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Original research article

Surgical treatment of neuronal-glial tumors of mesial-basal part of temporal lobe: Long term outcome and control of epilepsy in pediatric patients

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ABSTRACT

Background: Neuronal-glial tumors (ganglioglioma and dysembryoplastic neuroepithelial tumor) are a frequent cause of focal, drug-resistant and epilepsy in children and young adults, that is amenable for surgical treatment.
Aim of paper: Assessment of late outcome of surgical treatment and degree of seizure control, as well as prognostic significance of selected clinical factors.
Material and method: 52 Pediatric patients presenting with epilepsy, lesion of mesio-basal temporal lobe and histologically verified neuronal-glial tumor treated at our facility since 2000–2011.
Results: After the mean follow-up of 2.94 years, satisfactory treatment outcome (Engel classes I and II) was obtained in 92% of the patients ($n = 48$). Poor outcome (Engel class III) was seen in 8% of patients ($n = 4$). New neurological deficits appeared in 28% of the patients ($n = 20$) but in most of them resolved over time.
Conclusions: In patients with drug-resistant epilepsy and a lesion of mesial-basal part of temporal lobe suggestive of a glial-neuronal tumor, surgical treatment is strongly recommended, aiming at excision of tumor and elimination of seizures. Histological verification of the lesion is a pre-requisite for optimal treatment planning. In most patients, both treatment goals may be reached. Short duration of epilepsy prior to surgery and young age are favorable prognostic factors. Histological diagnosis of GG, co-existence of cortical dysplasia and location of tumor extending beyond mesial-basal temporal structures are associated with a higher risk of postoperative complications. These may out-weight expected benefits of surgery.

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1. Introduction

Neuronal-glial tumors (ganglioglioma and dysembryoplastic neuroepithelial tumor) are a frequent cause of focal epilepsy in children and young adults. They account for about 40% of all tumors located within the mesial-basal part of temporal lobe. This anatomic area is hardly accessible to both neurophysiological studies (detection of seizure activity arising here may require special techniques, e.g. foramen ovale electrodes), neuroimaging studies (visualization of low-grade tumors and dysplasia-like lesions may require special MRI acquisition techniques) and poses particular surgical problems due to close vicinity of brainstem, cranial nerves and vessels supplying highly eloquent brain areas. For a long time, these lesions evaded detection leaving these patients with a vague diagnosis of ''idiopathic'' or ''cryptogenic'' epilepsy, precluding cause-oriented and effective treatment. Only recently advances in neuroimaging and neurophysiology enabled detection of these lesions, their correlation with symptoms present and their relatively safe excision. This provides a chance for a cure of epilepsy in a considerable proportion of patients, which is fundamental in children and young adults.

2. Aim of paper

Assessment of late outcome of surgical treatment and degree of seizure control, as well as prognostic significance of selected clinical factors. Analysis encompassed a large group of patients relatively homogenous in what relates to clinical symptoms, location and type of lesion, diagnostic and therapeutic algorithm and surgical technique.

3. Material and method

Inclusion criteria (lesion located in mesial-basal part of the temporal lobe, histologically confirmed neuronal-glial tumor and at least 1 year follow-up) were fulfilled by 52 patients treated at our facility since 2000–2011. This group included 31 boys and 21 girls (ratio 1.47:1), aged 1.5–18 years (mean age 10.2 years). There were 30 left-sided lesions and 22 right-sided lesions (ratio 1.36:1). Mean follow-up was 2.94 (range 1–7 years).

Retrospective analysis of medical records took into account history, clinical symptoms, characteristics of MRI studies, surgical access used, results of histological studies, postoperative complications and late outcome concerning epilepsy control (assessed by the Engel scale) [1] (Table 1).

Location of tumors of the temporal lobe was assessed according to the Schramm-Allashkevich classification [2] (Table 2).

Due to the predefined scope of this paper, analysis encompassed tumors of types A, C and D only.

Statistical analysis used data concerning frequency of discrete features, mean and standard deviation, median and quartiles, as well as ranges for continuous features. Significance of differences among distribution of data in selected subgroups was verified using the Fisher exact test due to small number of observations in groups undergoing comparison. Discrimination analysis was used when appropriate. Significance threshold was set at $p < 0.05$. Results at the level of 0.06–0.09 were considered as a significant trend. Results above 0.09 were considered as non-significant and marked as ''NS''. Calculations were performed using commercially available software STATA v.10.0 (Stata Corp., College Station, TX, USA).

Table 1 – Engel scale assessing control of epilepsy after surgical treatment [1].

- Class I: Seizure free or no more than a few early, non-disabling seizures; or seizures upon drug withdrawal only
- Class II: Disabling seizures occur rarely during a period of at least 2 years; disabling seizures may have been more frequent soon after surgery; nocturnal seizures
- Class III: Worthwhile improvement; seizure reduction for prolonged periods but less than 2 years
- Class IV: No worthwhile improvement; some reduction, no reduction, or worsening are possible

Table 2 – Schramm-Allashkevich classification of temporal lobe tumors.

Type A (''mesial''): tumor limited to mesial-basal structures of temporal lobe (uncus, amygdaloid nucelus, hippocampus, parahippocampal gyrus, lingual gyrus).
Type B (''temporo-lateral''): tumor located lateral to Type A structures but not invading inferior and middle temporal gyrus.
Type C: tumor combining features of type A and B.
Type D: tumor consistent with type C, additionally invading temporal stem and basal part of central region of cerebral hemisphere.

4. Results

4.1. *Symptoms*

In all cases ($n = 52$) the leading clinical symptom were epileptic seizures. In 41 cases (79%) seizures persisted in spite of seemingly adequate pharmacotherapy, thus enabling the diagnosis of drug-resistant epilepsy. Median duration of seizures prior to admission to our facility was 2 years (range: 1 month–13 years). The most common type of seizures were generalized seizures ($n = 29$; 55%) and partial complex seizures ($n = 23$; 45%).

4.2. *Tumor location and surgical treatment*

The most common tumor location was type A ($n = 37$; 69%), while types C and D accounted for $n = 11$ (23%) and $n = 4$ (8%), respectively. Based on MRI-determined tumor location, three basic types of surgical approach were used. In the case of anteriorly located type A tumors, transsylvian Yassargil approach was used ($n = 24$; 46%). In posteriorly located type A tumors, transcortical Niemeyer approach was used ($n = 8$; 15%). In large type A tumors and in type C and type D tumors, Spencer anterior temporal lobectomy was used ($n = 20$; 39%).

In all cases, microsurgical tumor excision was performed under neuronavigation guidance and in cases of long-lasting,

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