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Surgical Considerations of Maximal Safe Resection of Adult Diffuse Low-Grade Glioma

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Abstract

Background: Most adults with Diffuse Low-Grade Gliomas (DLGGs) are identified around the age of 39, and they are usually completely normal when they are diagnosed. Most people know that the extent of resection (EOR) affects overall mortality (OS). In the past 20 years, surgery for Diffuse Low-Grade Gliomas (DLGGs) has changed a lot. Implementing multiple surgical tools into the process of tumor excision has a great impact on both the EOR and the safety of the patients.

Aim of Study: To evaluate the impact of the technological advancements and integration of multidisciplinary techniques on Extent of maximal safe resection of DLGGs.

Patients and Methods: This is an Observational retrospective study performed in period of almost 6 months, from May/2022 till November /2022 operated in Kasr Al-Ainy Hospitals to evaluate the impact of the technological advancements and the integration of multidisciplinary techniques on EOR and its clinical post-operative outcomes. 20 patients affected by DLGGs were enrolled in this study. Multiple intraoperative techniques have been utilized to offer safer surgery with maximum extent of resection; awake surgery, IV fluorosceine dye injection, localizing the tumor by utilizing craniometric points, Cortical and subcortical mapping and direct Electrical stimulation (DES).

Results: Our study showed that patients who underwent AC (awake craniotomy) had better impact on the EOR in comparison to those operated under GA (p=0.006) supporting the importance of AC for DLGGs in eloquent areas.

Key Words: *Diffuse low-grade glioma – Maximal safe resection – Extent of resection – Brain plasticity – Cortical & Sub cortical mapping – Awake surgery.*

Introduction

DIFFUSE Low-Grade Gliomas (DLGG) are rare genetically variant neoplasms comprising up to 7% of initial brain tumours. DLGG predominantly impacts young adults. without neurological deficits apart from headache and seizures (main presentation). Mechanisms of cerebral plasticity together with the slow growing nature of DLGG, give chance to the cerebrum for functional remapping and recruitment of perilesional or remote regions inside the ipsilateral half of the cerebrum or of contra-hemispheric homologous regions **[1].**

The incorporation of these concepts with treatment approaches has led to significant advancements in the management of DLGG, resulting in an increase in surgical interventions in previously deemed unreachable eloquent areas. As the target of the procedure is not only to remove the visible tumor present on the imaging study. Multiple intraoperative techniques have been utilized; awake surgery, IV fluorosceine dye injection, localizing the tumor by utilizing craniometric points, cortical and subcortical mapping and direct electrical stimulation (DES), applying multiple surgical tools into the process of surgical resection have allowed us to offer safer surgery with maximum extent of resection **[2].**

Moreover, the aim of pathological examination is very important in identifying the actual grade of the glioma. Maximal DLGG resection provided more amount of tissue, leading to increase in the reliability of the histopathological diagnosis and limiting the role of biopsy for DLGG.

Patients and Methods

This is an Observational retrospective study performed in period of almost 6 months, from 1/5/2022 till 1/11/2022 operated in Kasr Al-Ainy Hospitals descriptive study of a group of 20 adult patients of both sexes, whom performance status on Karnofsky scale varied from 60-100% with initial imaging suggestive of supratentorial DLGGs.

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We included patients which fulfilled the indications for surgical resection; pre-operative images suggesting the initial diagnosis of Diffuse low-grade glioma who will undergo surgery aiming to control refractory epilepsy, relief of mass effect, relief existing neurological symptoms and possibly improvement in progression-free survival (PFS) or overall survival (OS). Patients with recurrent gliomas, infratentorial lesions or those radiologically diagnosed with high grade gliomas or received adjuvant chemo or radiotherapy were excluded from the study.

Pre-operative evaluation:

Patients will undergo detailed history taking; starting with personal history (age, sex, occupation & marital status), chief complaint; presence of headache, epileptic seizures or abnormal movements if any with it's analysis (frequency, duration, post-ictal fatigue, association with aura and whether relived by medical treatment or not), any neurological symptoms (changes in cognitive state, any motor or sensory affection in the form of heaviness or any tingling or numbness, any speech affection) followed by analysis each complaint in the form of onset, course, duration and the Precipitating, Exacerbating, and Alleviating Factors.

Meticulous neurological examination is then done starting with the mental state (conscious level, orientation and alertness), cognitive functions and behavioral assessment. For example, discrete disorders of language (comprehension, repetition, fluency, naming, reading, and writing) with identifying the nature of speech affection whether its (1) Expressive aphasia, (2) Receptive aphasia, (3) Conduction aphasia, (4) Transcortical expressive aphasia, and (5) Transcortical receptive aphasia. Assessing both sensory (Astereognosis or agraphia) and motor integration affection (apraxia). All Cranial nerves are examined individually together with examining of motor (power, tone, bulk) and sensory (both superficial and deep sensations) functions of four limbs.

Preoperative neuroimaging include standard brain MRI with or without contrast, functional MRI (fMRI) for speech and movement mapping, and diffusion tensor imaging (DTI). Preoperative MRI, utilising T2-weighted images and T1-weighted images with contrast at 1mm or smaller slices, is employed to assess and classify lesions into three categories: presumed eloquent location, near eloquent position, and non-eloquent location. The preoperative MRI is utilised to identify functionally significant vessels that must be preserved during the procedure. The eloquent topographic regions of the brain include the primary sensorimotor cortex, Wernicke's area (located in the posterior portion of the superior temporal gyrus and the inferior parietal lobule), Broca's area (found in the inferior dominant frontal lobe), the calcarine visual cortex, and the associated white matter pathways. If any portion of the lesion is identified as infiltrating these areas, it is said to be situated in a presumed eloquent brain. If it is proximate to, but does not distinctly engage these regions, it is deemed near eloquent; conversely, if it is located in a different anatomical area, it is classified as non-eloquent.

This classification of lesions as located in eloquent, near-eloquent or non-eloquent areas has implications for further investigations that will be needed pre-operatively. Lesions that are far away from eloquent anatomical structures don't require any more preliminary investigation, but it may be wise to do functional imaging tests in cases involving eloquent and near-eloquent areas of the brain to help define the critical structures within the proposed operation field.

Operative management:

The distinction between non-eloquent, eloquent, and near-eloquent lesions is utilised to determine the necessary extent of intraoperative monitoring and mapping for the safe execution of a maximal safe resection of DLGG. In non-eloquent circumstances, physiological monitoring is unnecessary. Consequently, general anaesthesia is selected. Conversely, eloquent and almost eloquent lesions significantly increase the risk of brain damage. Consequently, to optimise safe resection in these instances, awake craniotomy is utilised, provided the patient is cooperative and capable of enduring the process. Furthermore, patients with a near-eloquent lesion who cannot endure awake craniotomy utilise cortical stimulation mapping or central sulcus localisation with cortical SEP mapping to customise surgical approaches, aiming to maximise the excision of the affected pathological tissue while minimising postoperative functional impairments. The anesthetic course of awake surgery with or without a sleeping phase involves generous application of local anesthetics to achieve a complete scalp block. Surgical exposure depends on the anatomical location and size of the lesion. Craniometric points is utilized to allow the surgeon to plan the craniotomy site and anatomically localize the lesion. Sylvian fissure and central sulcus are the most important landmarks together with the overlying skull sutures and bony prominences.

Maximizing the extent of resection was also aided by intraoperative application of high dose fluorescein sodium dye helping the surgeon to differentiate between the normal brain tissue and tumor tissue in the early stages of the surgery allowing him to maximize gross total resection in the absence of any contraindication for the application of it; Allergy or elevated kidney functions.

Following the craniotomy and dural incision, the subsequent steps in the surgical protocol entail the localisation of the lesion within the operative field. Cortical mapping is conducted for eloquent and near-eloquent lesions to delineate resection boundaries and identify functionally essential cortical areas.

Resection begins at the least eloquent region and concludes at the most eloquent areas. Cortisectomy is performed through non-eloquent tissue, with careful consideration of adjacent arterial structures. Following the acquisition of adequate tissue for pathological analysis, tumour excision is conducted via suction and bipolar electrocautery. The surgeon employs colour, stiffness, and texture to trace the tumour from sulcus to sulcus. excision proceeds until cortical or subcortical stimulation indicates functional cortex, concluding the surgery upon achieving maximal lesion excision, observing alterations in monitoring, or the emergence of neurological deficits.

Post-operative management:

After surgery, the patient recovers from anesthesia and transfered to the intensive care unit for post-operative monitoring. Neurological examination (motor, sensory or speech) is performed on patients after anesthesia's effect wears off to identify any deficits post operatively. The patient's neurological condition is observed, normotension is sustained, and antiepileptic drugs are administered continuously. If the patient exhibited no seizure activity before surgery, the surgeon may opt to administer a brief regimen of seizure prophylaxis. During the administration of perioperative antiepileptic medicine.

The following day, the patient is transferred to a general ward depending on their general status. Each patient will be neurologically assessed within the first 72 hours and before discharge from hospital, the postoperative MRI and/or CT scans is to be obtained to evaluate extent of resection in volumetric analysis. Extent of resection will be expressed as Gross Total (GTR): no residual, Subtotal (STR): resection of >75% and less than 100%, Partial (PR): less than 75%.

The FOR is calculated as follows: Preoperative tumor volume - postoperative tumor volume / preoperative tumor volume. Patient returns to clinic 10–14 days later for inspection of the wound and removal of stitches. Confirming the diagnosis of the lesion with the pathology result and discuss with the patient the post-surgery treatment plans and connecting the patient with the oncology department The initiation of adjuvant chemotherapy or radiation if needed is often delayed for 2 weeks or more from surgery date, if possible, to limit the effects on wound healing.

The ^{2nd} follow-up with the patient in the outpatient clinic is 1 month Post-op to assess both motor and sensory functions after starting physiotherapy sessions if needed and patient's general status after starting adjuvant therapy if also needed.

Pre and post operative patient's general assessment including cognitive functions, motor and sensory status and cranial nerve affection was obtained and statistically analyzed.

Confidentiality of data:

The privacy of the participant is protected by the use of serial numbers of the patients who are enrolled in the study and their identity or data are not disclosed without reference to them.

Results

This is an Observational retrospective study performed in period of almost 6 months, from 1/5/2022 till 1/11/2022 to evaluate the impact of multiple surgical tools on both; The EOR and functional outcome of patients following DLGG resection.

A total number of 20 patients were included in the study. Managed at Cairo University Hospitals. Patient's age ranges between 18 and 60 with an average age of 38 years, SD 14. Female (65%) to male (45%) ratio was 1.2:1.

Out of the 20 patients, 19 patients presented with headache ranging from mild to severe headache (not responding to analgesics). Out of the 20 patients, 14 patients presented with seizures in the form of focal seizures with secondary generalization (n=7), GTC (n=5) and absence seizures (n=2). Out of the 20 patients, 3 patients only presented with dysphasia (15%); 2 patients had expressive aphasia and 1 patient had fluent aphasia. Out of the 20 cases, 1 patient only had pre operative motor weakness (right sided weakness GIV) according to MRC score (5%). Out of the 20 cases 2 had behavioral changes and frontal manifestations.

The 20 patients enrolled in the study will be divided into 3 groups; Group A, patients which had lesions infiltrating eloquent areas in the brain. Group B, patients which had lesions compressing near eloquent areas and near to important vascular structures. Group C, patients which had lesions not related to eloquent areas and considered relatively safe zones in the brain.

DTI was done in 55% of the cases, studies were done to study corticospinal Tract (CST) in relation to the lesion; 40% of the cases CST was shifted without disrupting, 10% shifted and disrupting and 5% there was no interruption or displacement of the tract.

- In Group A, we have total number of 12 patients (60%), 6 patients of which had lesions infiltrating the motor strips and pathway and 6 patients of which the lesion was perisylvian, infiltrating the speech area in the dominant hemisphere.

- In Group B, we have total number of 2 patients (10%), Both patients had lesions present in the perisylvian area in the non-dominant hemisphere compressing important vascular structures (branches of the Middle cerebral artery) identified by void signals on T2 weighted images of MRI.

- In Group C, we have total number of 6 patients (30%).

Out of the 20 patients, 14 patients had lesions at or near eloquent areas (Group A and Group B). Out of the 14 patients, 7 patients performed surgery in General anesthesia, 6 patients performed surgery in Awake mode and 1 patient had surgery in awake mode and then converted to General anesthesia due to intra-operative seizures. All patients in Group C, performed surgery in general anesthesia.

Performing surgery on patients which had lesions in eloquent or near eloquent areas in general anesthesia was due to multiple of reasons; The size of the lesion was large with midline shift more than 2cm, the presence of behavioral manifestations which was considered by the anesthesia team to be unsafe as the patients will be uncooperative and some patients refused surgery in awake mode out of fear even after explaining the benefits of surgery.

Out of the 6 patients who underwent surgery in awake mode, GTR was achieved in 86% and STR was achieved in 14%. Intra-operative events have occurred in 30% of the patients planned to perform awake surgery. One case had intra-operative speech arrest during dissection and excision of the lesion which resulted in limiting the extent of resection. Out of the 6 patients who underwent surgery in awake mode, 2 patients had pre-operative neurological deficit. one of which had speech affection (motor aphasia) and the other had right sided GIV motor weakness. Immediate post-op assessment showed that only 1 patient had a new neurological deficit (aphasia). Neural deficits improved in the 1st follow -up on physiotherapy and speech therapy.

Out of the 6 patients underwent surgery in awake mode, 2 patients in which neurophysiological monitoring was performed together with cortical stimulation to assess functional capacity of the adjacent brain tissue. Neurophysiological monitoring was not performed in all cases due to high costs and long waiting list.

Out of the patient 6 underwent surgery in awake mode, 5 patients were injected with preoperative IV fluoresceine dye before craniotomy to enhance the visualization of the lesion in contrast to normal brain tissue, the patient which was not injected with the dye was due to high kidney functions which was considered unsafe.

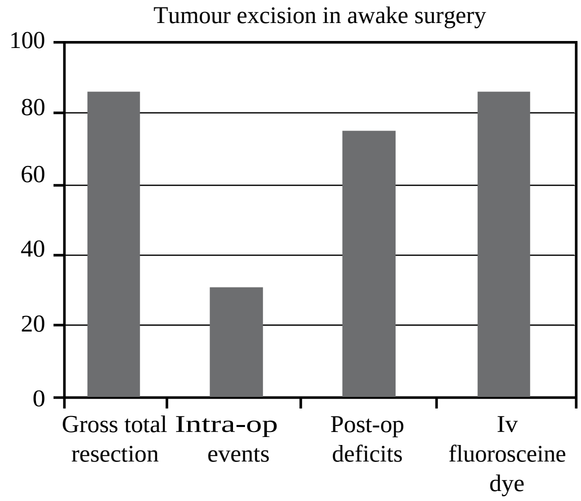

Fig. (1): Awake surgery stats.

Out of the 14 patients who performed surgery in GA. 77% GTR was achieved and only 23% STR was achieved. Intra-operative event occurred in one case. Brain edema have occurred during dissection and excision most probably due to venous infarction resulted from vein occlusion from aggressive manipulation managed by head elevation, continuous saline irrigation, mannitol administration and hyperventilation. Out of the 14 patients that performed GA, 2 patients had preoperative neural deficit in the form of dysphasia. New Post-operative neural deficit occurred in 2 out of the 14 patients in this group in the form of speech affection (motor dysphasia) and presence of frontal manifestation, improved on medical treatment but did not gain full recovery until the most recent visit.

Out of the 14 patients planned for GA, only 1 patient in which had neurophysiological monitoring intraoperative as the lesion was infiltrating eloquent area and refusing awake surgery.

Out of the 14 patients who performed surgery in GA, Iv Fluoresceine dye was used in 77% of the cases.

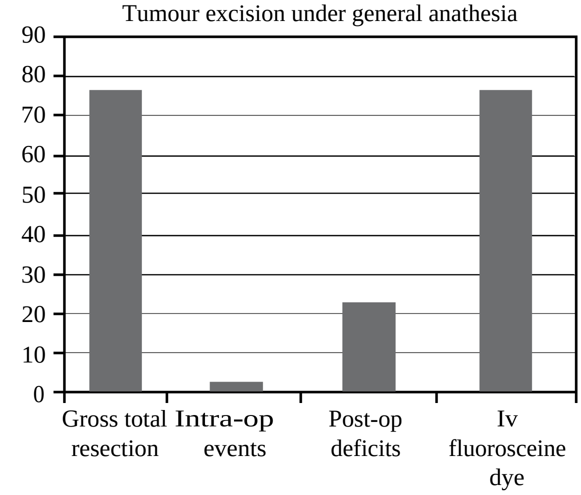

Fig. (2): General anathesia stats.

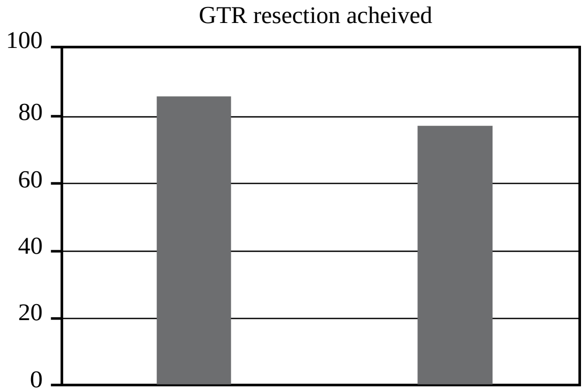

Fig. (3): EOR in awake vs. under GA.

Table (1)

Pathology result	Awake surgery	GA	Percentage
Diffuse astrocystoma GII (IDH +ve)	N=6	N=7	65
Oligodendroglioma GII	N=0	N=3	15
Diffuse mixed Oligoastrocytoma GII	N=0	N=1	5
Pleomorphic xanthoastocytoma (PXA)	N=1	N=0	5
Pilocytic astrocytoma	N=0	N=2	10

The most craniometric points used on patients in this study; when the lesion was near or at motor area was the interaction of the precentral sulcus with the superior frontal sulcus (3cm lateral to the midline and 1.5cm behind the coronal suture). In perisylvian lesion the most used craniometric point was the anterior sylvian point.

Out of the 20 patients, 4 patients had preoperative neurological deficits (20%). Out of the 4 patients with neurological deficits 3 patients had speech affection; both motor aphasia and sensory aphasia. Only 1 patient had pre-operative motor weakness. 75% of the patients included in the study had no post-operative neurological deficits. 3 patients only presented with neural deficits whom were intact pre-operatively and developed speech affection which has improved in 1 month follow-up.

Regarding seizures, preoperative seizures were seen in 70% of cases; 35% GTC, 50% focal with secondary generalization and absent seizures (14%). Preoperative seizures were controlled in 50% on one line of Anti-epileptics (AED). While post-operative seizures were found in 20% early post-operative, which was controlled either by increasing the dose of Anti-epileptic drugs (AED) in 5% and adding another AED in 15%. Six cases (30%) had pre-operative uncontrolled seizures, which showed no seizures postoperative. Six cases (30%) had not pre-operative seizures and did not have seizures post-operative. EOR when correlated to number of AED post-operative, *p*-value was 0.5: All patients who had GTR did not need more than one AED. STR 1/13 had one AED and 2/13 had two AED needed to be controlled.

Provisional surgeon diagnosis matched final Pathology and radiological diagnosis both in 6 out of the 7 patients planned for awake surgery; Diffuse astrocytoma GII (85%) (IDH +ve) and 1 case pleomorphic xanthoastrocytoma (PXA) & 11 out of 13 patients underwent surgery in GA; Diffuse astrocytoma GII (n=7), Oligodendroglioma GII (n=3), diffuse mixed oligoastrocytoma GII (n=1) and pilocyticastrocytoma (n=2).

There was no post-operative morbidity in 75% of the cases, which required prolonged hospital stay or re-hospitalization or discharge to rehabilitation center. Intraventricular hemorrhage occurred in 1 patient and resolved in 9 days before discharge and no consecutive hydrocephalus seen during follow-up period up to till 4 weeks.

Length of stay (LOS) at hospital postoperative was 7 days in average (4-11 days). LOS was the longest (4-12 days) in near eloquent and shortest in eloquent (3-5 days), while in non-eloquent it varied from 4-7 days.

EOR correlations when dominance compared to EOR; GTR was achieved in non-dominant hemisphere: 80%. GTR was achieved in 30% in dominant hemisphere.

EOR correlations with Eloquence; When in eloquent or near eloquent area GTR was achieved in (75%). In Non eloquent areas GTR was achieved in 75%.

EOR correlations when the lesion is in both dominant side and in eloquent area; Gross total resection (GTR) was achieved in (57%) and Subtotal Resection (STR) was achieved in (42.5%).

EOR when Non-dominant side and non eloquentarea; Gross Total Resection (GTR) (60%).

Non-dominant side and near eloquent GTR was achieved in (100%). When lesion was near to motor area or supplementary motor area, EOR was GTR (67%) and STR (33%). When lesion was in speech area GTR was seen in 100%.

Discussion

Managing tumors or lesions of DLGG is a subject of growing interest and we hope that the data provided by the current study serve as a guide through some controversial issues. As outlined in the methodology and results sections, this study was done in a prospective fashion in a tertiary care facility with full set up and preparedness for microsurgical approaches and full radiological studies if necessary.

There was slight female predominance in the enrolled patients, mean age of 38 years with a wide range (18 years – 59 years). This is consistent with data reported by Omay SB et al. [4]. That showed predominance in young adults between age 30-40, typically affecting younger persons (median age 35).

Headache (95%, n=19) was the most common presenting manifestation. Seizures was the 2nd most common presenting manifestation, being found in 65% (n=13) of the patients. This is not consistent with what other researchers have found. Isola M et al. [5]; showed that seizures were the most common presenting manifestations for DLGG being found in 60%. Explained by general practitioners falsely diagnose symptoms such as recurrent attacks of loss of consciousness (absent seizures) for syncopal attacks and mistaking focal fits with tremors from hypo-parathyroidism or even psychic manifestations from mental disorders.

In this study, 50% of lesions wherelocated in dominant hemisphere. 60% were near or at eloquent areas and 40% located at non-eloquent and not close to eloquent areas, 30% of tumors were close to or at motor area, 5% close to SMA, 30% at speech area or at somatosensory area. Our finding are close to results seen in many studies. Trimble et al. [6] found that 82.6% of tumors were located within eloquent motor or language areas (27.3% of cases within the SMA, 25.0% in the insula, 18.9% in language centers, 6.0% in the primary somatosensory area, 4.5% in the primary motor area).

This study showed postoperative neurologic deterioration occurred in 25% of the patients. Patients with tumor in presumed eloquent areas showed more often new postoperative neurological deficits compared with patients with tumors in non-eloquent areas. However, Berger et al. [7] had slightly lower rate of post-operative neurological deficits (22%) which could be attributed to utilizing neuronavigation during tumor resection and cortical mapping in all the cases.

When comparing post operative neural deficits in awake surgery vs. patients underwent surgery under GA, presuming both groups had lesions in eloquent or near eloquent areas. In awake surgery 14 % had post-operative neural deficits while under GA 16% only had deficits. Our results are similar with the results concluded by Duffau, H. et al. [8] who had 14% post operative neural deficits when comparing the patients who underwent glioma resection in awake. However the results by Victor M. Lu et al. [9] which is a meta-analysis that examined all literature published to date comparing the operative outcomes of eloquent glioma resection performed under AA and GA. It showed that there is no significant trend in favor of one approach over the other in the majority of aspect investigated including EOR and postoperative function.

This study showed that patients who underwent AC had a better EOR; GTR was 86% in comparison to those operated under GA; GTR 77% proved to be statistically significant (p=0.006). Similar results were concluded by Philip C De Witt Hamer et al. [10]. In which GTR was achieved in awake surgery by 81% and 58% in GA. It's worth mentioning that results by Victor M. Lu et al. [9] showed that there is no significant difference in EOR when comparing awake surgery and GA (p=0.27). On the contrary, Desmurget M, [11] showed lower results in terms of EOR in The GTR, was achieved in 40% of the awake group compared to 50% of the GA group.

Intraoperative seizures occurred in 16.6% patients that underwent AS and resulted in turning it to GA. Trimble G et al. [6] showed that 16% had intra operative seizures during awake surgery but did not affect the extent of resection.

In this study, Ivfluorosceine dye was injected intra op in a number of patients. Results showed that 75% of GTR was achieved and only 25% STR with limited benefits in grossly visualizing tumor from normal brain tissue. Weller M et al. [12]. The Extent of GTR was achieved in 91% of the cases. The higher percentage in the GTR with integrating IV fluoresceine dye might be due to the presence of higher grade gliomas in the study which was one of the exclusion criteria in our study.

Pre-operative seizure control, seizure type, and duration of seizure history in patients with low-grade gliomas may predict outcomes. Patients with well-controlled seizures on medication before to surgery experienced superior outcomes post-tumor resection, indicating that lesions responsible for more severe epilepsy may provide a higher surgical difficulty. For adult patients with low-grade gliomas experiencing seizures, our findings indicate that seizure control can be accomplished when the extent of resection exceeds 80%. Enhancements in both the percentage of seizure-free patients and the sustainability of seizure independence were noted beyond this 80% threshold. Still et al. (2019) indicate that postoperative seizure control is more probable when the extent of resection (EOR) is ≥91% and/or when the residual tumour volume is ≤19cc in supratentorial diffuse low-grade gliomas (DLGG) presenting with seizures [13].

DTI was done in 55% of the cases to study corticospinal Tract (CST) relation to the lesion; 40% of the cases CST was shifted without disrupting, 10% shifted and disrupting and 5% there was no interruption or displacement of the tract. Zetterling et al. **[14]** proved that DTI is an accurate tool for detection of infiltrative nature lesions such as DLGGs and possibility improves radical resection and lower of postoperative morbidity and poor outcome.

There was no mortality or severe permanent neurological due to the surgeries. Surgery aimed to maximal resection of lesions and preservation of brain function. Awake surgery with intraoperative functional brain mapping was performed. All patients returned to their normal social and professional life and all had a KPS score of 90 or 100 at the most recent follow-up.

Conclusion:

Substantial excision of DLGG is feasible, even inside the presumed eloquent cortex. Aggressive resection optimises seizure management and does not inherently result in persistent neurological impairments. Meticulous pre-surgical planning, informed by thorough historical research, contemporary imaging modalities, and the application of advanced intra-operative technologies, optimises the safety of surgical resection while preserving patient functionality and quality of life. In contrast to general anaesthesia, awake craniotomy is a very straightforward and cost-effective surgery that facilitates tumour excision based on physiological rather than anatomical guidance.

Nevertheless, additional research is required with a bigger study group and extended follow-up.

Our study shown that patients who received AC had a superior EOR compared to those operated under GA (*p*=0.006). This method is crucial for the direct identification of brain networks, hence optimising resection and minimising the danger of irreversible damage. Facilitating more extensive resections and enhanced tumour management, hence preserving neurological functions.

In summary, early and extensive surgical resection is the primary therapeutic option to explore for DLGG, as per the European guidelines. To the best of our knowledge, the EOR results in markedly prolonged overall survival. Unexpectedly, in non-eloquent regions, supra-total resection for DLGGs has been advocated in numerous studies, with a margin surrounding the signal abnormality, potentially enhancing overall survival by reducing malignant transformation.

Careful pre-surgical planning based on proper reviewed history, recent imaging techniques and utilizing up-to-date intra-operative technology is helping to maximize safe surgical resection, while saving patient function and quality of life.

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الاعتبارات الجراحية للاستئصال التام الآمن للاورام الدبقية المخية منخفضة الخطورة

الاستئصال الجراحى المبكر والتام هو الخيار العلاجى الأول الذى يجب أخذه فى الاعتبار حاليًا فى الأورام الدبقية منخفضة الخطورة .على حد علمنا، يؤثر مدى الاستئصال التام للورم على البقاء على قيد الحياة لفترة أطول بشكل ملحوظ.

أظهرت دراستنا أن المرضى الذين خضعوا للجراحة فى وضع اليقظة حصلوا على الاستخلاص التام للورم بشكل أفضل بالمقارنة مع أولئك الذين خضعوا للجراحة تحت التخدير الكلى. مما يدعم أهمية الاستئصال لـ الأورام الدبقية منخفضة الخطورة فى المناطق البليغة فى وضع اليقظة. هذه هى التقنية الوحيدة التى تتيح التعرف المباشر على الشبكات العصبية وبالتالى تعظيم الاستئصال مع تقليل مخاطر العجز الدائم. إتاحة المزيد من الاستئصال المطول وتحسين السيطرة على الورم، مما يؤدى إلى الحفاظ على الوظائف العصبية التى يمكن تحديدها على المريض اثناء الجراحة.

يساعد التخطيط الدقيق لما قبل الجراحة على أساس التاريخ الذى تمت مراجعته بشكل صحيح، وتقنيات التصوير الحديثة واستخدام أحدث التقنيات أثناء الجراحة على تحقيق أقصى قدر من الاستئصال الجراحى الآمن، مع الحفاظ على وظيفة المريض ونوعية الحياة.