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TRANS-SULCAL MICROSURGICAL APPROACH TO GLIAL CEREBRAL TUMORS

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ABSTRACT
Objective: To minimize therapeutic morbidities, such as cortical injuries, a transsulcal approach was applied in the surgical treatment of glial cerebral tumors. We aimed at introducing this approach in the everyday clinical practices. Materials and methods: We present 142 cases of patients with glial brain tumors treated surgically by trans-sulcal microsurgical approach. 78 of them are men and 64 are women, average age 57 years. According to the outcome of CT and MRI, the chosen sulcus was opened toward the lesion. Following complete dissection of the sulcus to remove the lesion. Results: The trans-sulcal microsurgical access was successfully applied in all of the cases. There was a regress of the neurological deficit in the early post-surgical period and improvement of the overall condition in 136 of the patients. In 6 patients the condition was aggravated by the concomitant somatic diseases which led to lethal end. Conclusion: The trans-sulcal microsurgical approach ensures less traumatic surgical interventions and preserves as much as possible the physiological and anatomical structures of the brain.

Key words: trans-sulcal approach, glial tumors – surgical treatment

INTRODUCTION:

The tumors of the nervous system represent about 8-9% of all neoplasms, and those of the cerebrum are 5-6%. The frequency of tumors of the central nervous system is about 5 in every 100 000 people. From all deceased oncological patients, the death rate for glial tumors of the brain is 2-3% (1). The introduction of microsurgery in everyday practice allowed the application of new surgical methods which made it possible to perform surgical interventions with more certainty and less trauma (2). The modern diagnostic possibilities of CT and MRI allow for their accurate location and choice of surgical approach thereto (3). Prof. Yasargil used and popularized the idea of approaching lesions that were previously thought to be inaccessible by using the subarachnoid system surrounding the brain (3, 4). Natural anatomic routes (cisternal, sulcal, fissural, ventricular) can be used to reach deep localized tumors and perform a pure "tumorectomy", thereby avoiding compression or resection of normal neural tissue (5,6). The trans-sulcal approach is applied to minimize therapeutic morbidities, such as cortical injuries during the removal of the lesion (7). It is beneficial to operate through the cortical sulci, as working through these natural tunnels leads to safer surgery (8). We aimed at introducing in the everyday neurosurgical practices the trans-sulcal microsurgical approach to surgical treatment of glial tumors of the cerebrum.

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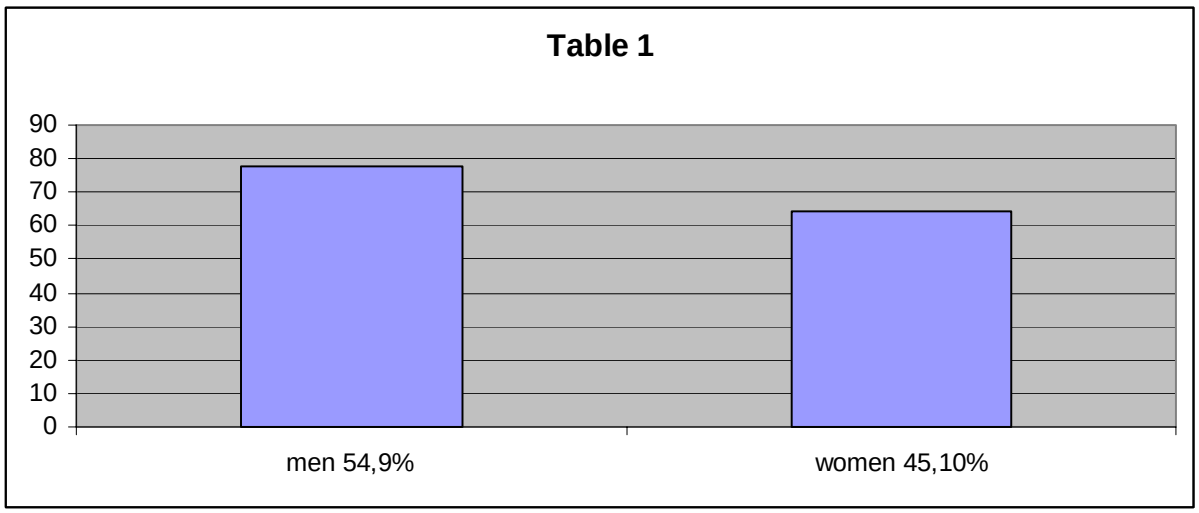
MATERIALS AND METHOD

142 cases of patients with glial brain tumors treated surgically by trans-sulcal microsurgical approach at the Neurosurgical Clinic of Stara

Zagora University Hospital between 1999 and 2011 were analyzed retrospectively. 78 (54,9%) of them are men and 64 (45,1%) are women, average age 57 years **(table 1)**. For the surgical intervention we used Carl Zeiss surgical microscope, AESCULAP micro-set and ERBE 350 bipolar coagulator.

Table 1. *Distribution of operated patients with glial tumors by gender for the period 1999 - 2011*



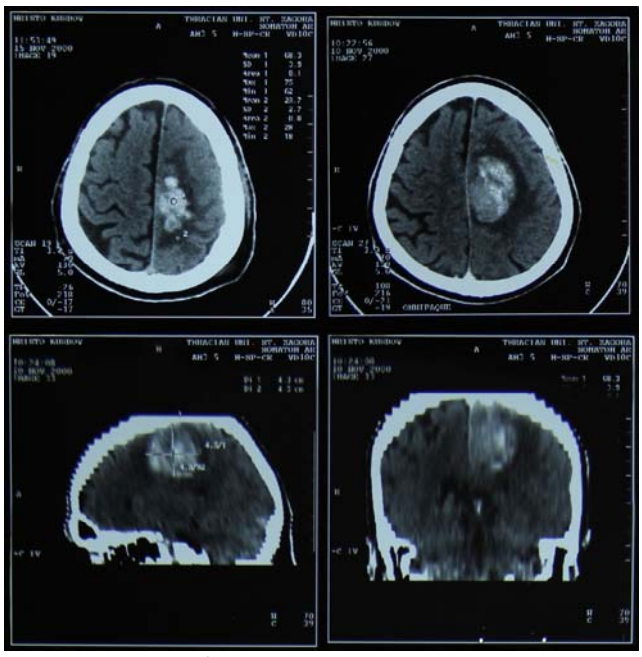


Fig. 1. Pre-operative CT

Following craniotomy over the top of the process, we opened the dura mater under optical enhancement. We localized the sulcus chosen prior to the surgery with CAT and MRI tests **(fig. 1)**. We used an arachnoid knife to cut the arachnoid mater above the sulcus, in an area where there are no large veins **(fig. 2)**. If there are large arteries or veins, the surface arachnoid layer must be opened to the side of the vessel, so that it can cover and protect it. We opened the walls of the sulcus carefully by dull dissection with the shoulders of the bipolar forceps **(fig. 3a)**. We tore the arachnoid mater and penetrated deeply into the sulcus **(fig. 3b)** while protecting as much as possible the small vessels passing through the sulcus. Depending on the location of the tumor established by CAT and NMR tests prior to the surgery, it must be decided whether to penetrate to the bottom of the sulcus or to pass through one of its walls in order to reach the lesion **(fig. 3c)** which must be extirpated with bipolar forceps, aspirator and tumorfaszang. The dura matter was restored after thorough chemostasis, followed by restoration of the bone flap, muscles and skin.

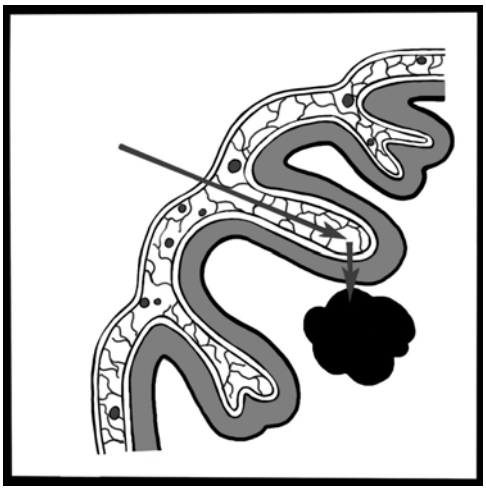


Fig. 2. Dissection of the arachnoid layer.

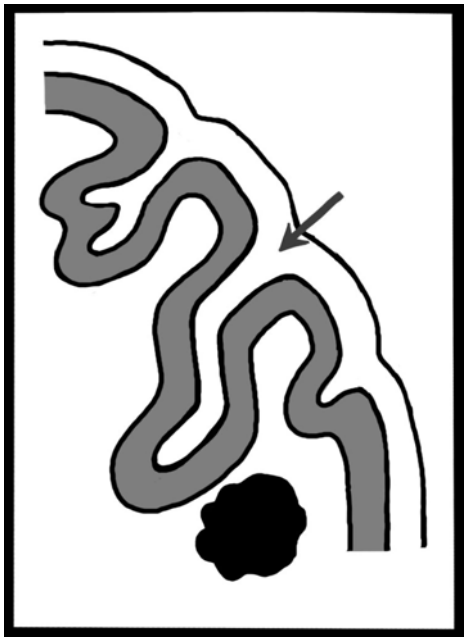


Fig. 3a. Opening the walls of the sulcus.

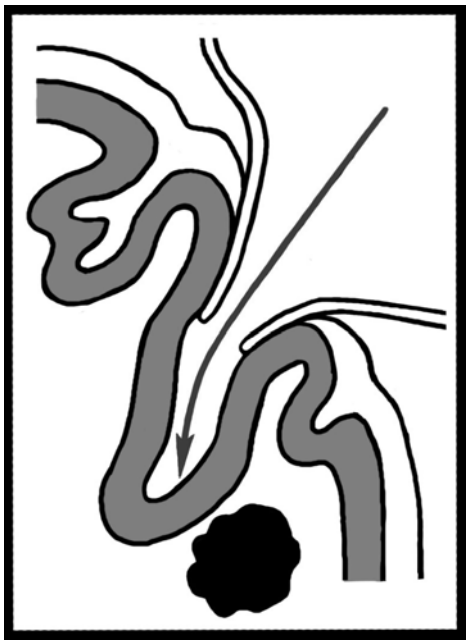


Fig. 3b. Penetrating deeply into the sulcus.

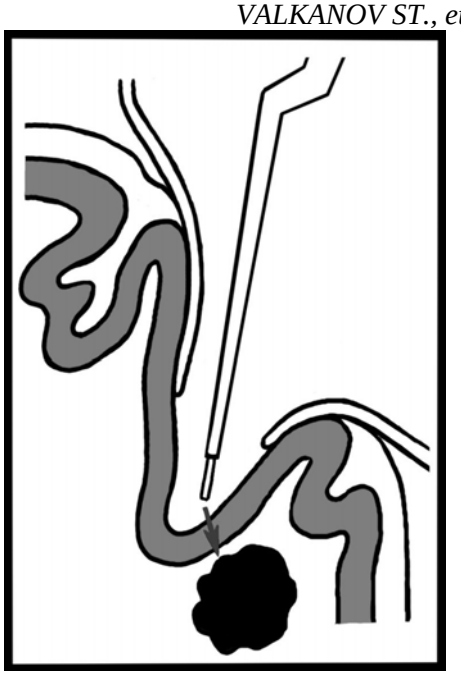


Fig. 3c. Penetrating to the tumor through the wall of the sulcus

RESULTS

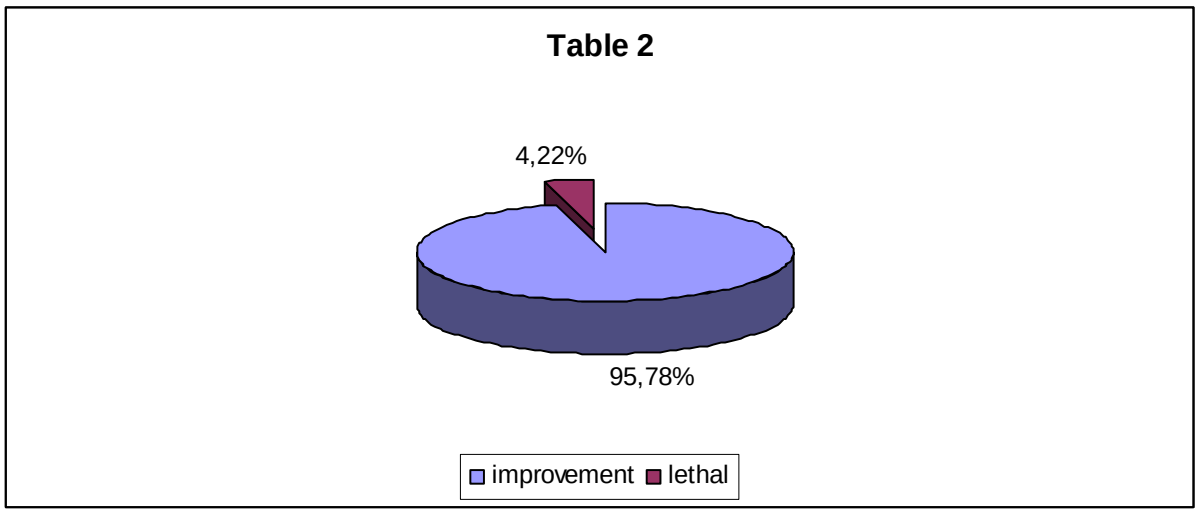
The surgical interventions for the 136 patients through trans-sulcal microsurgical approach went without any complications (95,78%). In the early post-surgical period, all patients experienced a regress of the neurological deficit and improvement of the overall condition. In 6 patients (4,22%) the condition was aggravated by the concomitant somatic diseases which led to lethal end (table 2). Using of trans-sulcal approach, help to preserve as much as possible the functional and anatomical structures of the brain without causing an additional trauma to the cortex. The surgical approach provide minimal discomfort for patients with more rapid recovery in the postoperative period.

DISCUSSION

Recent clinical data have shown that surgical resection of glial tumors, particularly those in the dominant hemisphere, is often challenging. Standard approaches require significant brain retraction, or resection of normal structures.The trans-sulcal microsurgical approach is minimally invasive technique, targeting both the adjacent sulcus and the lesion. It is relatively simple and provides added accuracy and safety to the surgical procedure (9). The trans-sulcal approach should be recommended in the dominant cerebral hemisphere for avoiding violation of the high cognitive functions. A thorough knowledge of micro anatomy and existing anatomical landmarks is necessary both in

selecting appropriate sulcus access to the lesion, and the safer and less invasive surgery, without the need of navigation system (7, 8, 10, 11). Our results from the surgical interventions for the 142 patients through trans-sulcal microsurgical approach corresponds with the results of using transsulcal approach to intracerebral lesions by many authors.

Table 2. *Distribution of operated patients with glial tumors depending on the outcome of treatment.*



CONCLUSIONS

1. The trans-sulcal microsurgical approach ensures less traumatic surgical interventions.
2. Preserves as much as possible the physiological and anatomical structures of the cerebrum.
3. The surgical intervention creates the least amount of discomfort for the patient.
4. The recovery post-surgical period is fast and with minimum complications.

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