen optischen Systems sind Opticus Gliome (Pilozytische Astrozytome), die im Kindesalter auftreten und zu Sehstörungen führen. Die genaue Topographie des Tumorsprungs ist entscheidend für die Visuserhaltende Operation. Die Kenntnis der genauen Anatomie des Chiasma Opticum und seine Umgebung, sowie die detaillierte Interpretation des neuroophthalmologischen Befundes und der MRT-Aufnahmen, kann Ursprungsbereich des Tumors definiert werden. Bei unseren Patienten konnte der Tumor an folgenden anatomischen Strukturen des Sehsystems haften: 1. an einem der beiden Opticus Nerven, 2. Am medialen oder lateralen N. Opticus/Chiasma Winkel, 3. an dem medialen oder lateralen Chiasma/ Tractus Opticus Winkel, 4. am vorderen Rand des Chiasma und 5. am hinteren Rand des Chiasma mit und ohne Beteiligung des Hypothalamus. Bei den 12 operierten Kindern, über einen frontolateralen Zugang konnte der Tumor total entfernt werden und ein Visus erhalten bleiben. Endokrine Störungen sind bei 4 Patienten post Op aufgetreten.

Infraoptic pre-communicating anterior cerebral artery

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Objective: To describe a very rare vascular anomaly of pre-communicating anterior cerebral artery associated with an anterior communicating artery aneurysm relevant for surgical management.

Methods: Analysis of imaging studies, microsurgical situs and literature.

Result: A 20-year-old woman present with a subarachnoid hemorrhage secondary to a ruptured aneurysm of the anterior communicating artery. CT-angiography and transfemoral catheter angiography of the cerebral vessels demonstrated a berry aneurysm (9x7 mm) of the anterior communicating artery with filling only from the right side, coarctatio aortae and fibromuscular dysplasia of both internal carotid arteries. The left pre-communicating artery (A1) was hypoplastic. Due to the complex angioarchitecture it was decided in an interdisciplinary setting to secure the aneurysm by microsurgical clipping. The microsurgical situs revealed an infraoptic course of the right A 1. The aneurysm was completely obliterated by microsurgical clipping.

Conclusion: The very rare finding of an infraoptic course of the A1-segment of the anterior cerebral artery is associated in about 60 % with cerebral aneurysms. Four types of vascular configurations with infraoptic A1 have been described. The embryogenesis of the anomaly is still controversial. Knowledge of the anomaly has practical implications for performing surgery.

Schlüsselloch-Zugänge zur Resektion kleiner Meningeome um den Nervus opticus: eine anatomische Studie und intraoperative Beobachtungen.

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Objective: Neue Techniken moderner Schädelbasischirurgie sollen das zugangsbedingte Operations-trauma reduzieren. Dieses Ziel wird unter anderem mit einer individualisierten Zugangsplanung erreicht. In unserer Studie wurde die Anatomie des vorderen Abschnittes der suprasellären Pyramide untersucht, um den anatomisch günstigsten Zugang zur Resektion kleiner Meningeome im Bereich der Processus clinoideus anterior, Canalis opticus oder dem Tuberculum sellae zu finden.

Methods: 10 menschliche Kopfpräparate wurden untersucht und ausführliche topographische und morphometrische Beobachtungen durchgeführt. Dabei haben wir die Anatomie verschiedener frontolateraler, supraorbitaler und kontralateraler supraorbitaler Zugänge erarbeitet und miteinander verglichen. Unsere Ergebnisse dieser anatomischen Untersuchungen wurden anschließend bei Planung und Resektion von Meningeomen mit Bezug zum Nervus opticus (N.II) berücksichtigt.

Results: Der N. II., das Chiasma opticum und die Aa. carotis internae bilden eine virtuelle Pyramide in der suprasellären Region. Natürliche Spalträume zwischen diesen Strukturen dienen als "chirurgisches Fenster" zu tieferen Regionen der Schädelbasis, bestimmen die Einsicht mit dem Operationsmikroskop und die Beweglichkeit der Mikroinstrumente. Die topographische Anatomie und Morphometrie der inter-optischen, optico-carotischen und carotico-temporalen Fenster wurden bestimmt. Bei der Zugangsplanung für Meningeome im vorderen Abschnitt der suprasellären Pyramide wurde die Erreichbarkeit dieser Fenster berücksichtigt. Die chirurgische Anatomie der frontolateralen, supraorbitalen und kontralateralen supraorbitalen Zugänge wurde ebenfalls bestimmt. Die Lage der Tumore zum N.II ist bei der Zugangsplanung von entscheidender Bedeutung. Kleine Meningeome direkt lateral des N.II wurden über den frontolateralen Zugangsweg operiert. Läsionen medial des N.II, aber mit lateralen Anteil waren optimal für den ipsilateralen supraorbitalen Zugang. Meningeome direkt am medialen Rand des N.II ohne laterale Ausdehnung wurden über den kontralateralen supraorbitalen Zugang entfernt.

Conclusion: Die Entfernung auch kleiner suprasellärer Meningeome kann herausfordernd sein und erfordern bei der Planung minimal-invasiver Zugänge Rücksicht auf die umliegenden Strukturen, insbesondere den N. II. Anatomisch geeignete transkranielle Zugänge sind die Varianten des subfrontalen Zugangsweges: die frontolaterale, supraorbitale oder kontralaterale supraorbitale Kraniotomie.

Operative Strategien zur Dekompression des N. opticus bei intraorbital und intracanaliculär gelegenen Tumoren und Prozessen

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Tumore und Prozesse, die den N. opticus in seinem intraorbitalen und intracanaliculären Verlauf komprimieren, stellen eine besondere chirurgische Herausforderung dar, da sie die Grenzen der klassischen Fachgebiete überschreiten und hierdurch sehr verschiedenartige operative Strategien der Dekompression erforderlich machen können. Durch die Spezialisierung des Senior- Autors besteht in unserer Klinik eine langjährige Erfahrung mit den hierfür erforderlichen Techniken, die aus einer intensiven fächerübergreifenden Zusammenarbeit entstanden sind. Wir präsentieren anhand von Fällen aus unserem Patientenkollektiv geeignete Zugangs- und Dekompressionsstrategien bei Opticus-Kompressionen in den genannten Bereichen und gehen dabei auch auf besondere mikroanatomische Besonderheiten ein. Als Ausblick werden 3D- Rekonstruktionen präsentiert, die zur Planung in komplexen Fällen dienen können.

Intraoperative examination of the optic nerves microvascular patency by ICG angiography after resection of suprasellar/anterior clinoidal lesions and correlation with functional outcome

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Introduction: Resection of tumors of the suprasellar and anterior clinoidal region are associated with risk of postoperative worsening of optic nerve or chiasma function even in well-experienced hands. The microvascular patency of these structures may play a pathophysiological role for postoperative deterioration of visual functions.

Patients and methods: In a prospective intraoperative study with ICG videoangiography, 24 optic nerves in 14 surgeries for suprasellar and/or anterior clinoidal space-occupying lesions were investigated after resection and decompression manoeuvres during the last 2 years. The ICG videos were analysed and the so-called optic inflow-time (OIT) in seconds (s) was measured.

Results: The mean OIT for all 24 nerves was 5.9 s (+/- 3.1 s; 3-14 s). In 2 patients a new postoperative mild/moderate deterioration of an optic nerve occurred. In another patient the vision on one side was bad preoperatively. These 3 patients/nerves are joined to a subgroup B, whereas the other 21 nerves are collected to subgroup A. The mean OIT in subgroup A was 5.1 s (+/- 2.4 s; 3-14 s). Contrarily, the mean OIT in subgroup B was 11 s (+/- 2.7 s; 8-13 s).

Conclusion: The OIT seems to be a good intraoperative parameter to estimate the functional prognosis of a decompressed optic nerve. An OIT of 8 or more s may be critical. An ipsilateral aplasia of the A1-segment may cause a slow OIT without functional deterioration. Further studies with larger case numbers are necessary to confirm these limited preliminary results.

Das visuelle System und intraoperatives Monitoring – aktueller Überblick

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Einleitung: Die Sehbahn ist eine Hochgeschwindigkeitsstrecke des Sehens mit einem anatomisch anspruchsvollen Verlauf.

Sie besteht aus den speziell-somatosensiblen Fasern der Retina, die zum primären und sekundären Sehcortex ziehen. Auf dem Weg zur Sehrinde beginnt nach dem dritten Neuron der Nervus opticus. Von dessen Beginn bis hin zur Sehrinde kann es je nach Lokalisation und Pathologie zu Ausfällen kommen. Die Ableitung von visuell evozierten Potentialen (VEPs) ist eine Technik, die intraoperativ das Monitoring der Funktion der Sehbahn ermöglicht. In einer Pubmed Recherche mit den Schlagworten „visual evoked potentials in neurosurgery“ zeigen sich mehr als 200 Publikationen zu dieser Thematik.

Ziel dieser Arbeit ist es, einen Überblick über technische Möglichkeiten und die bislang erfolgten Einsätze im Bereich des visuellen Systems aufzeigen.

Methode: VEPs basieren auf dem Prinzip, dass nach adäquater retinaler Reizung Potentiale über dem okzipitalen Kortex abgeleitet werden. Dies ermöglicht in einem gewissen Umfang eine Untersuchung der Physiologie und Pathophysiologie des visuellen Systems.

Historisch wurden Änderungen der elektrischen Hirnaktivität nach visueller Reizung schon von Caton im Tierversuch bei direkter kortikaler Ableitung 1875 und 1877 berichtet. Analoge Phänomene beim Menschen wurden erst mehr als 50 Jahre danach durch Adrian und Matthews (1934) entdeckt. Sie stellten Änderungen des okzipitalen Alpha-Rhythmus bei Flickerlichtstimulation fest, ein Effekt, der seither als "photic driving" bekannt ist. Die Weiterentwicklung und Einführung von Summations- und Mittelungstechnik für die SEP ermöglichte es, die VEP aus der Grundtätigkeit des EEG hervorzuheben. Mit der Verfügbarkeit von leuchtstarken Leuchtdioden (LED) ist eine stabile Stimulation der Sehbahn möglich geworden. Diese Messung kommt bei Operationen zum Einsatz, bei welchen Auswirkungen auf die Sehbahn als Komplikationen auftreten können. Komplizierte neurochirurgische Eingriffe, welche mit einem erhöhten Risiko einhergehen, können durch VEP erst ermöglicht werden.

So können Tumoren in der sellären Region komplexer Art und deutlicher Größe mit Überwachung der Sehbahn operiert werden. Intraaxiale Tumore im Bereich der Sehbahn können mit VEP und Electrocorticogrammen überwacht werden und so verlässliche Angaben zu postoperativen möglichen Gesichtsfeldausfällen gemacht werden. Die normale Gehirnaktivität während der Messung stört, beim VEP ist eine Mittelung der abgeleiteten Reizantworten erforderlich. Dazu werden ca. 100 Messungen hintereinander abgeleitet, die dann vom Computer miteinander verrechnet werden. So werden die Störungen unterdrückt und die Reizantworten von der Sehrinde herausgefiltert. Für jedes Muster erhält man eine Reizkurve, deren wichtigstes Kennzeichen eine positive Welle nach ca. 100 ms ist (P100-Komponente). Bei Erkrankungen kann die Zeitdauer des Auftretens (Latenz) dieser P100-Komponente verzögert sein, die Höhe (Amplitude) vermindert sein oder die Reizantwort fehlt ganz. Dieses ist im wachen Zustand mit möglich kooperativem Patienten machbar. Die Blitz-VEP bietet gegenüber den Antworten auf Musterreize eine größere Schwankungsbreite zwischen unterschiedlichen Individuen auf, interokulär sind die Schwankungen jedoch gering. Grund hierfür ist, dass die blitzevozierte Antwort immer gleichzeitig eine Reaktion auf eine globale Beleuchtungsänderung und auf die Reizstruktur ist. Bei Blitzstimulation ist die VEP Ableitung unabhängig von Aufmerksamkeit oder Fixation, sodass sie eine Möglichkeit der Beurteilung von kooperationsunwilligen oder – unfähigen Testpersonen eröffnet und somit intraoperativ genutzt werden kann.

Ergebnis: Verschiedene Studien wurden durchgeführt, um diese Untersuchungstechnik der VEPs technisch zu verfeinern und in den klinischen Alltag, zu implementieren. Trotz dieser Möglichkeiten zeigt sich die Umsetzbarkeit nicht unmöglich, jedoch erschwert. Die Limitationen zeigen sich zum

Beispiel in der einfachen Stimulation mit Blitzreizen. Hier lassen sich nur grobe Rückschlüsse auf die Integrität der Sehbahn schliessen.

In neueren Arbeiten, wird beschrieben, dass diese Technik einen hohen prediktiven Wert für die Detektion von Veränderungen und Einschränkungen postoperativ bietet. Andere Arbeiten beschreiben, dass die VEPs in Kombination mit der Elektrokortikographie eine Maximierung der Resektion in der Gliomchirurgie darstellen.

Zusammengefaßt muss reflektiert werden, dass bezüglich der Reizantwort, der Technik und Durchführung der Untersuchung, der genutzten Devices zur Optimierung der Anwendbarkeit noch Untersuchungsbedarf besteht. Die Auswertbarkeit der Ableitungen, die Validität der Ergebnisse ist zu diskutieren. Die umgebenden Faktoren wie Setting, Anästhesie, der Patient selbst spielen eine wichtige Rolle die die Reizantwort beeinflussen können. Diese Punkte zeigen auf, dass diese Technik weiterhin ein Ziel von zukünftigen Untersuchungen sein sollte um sie zunehmend sicherer anwendbar und ihre Ergebnisse sinnvoll interpretierbar zu machen.

Field deficits after temporal lobe surgery in epilepsy patients: comparison of anterotemporal and subtemporal approach

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Introduction: Most operations in temporal lobe epilepsy (TLE) include the resection of the amygdala-hippocampus-complex (amygdalahippocampectomy, AHE) and are carried out as temporal pole resection with AHE (TPAHE), as anterior two-third temporal lobe resection (TLR) with AHE (2/3TLR) or as selective AHE (sAHE) over a posterior subtemporal approach (STAHE). The extent of resection is dependent on the suspected size of the temporal lobe lesion, judged on MRI. The indication for anterior TLR is growing, because improvements in MRI technology show more, probably irrelevant, abnormalities of the temporal lobe. Anterior TLR (TPAHE, 2/3TLR) bear the risk of postoperative visual field deficits (VFD) due to immediate vicinity of the Meyer's loop of the visual tract anterior of the temporal horn of the ventricle. Some studies showed that STAHE has a lower rate of VFD, most likely because the approach is inferior of temporal horn and the visual tract. The purpose of this study is to show, whether the rate of VFD in STAHE is low and whether the use of navigated diffusion tensor imaging (DTI)-marked visual tract can reduce VFD in anterior TLR to the level of STAHE.

Methods: In 24 patients, temporal lobe surgery was performed with navigation, based on preoperative DTI imaging of the visual tract. The extent of the volume of the visual tract was calculated using the BrainLab software. Pre- and 3 months postoperatively visual field diagnostics using Goldmann perimetry were performed.

Results: Seventeen patients had anterior TLR with AHE (TPAHE, 2/3TLE), of those, 11 showed a VFD in the contralateral upper quadrant, 6 patients had no new VFD. Three patients had an anterior TLE for resection of an epileptogenic lesion without AHE, of those two had a VFD contralateral upper quadrant. Three patients had STAHE, none of them developed VFD. In a single patient, a temporal lesion close to the visual tract was resected through a subtemporal approach, the patient developed a contralateral upper quadrant VFD. Most patients with detectable VFD did not experience a noticeable impairment.

Conclusions: In STAHE 1/4 of the patient showed VFD, in anterior TLR 3/4, despite the use of navigated DTI-marked visual tracts. Since MRIs show more abnormalities, the indication for anterior TLR is growing compared to STAHE, as might the number of patients with postoperative VFDs.

Intraoperatives MRT (ioMRT) mit dualer Nutzung: die Erfahrungen der ersten 100 Patienten Dual-utility intraoperative MRI (ioMRI): experience of the first 100 patients

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Objective: Hybrid OR suites with integrated MRI (ioMRI) have become highly instrumental in brain tumor surgery. Associated costs however need to be met either by research investment or additional diagnostic use. In June 2017 a dual-utility setup of a hybrid Neurosuite (Magnetom Aera 1.5T, Siemens), which serves two operating rooms and an ambulatory diagnostic facility via a separate entry, was implemented. We report on our initial experience with the feasibility and efficacy of intraoperative use of MRI in brain tumor surgery in this setting.

Methods: This retrospective study included the first 100 patients who had undergone brain tumor surgery with the use of ioMRI between June 2017 and October 2018. Tumor localization, histopathology, complications such as new neurological deficits or infections, OR times and need for additional resection, were studied. All analyses were evaluated using SPSS software (IBM SPSS, V21) Descriptive statistics are presented.

Results: A total of 100 patients had undergone tumor resection with the use of ioMRI. Within the same time period roughly 3900 purely diagnostic studies (without OR access) were carried out. Patients who underwent ioMRI were 61 males and 39 females. Age ranged from 19 to 89 years (median age: 65). Lesions included 58 glioblastomas, 6 low-grade gliomas (4 astrocytomas, 2 oligodendoglioma), 3 anaplastic variants (ependymoma, astrocytoma), 22 pituitary adenomas, 5 metastases, 4 benign tumors (meningioma, papillary glioneural tumor, craniopharyngioma, pilocytic astrocytoma), 1 abscess, 1 encephalitis. Tumor localization was mainly in the temporal lobe (n=30), followed by the sella region (n=22), frontal (n=17), parietal (n=10), and diverse locations (n=21). In total, 44% of all lesions were right-sided, 32% left-sided, 23% (para) sellar, 1% bilateral. In 25% recurrent tumors were operated. In 17% of all cases intraoperative neuromonitoring (electrophysiology) was used. Operating times ranged from 36 to 897 minutes with a median of 282,5 minutes. In 41 % of all cases ioMRI demonstrated complete resection. Additional tumor resection was performed in 57%, in 2 % subtotal resection was achieved as planned. The majority of patients (87%) was neurologically intact postoperatively, 13% suffered new neurological deficits of which 4% were transient. Postoperative complications occurred in 6 patients. This included 2 CSF infections. Overall, 4 patients required surgical revision (CSF fistulae or postoperative haemorrhage, both n=2).

Conclusion: Within these 100 patients, who were operated in a dual-utility ioMRI setup, first results were obtained which compare well to other contemporary series. Neither infections nor complication rates were increased. Growing experience will shorten operation time. At the same time reimbursement of the dual-utility ioMRI was possible by allowing for a high number of ambulatory diagnostic studies.

Robot-assisted neuroendoscopic intracranial membrane resection in premature infants with posthemorrhagic hydrocephalus and complex cyst formation

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Introduction: Complex intraventricular cyst membrane formations are often observed after intraventricular hemorrhage in premature infants and in particular after cerebrospinal fluid (CSF) diversion-associated infections. The resection of multiple cyst membranes is crucial for creating one common intracranial CSF space. Since those membranes have a complex structure, navigated procedures are required. We report our experience with robot guided minimally invasive endoscopic intervention and microsurgical operations.

Methods: Six children with complex intraventricular cyst membrane formations were included in this study in the period between 2016 and 2018. Three children were operated using a microsurgical approach guided by neuronavigation and three were operated endoscopically with the endoscope guided by the robotic surgery assistant (ROSA). All six infants were premature, had intraventricular hemorrhage, hydrocephalus and developed intracerebral cysts. Due to the soft skull, two of six children were not fixed in the mayfield clamp, but head fixation was performed using tapes. For the robot guided endoscopic approach, referencing with preoperative magnetic resonance imaging was accomplished by facial laser scan.

Results: The children had between six and 23 CSF diversion catheter procedures before and a minimum of 6 cysts. Diameters of microsurgical craniotomies were 3 cm or larger. Due to the thickness and vascularization of the membranes, pure endoscopic operations were not possible and microsurgical instruments were used. The robot reached all planned endoscopic trajectories to resect membranes. This was not achieved in microsurgical cases, despite neuronavigation. Membrane resection was followed by external ventricular drainage for seven to 14 days and thereafter permanent ventriculoperitoneal shunts were successfully implanted in all patients.

Conclusion: Our experience using the Robot-assisted endoscopy shows that this procedure is safe, less invasive, avoids brain retractors during surgery, allows less CSF and blood loss and consequently a shorter patient hospitalization time. Moreover this technique improves access to multiple intracerebral cysts membranes with a better anatomical visual control.

Posterior falcine meningiomas with bilateral involvement of the visual cortexS. Asgari¹¹Department of Neurosurgery, Hospital Ingolstadt, Ingolstadt, Germany

Introduction: Falcine meningiomas with bilateral expansion may be surgically challenging. Tumors originating from the posterior third of the falx may lead to worsening of the visual cortical function on both sides.

Patients and methods: During the last 10 years, three patients with extensive bilateral posterior falcine meningiomas underwent surgical gross resection (Simpson grade 1 or 2). Two of the tumors were recurrent lesions after previous surgery. The superior sagittal sinus was invaded and occluded by the tumor in all cases. Preoperative tumor embolization was done in one patient. Surgery was performed in semi-sitting positioning for all patients. Visual field investigations and MRI were performed preoperatively, 3 months and 1 year after surgery.

Results: The unique preoperative tumor embolization led to severe bilateral homonymous hemianopsia. Therefore, preoperative embolization was avoided in the other two patients. Simpson grade 1 or 2 resection was achieved in all patients without complications. 3 months after surgery, the visual fields improved in all patients.

Conclusion: In large posterior falcine meningiomas with bilateral extension, the visual cortex of both hemispheres showed significantly functional deterioration. The calcarine cortex and the posterior part of the optic radiation are at risk in cause of both mechanical compression by the tumor and venous congestion. I advise against performing preoperative embolization because of high risk of postinterventional blindness. Meticulous preparation technique at the often infiltrated arachnoidal border and preservation of the venous rerouting of the occluded sagittal sinus are mandatory for saving the residual visual function.

Der laterale Transkanthale, extra-ossäre Zugang für Intraorbitale Tumore, Mikroanatomie und Mikrochirurgie

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Die intraorbitalen Tumore stellen, trotz der verbesserten und nahe zu perfekten diagnostischen Möglichkeiten, eine interdisziplinäre Herausforderung dar. Das genaue Studium der Anatomie der Orbita ermöglicht uns neue funktionserhaltende mikrochirurgische Zugänge zu entwickeln. Nach Darstellung der mikrochirurgischen Anatomie der Orbits wird ein lateraler minimalinvasiver Zugang vorgestellt, der die mikrochirurgische Exploration der lateralen Zweidrittel des retrobulbären Raumes bis zur Orbitaspitze ermöglicht. Die gemachten klinischen Erfahrungen und Ergebnisse werden präsentiert.

CSF-complications after radical orbital decompression – technical considerations

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Background and objective: CSF-fistula after radical orbital decompression (including extradural clinoidectomy, resection of temporal dura propria and cavernous sinus opening) is difficult to prevent. Using the pterional many techniques, e.g. dura sealant, fat graft, lumbaldrain have been proposed for prevention, but are not a guarantee for success. In our experience, using a technique with a temporal muscle incision and pterional craniotomy below the superior temporal line during the approach provides a supplementary barrier for watertight closure without impeding surgical access. We propose a description of this “low pterional approach” for radical orbital decompression along with a detailed illustration by clinical cases.

Material and Methods: Retrospectively, 4 complex skull base cases operated over the last 12 months by the technique of “low pterional approach” were studied. Outcome with special interest for CSF and local healing was analysed.

Results: 4 patients that underwent extradural approach for radical optic nerve / orbital decompression were included: 2 sphenoidal and one anterior clinoid process meningioma and one invasive sino-nasal undifferentiated carcinoma (SNUC). Extradural dissection of anterior and middle fossa and dura opening was performed in all; three patients underwent anterior clinoidectomy and extensive removal of orbital wall. Resection of dura propria of the cavernous sinus was performed in three patients. In two patients dura was reconstructed with abdominal fat graft, one patient got a lumbal drain and dura sealants were used in all. A CSF fistula occurred in no patient.

Discussion: The superior temporal line represents an important landmark in the pterional approach for radical orbital decompression. An incision of the temporal muscle and bone below this landmark permitted a very watertight closure and prevented CSF fistula in the presented cases. On the other hand, access for radical and adequate orbital decompression was not hindered.

Conclusions: In our initial experience, the “low pterional approach” allowed radical orbital decompression and provided an extra barrier for watertight closure. CSF complications were successfully prevented in this short series of patients. A larger study is planned.

Cranial nerve palsy and vision impairment in patients with unruptured intracranial aneurysm

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Background: Patients with unruptured intracranial aneurysms presenting with neuro-ophthalmologic symptoms are classic neurosurgical emergencies with recommended expedited repair of the aneurysm. Therefore, we assess UIA associated neuro-ophthalmic findings and treatment morbidity to improve the patient management.

Materials: We retrospectively analyzed medical records of all UIA patients admitted to our institution between 2007 and November 2018. Cranial nerve palsy associated vision impairment, localization of aneurysm, treatment methods and results, clinical outcome 6 months after treatment and further patient characteristics were recorded.

Results: A total of 58 patients with symptomatic UIA were included. In 21(36%) patients a compressive optic neuropathy was the reason of vision impairment mostly caused by an internal carotid artery aneurysm (n=12; 57%) being treated with endovascular techniques (n=10) vs. surgical clipping (n=5). All surgical treated patients were asymptomatic in follow-up. In 6(60%) endovascular treated patients neuro-ophthalmologic symptoms were completely in remission. One patient died because of thromboembolic vessel occlusion after endovascular treatment. Clinical observation was decided in 3 patients, further 3 patients rejected any treatment. Cranial nerve palsy associated ophthalmoplegia was detected in 37(64%) patients (oculomotor nerve palsy (n=29); abducens nerve palsy (n=10); trochlear nerve palsy (n=5), 7 cases with combined nerve palsy). Endovascular treatment in 20 and surgical clipping in 9 patients was performed (n=4 rejected treatment; n=4 clinical observation recommended). In 13(65%) endovascular and in 5(50%) surgical treated patients neuro-ophthalmologic symptoms could not be evaluated 6 months after treatment. In 30 (81%) cases ophthalmoplegia was followed by growing internal carotid artery aneurysms.

Conclusion: Recent advances in neurosurgical techniques, endovascular treatments, and neurocritical care have improved the optimal management of symptomatic unruptured aneurysms, but whether the chosen treatment has an impact on neuro-ophthalmologic outcomes remains debated.

Unruptured Intracranial Aneurysms causing Visual Impairment. A Single-Center Case Series

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Background: Visual impairment originating from mechanical compression of the optic nerve (ON) has been observed for unruptured intracranial aneurysms (UIA) of the clinoid and ophthalmic segments of the internal carotid artery (ICA) in particular, but less so for UIAs of the anterior communicating (ACOM) and A1 complex. We present our case series of two patients from 2018 presenting with visual impairment stemming from UIAs of the anterior circulation and their functional outcome after microsurgical clipping.

Case Presentation: A 31-year-old female experienced fading color vision and visual impairment to 0.5 on the right side, caused by a UIA of the right ACA. Upon microsurgical preparation, a section of the lesion's dome appeared to be closely attached to the right ON, therefore it was left in situ after clipping of the aneurysm neck. Visual acuity improved to 0.7 by discharge on the 8th postoperative day. A 34-year-old female presented with a UIA of the right parophthalmic ICA with accompanying right-sided visual impairment of 0.7 after refractory correction. During the clipping procedure, the ON sheath was fenestrated with subsequent anterior clinoidectomy and drilling of the optic canal. Visual acuity remained stable and the patient was discharged on the 7th postoperative day.

Conclusion: Microsurgical clipping of unruptured aneurysms affecting the optic system may prevent further deterioration of visual function and allow for its partial recovery.

Supervised ensemble classifier of preoperative network characteristics predicts visual field deficit after selective amygdalahippocampectomy

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Purpose: Selective amygdalahippocampectomy is an effective treatment for patients with therapy-refractory temporal lobe epilepsy [Delev et al., 2018], but may cause contralateral superior visual field defect (VFD) in more than half of the cases [Barton et al., 2005]. It has repetitively been hypothesized that preoperative computational MR image analysis could predict VFD [MacDonald et al., 2010 | Winston et al., 2011]. Whereas Diffusion Tensor Imaging (DTI) studies demonstrated postoperative correlates of the VFD, preoperative imaging predictors of VFD have not yet been found. Here, we aimed to predict postoperative VFD using ensemble machine learning on preoperative brain graphs (1) and to delineate neuronal correlates of VFD severity (2).

Methods: 28 patients (15 females, mean age \pm SD: 38.8 \pm 12.8) with pharmacoresistant temporal lobe epilepsy underwent MRI (T1-MPRAGE and DTI) and Goldmann perimetry prior to and after (2-21 months) selective amygdalahippocampectomy. We calculated a whole-brain structural connectome based on individual parcellations. To predict postoperative VFD (1), we inserted the preoperative subnetwork of the lesioned hemisphere into a supervised ensemble learning technique combining tree-based classifiers with an artificial neural network. Goodness of classification was assessed using a leave-one-out cross validation scheme. Neuronal correlates of the VFD were analyzed (2) employing a tractography-based region of interest analysis [Behrens et al., 2007].

Results: (1) Using preoperative network characteristics only, the ensemble classifier was able to predict postoperative VFD (Precision = 95.45 %, Recall = 95.45 %, Accuracy = 93.10 % | figure 1). (2) Tractography-based analysis of the optic radiation yielded a significant correlation between DTI diffusivity parameters and VFD severity in the ipsilesional sagittal stratum (see figure 2).

Conclusion: In this longitudinal study, we demonstrated that the postoperative FVD after selective amygdalahippocampectomy can be reliably predicted based on preoperative imaging data only. The regional postoperative correlate of the VFD severity in the optic radiation may emphasize the functional importance of this region.

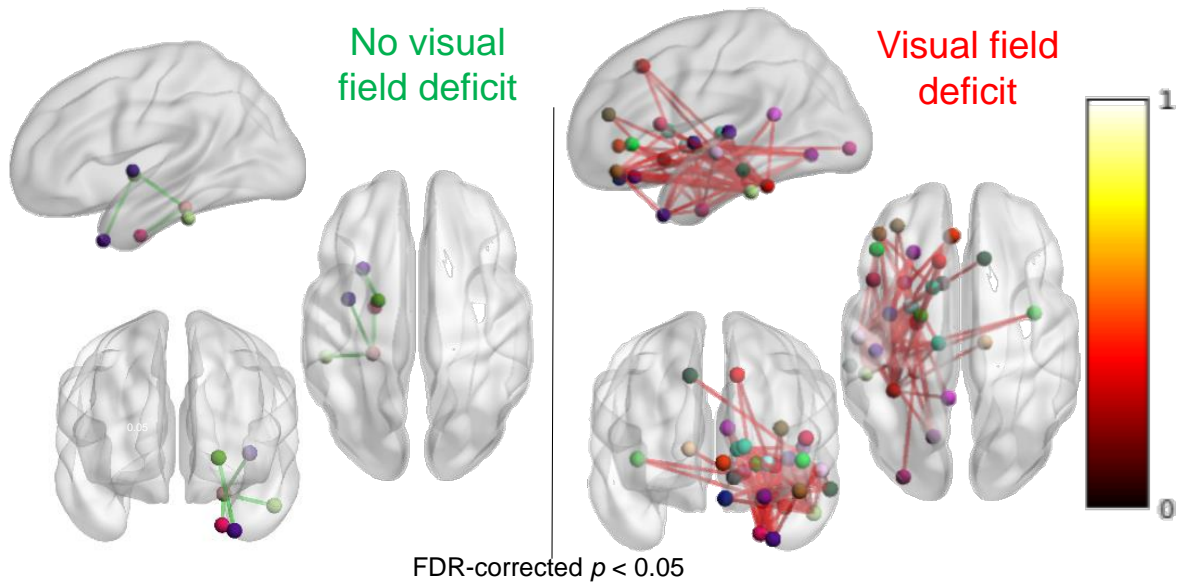


Figure 1. Postoperative connectome-differences between patients with visual field deficits and patients without visual field deficits after selective amygdalahippocampectomy.

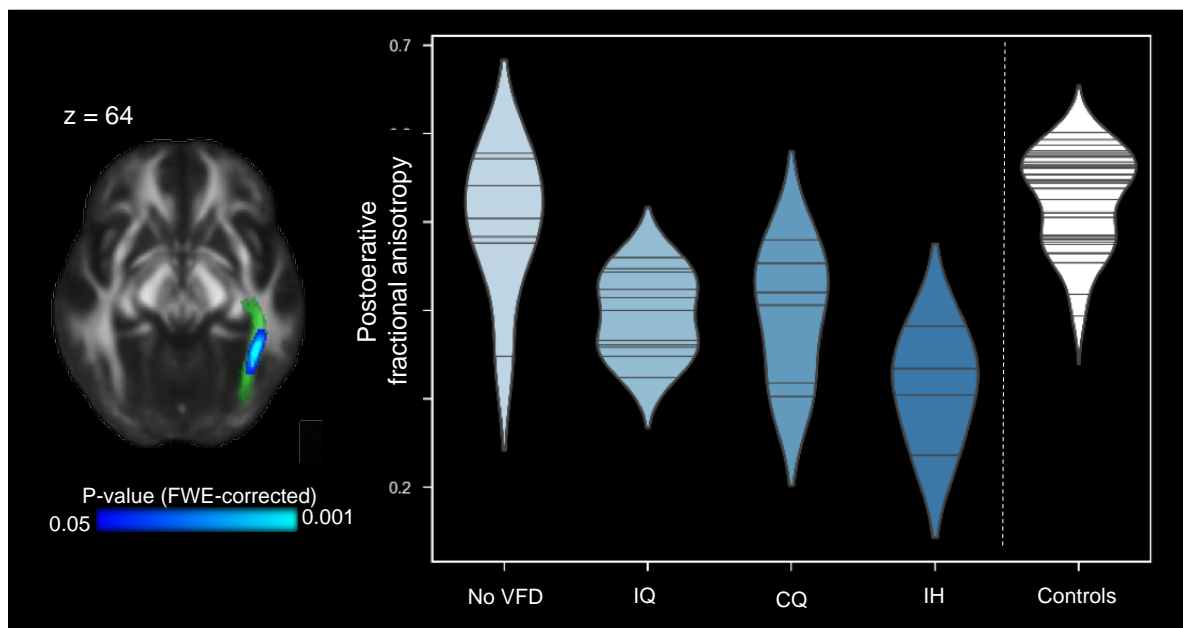


Figure 2. Postoperative fractional anisotropy of the ipsilesional sagittal stratum is plotted against the postoperative visual field deficit. 11 = incomplete quadrantanopia (IQ), 6 = complete quadrantanopia (CQ), 4 = incomplete hemianopsia (IH).

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