ONE THERAPEUTIC CHALLENGE – ACUTE STROKE BY OCCLUSION ON M1 PORTION OF THE MCA – CASE REPORT

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ABSTRACT

PURPOSE: To discuss the therapeutic possibilities for treatment of malignant infarction by occlusion on M1 portion of the MCA.

MATERIAL AND METHODS: The study was performed in a 35-year-old patient with acute ischemic stroke and left sided hemiparesis one hour before hospitalization. Intravenous t-PA was performed regarding the inclusion/exclusion criteria by protocol.

RESULTS: By reason of progression of neurological deficit and loss of consciousness MRI was performed in the next 24 hours. On MRI and MRI angiography ischemic stroke with haemorrhagic transformation in the right MCA and dislocation on the left were seen. The patient was treated by decompressive craniectomy. A converse development of focal neurological symptoms to mild central left-sided hemiparesis was reported with present good results.

DISCUSSION: The presentation of this clinical case shows that some of the patients with acute ischemic stroke may benefit from a decompressive craniectomy. The timing and indications for this potential lifesaving procedure are still debated, there are no well-defined selection criteria for performing the surgery in case of supratentorial infarctions.

Keywords: stroke, decompressive craniectomy

INTRODUCTION

Decompressive craniectomy procedures evolved from a primitive form of surgery known as trephining or trepanning. In a classic article in 1905, Cushing reported the use of this procedure to relieve the pressure caused by the growth of an intracranial tumor. Since then, surgical decompression has been reported as a treatment option for traumatic head injury (2,11,19,20), subdural hematoma, edema resulting from vasospasm secondary to subarachnoid hemorrhage (2), encephalitis (7,8,29), intracerebral hematoma (21), cerebral venous and dural sinus thrombosis, cerebellar infarction, and cases with “malignant” stroke (5,13,14,15).

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Occlusion of either the distal Internal Carotid Artery (ICA) or proximal (MCA) trunk has been characterized as a “malignant” stroke. In case of massive cerebral ischemia, the effectiveness of such medical therapy is severely limited (4,7,9,21). In all cases with supratentorial infarctions in which autopsy is performed, it is shown that patients suffer from severe brain swelling after the infarction. Severe cerebral oedema can lead to herniation of cerebral structures through the tentorium or falx, as well as the brainstem structures through the foramen magnum (17,22). In fact, transtentorial herniation has been cited as the probable cause of death in many of these cases of malignant stroke (9,10).

The pooled evidence from three randomised controlled trials in Europe supports the retrospective observations that early (within 48 hours) application of decompressive craniectomy after „malignant“ stroke may result in improved survival and functional outcome in patients under the age of 55, compared to conservative management alone (16,25).

The procedure is recommended especially for young patients in whom ICP is not controllable by other methods (10,23). Patients aged over 50 are associated with a poorer outcome after the surgery (4). In addition to clinical findings, neuroimaging criteria can help to identify those patients at particular risk for a malignant infarction in the early phase of their stroke (22). In patients with malignant CVA, a large area of parenchymal hypodensity in the MCA territory is often visualized on the admission CT scans (6). With progressive clinical deterioration, CT-demonstrated signs may also include mass effect, effacement of the basal cisterns, compression of the ventricular system, a shift of midline structures and herniation of tissue through the falx, foramen magnum, or tentorium.

Extensive MCA infarction with oedema in greater than 50% of the MCA territory can be identified early after the ictal event on CT scans, and it is observed on the initial CT scan in approximately 70% of the cases (19,21). Parenchymal hypodensity in greater than 50% of the MCA territory is highly indicative of a progressive clinical course, leading to severe morbidity or death.

The CT signs for extensive MCA infarction are:

- ❖ Hyperdensity of MCA

- ❖ Parenchymal hypodensity in greater than 1/3 of the MCA

- ❖ Hypodensity of basal ganglia

The question is about the optimal time window for intervention (16). The data from the trials show benefit from decompressive craniectomy - mortality is lower compared to medically treated patients (5,6,11,18).

The presentation of this clinical case shows that some of the patients with acute ischemic stroke may benefit from a decompressive craniectomy. The timing and indications for this potential lifesaving procedure are still debated, there are no well-defined selection criteria for performing the surgery in case of supratentorial infarctions.

MATERIAL AND METHODS

A 35-year-old male was admitted for the first time to 2nd Clinic of Neurology in University Hospital “St. Marina” – Varna with sudden weakness of the left hand and leg one hour before hospitalisation. There were many vascular risk factors: arterial hypertension, dyslipidemia and obesity. A pointed laboratory examination of complete blood count, biochemistry, coagulation status and cerebral CT was preformed. Main head arteries were examined with Sonix SP (Canada) by color coded duplex scanning using a 7.5 Hz transducer. Neuroimaging examination of the brain was conducted by 1.5 Tesla MRI (GE HTX Sigma- USA). Intravenous t-PA was performed regarding the inclusion/exclusion criteria by protocol.

RESULTS

During admission the patient was conscious with a left-sided hemiplegia. A 24 hours after thrombolysis a dramatic reversal of clinical signs of increased intracranial pressure was detected. Emergency MRI and MRA were performed after the patient's clinical deterioration, establishing ischemic stroke in MCA with haemorrhagic transformation and dislocation on the left with perifocal edema (fig. 1).

On the third day after the onset of the symptoms the patient underwent surgical intervention – decompressive craniectomy. After surgery in next few days, the patient's condition improved with full reverse development of the edema. A converse development of focal neurological symptoms after three

months to mild central left-sided hemiparesis was reported (Rankin score 3).

ma with brain herniation and compression of critical brainstem structures (11,24). This patient popula-

Fig. 1. MRI of the brain – ischemic stroke in MCA with haemorrhagic transformation and dislocation on the left

DISCUSSION

Malignant cerebral ischemia occurs in a significant number of patients who undergo emergency evaluation for ischemic stroke. The mortality rate in these patients is very high (9,10). Fatal outcome is usually related to progressive, severe cerebral oede-

tion can be identified by early clinical and neuroimaging characteristics. In some of these patients, decompressive craniectomy appears to be a life-saving procedure (25).

Recommendations for medical management of stroke-related malignant edema included admission to the intensive care unit, osmotherapy with

mannitol, invasive monitoring of intracranial pressure, blood pressure control, elevation of the head to 30°, and maintenance of normothermia, normoglycemia, and normovolemia. Decompressive hemicraniectomy improves survival in patients with malignant MCA infarction when compared to earlier reports of conservative treatment alone. The outcomes of patients undergoing decompressive craniectomy may be impacted by the complications of the procedure, reported complications include inadequate decompression, infection, hemorrhage, and the development of contralateral fluid collections (12,14).

The evaluation of experimental findings suggests that aggressive, early surgical decompressive surgery for the treatment of massive cerebral ischemia may limit the extension of the infarction and reduce morbidity (15). Forsting, et al., have demonstrated that craniectomy can decrease the infarct volume and improve neurological outcome in a rat model of MCA occlusion when surgery is completed early (1 hour postictus). Doerfler, et al., have found similar results in the same model when surgery was completed 4 hours postictus. In the 4-hour treatment group, outcome and infarct volume were significantly better as compared to those observed in control animals and animals surgically treated at 12, 24, and 36 hours postictus. Animals treated at these later time periods improved, but no significant differences were reported among these three groups and the control group. The results of recent clinical studies support this notion. When patients who suffer malignant CVA were surgically treated on average 21 hours postictus, there was a greater decrease in mortality rate and length of stay in the intensive care unit as compared with patients who underwent surgery an average 39 hours postictus. There was also a trend of improved Barthel Index scores demonstrated at follow up for patients in the earlier surgical group (13,27).

Although decompressive craniectomy has been shown to significantly decrease mortality, the morbidity rates are high. Available data are in agreement that there is a reduction in the mortality rate, but the reported functional outcome was highly variable. Older age, more severe neurological deficit on admission, and longer duration of intensive care treatment and mechanical ventilation were significantly associated with worse disability. Data analysis demonstrated significant mortality reduction in the sur-

gically treated patients compared to those receiving medical treatment (2,3,16,18).

In conclusion - surgical decompression within 48 hours of stroke onset reduces the risk of death and the risk of significant morbidity by patients with malignant infarction by occlusion on M1 portion of the MCA (16,26). Questions persist regarding the indications for such a procedure and the time window in patients with malignant stroke. Future studies will need to focus more rigorously on the long-term quality of life in survivors and the neurological outcome.

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