The effect of nimodipine and magnesium sulfate in the treatment and prevention of cerebral vasospasm in subarachnoid hemorrhage caused by rupture of a cerebral aneurysm.

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Background and Goal of Study: Vasospasm is the leading cause of disability and death from ruptured cerebral aneurysm. To determine the effect of nimodipine and magnesium sulphate in the treatment and prevention of cerebral vasospasm in subarachnoid hemorrhage (SAH) caused by the rupture of a cerebral aneurysm.

Patients and Methods: Two groups of patients were formed. Group I: patients to whome, in addition to the standard initial treatment and "3H therapy", nimodipine was administered at a dose of 15-30 mg/kg bw/h (3-10 ml) for the duration of the initial treatment. Group II: patients to whome, in addition to the standard initial treatment and "3H therapy" were administered with MgSO₄ at a dose of 12 grams in 500 ml of 0.9% NaCl/24 h during the initial treatment (patients who had initial measures and intensive treatment to 12 days after the occurrence of SAH).

Results: The progression of WFNS value (worsening of clinical condition) occurred in 30% of patients by observing both groups. There were no significant differences in progression of WFNS value during the initial treatment according to the groups (p=0.529). The worsening state of consciousness occurred in 32% of patients, measured by the GCS scale between the first and the tenth day, but there were no significant differences between groups (p=0.804). Regression analysis was applies, which included all potential predictors of outcome in the model. None of the parameters is not identified as a good predictor of the outcomes: WFNS (95% CI 0.52 to 6.95, OR=1.9, p=0.365), nimodipine therapy or magnesium sulfate (95% CI 0.29 to 8,79, OR=1.6, p=0.597).

Conclusion: The research has confirmed the safety and feasibility of continuous infusion of high doses of intravenous MgSO₄ in patients with aneurysmal subarachnoid haemorrhage (aSAH).

INTRODUCTION

The incidence of aSAH has been estimated at around 6-7 per 100,000 people in most populations. Fifty percent of survivors have neurological deficits. The aSAH is often complicated by rebleeding, hypertension, cerebral edema, delayed cerebral ischemia (DCI), electrolyte abnormalities, hydrocephalus, seizure activity, and cardiopulmonary dysfunction.

PATIENTS AND METHODS

Study had prospective character in which included 50 patients. The subjects were patients admitted to the OIT Clinic for Anesthesiology and Reanimatology, Neurology Clinic and Neurosurgery Clinic Center Tuzla diagnosed with SAH caused by the rupture of a cerebral aneurysm in the period from 2011 to 2013. Including criteria: patients with subarachnoid hemorrhage caused by rupture of cerebral aneurysm, patients older than 20 years and younger than 70 years, patients underwent 72 hours after the occurrence of hemorrhage, patients who had initial measures and intensive treatment to 12 days after the occurrence of hemorrhage. Exclusion criteria: patients operated on due to subarachnoid hemorrhage but not from aneurysm, patients previously operated due to cerebrovascular disease, patients who are already treated for cancer and other systemic diseases.

RESULTS

The majority of patients (40 patients or 80%) state of mind at the admission to the hospital graded the grade 14 or 15 according to the GCS scale. GCS 12-13 had 7 patients or 14%, GCS less than 8 had 3 patients or 6%. In the initial treatment of a clinical condition in most patients the values WFNS (92% patients) on admission is graded rating of I and II. At the end of treatment progression of WFNS value (worsening of clinical condition) occurred in 30% of patients by observing both groups. There were no significant differences in progression of WFNS value during the initial treatment according to the groups (nimodipine or MgSO₄), p=0.529.

The worsening state of consciousness occurred in 32% of patients, measured by the GCS scale between the first and the tenth day, but there were no significant differences between groups (p=0.804). But this deterioration of consciousness was usually accounted for only 1 degree to the GCS scale. Values of Mg in serum were slightly elevated in the expected, permitted limits.

The effects of age, sex, radiological findings on the treatment, then the clinical parameters and influence the type of treatment and prevention of vasospasm during Initial treatment on outcome of treatment are presented in Table (**OR** -Odds ratio value).

Risk factors	OR	95 % CI	p
Fisher scale	3,5	0,57-21,80	0,150
Age	2,2	0,63-7,48	0,208
WFNS	1,9	0,52-6,95	0,365
Sex	1,6	0,29-8,79	0,597
Type of treatment	1,6	0,29-8,79	0,597

One month after hospital admission, patients with values GOS 5 was 16 (32%), GOS 4 had 18 patients (36%). GOS inferior grade had 3 of 10 patients (20%), GOS II had one patient (2%) and GOS I had a 5 (10%) patients in both groups were analyzed (Figure 1). This means that two-thirds of patients (68%) in both groups had a good outcome measured values scale GOS, GOS IV and V. The poorer outcome, GOS III had 20% of patients, GOS II was at 2% and the GOS I was at 10 % of patients (Figure).

DISCUSSION

Yarada and colleagues in 2013 conducted a systematic review of articles for the classification of the available evidence to evaluate the effects of intravenous magnesium sulfate application in the prevention of cerebral arterial vasospasm. Nine of the 38 proven studies were included in this review. From the studies that could be combined, they found a statistically significant reduction in the appearance of vasospasm with magnesium sulfate (RR 0.83; 95% CI 0.71, 0.98, p = 0.03).

CONCLUSIONS

The outcome of the 30-day treatment after the occurrence of SAH, was analyzed with the WFNS and GOS values, is not dependent on the method of prevention and treatment of vasospasm. Overall, calcium channel block reduce the risk of adverse outcomes. The study confirmed the safety and feasibility of continuous infusion of high doses of intravenous MgSO₄ in patients with aneurysmal SAH.