Effect of early intraoperative magnesium sulfate application on the incidence of vasospasm and postoperative clinical outcome – a retrospective cohort study

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BACKGROUND AND GOAL OF STUDY:

The benefit of magnesium in patients with aneurysmal subarachnoid haemorrhage (SAH) is under active debate. We investigated the effect of intraoperative intravenous magnesium sulfate (MgSO₄) application and compared the rate of vasospasm, delayed ischaemic deficit and neurological outcome in two patient groups.

MATERIALS AND METHODS:

Patient group 1 was a cohort of 20 individuals (15 female, 5 male, age 49.0 ±11.0 yrs) that suffered from aneurysmal SAH and underwent microsurgical clipping in 2005 without MgSO₄. The second group included 20 patients (15 female, 5 male, age 56.0 ±11.0 yrs) treated in 2014 with early intraoperative application of magnesium sulfate 10% 50 mg/kg body weight as a continuous infusion with a infusion rate depending on blood pressure (MAP 60-65 mmHg) over a time period of max. 60 minutes. In group 1, general anesthesia was maintained with sufentanil (0,15-0,30 µg kg⁻¹) or remifentanil (0,1µg kg⁻¹ min⁻¹-0,5µg kg⁻¹ min⁻¹), propofol 1% (6 mg kg⁻¹ h⁻¹). In group 2, general anaesthesia was maintained with sufentanil (0,15-0,30 µg kg⁻¹) or remifentanil (0,1µg kg⁻¹ min⁻¹-0,5µg kg⁻¹ min⁻¹), esketamine (1mg kg⁻¹ h⁻¹) and sevoflurane 1,5-2,0 Vol%. Clinical endpoints were 1) incidence of vasospasm, 2) DIS, 3) neurological outcome using the modified Rankin Scale (mRS) 3 and 12 months after SAH. ebral

RESULTS:

Both groups had SAH Hunt and Hess grade I-III in 11 of 20 and grade IV-V in 9 of 20 patients. In the first group, cerebral vasospasm occurred in 10 patients (50%), in the second group in 9 patients (45%) as defined by transcranial ultrasound or digital subtraction angiography. Eight patients (40%) of group 1 had an associated delayed ischemic deficit, whereas in group 2, only 5 patients (25%) had an ischaemic deficit. Neurological outcome after 3 months was mRS 2.9±1.5 and 12 months mRS 2.0±1.8 in group 1, whereas group 2 had an 3 month mRS of 2.3±1.5 and 12 months mRS of 1.8±1.5.

Fig. 1: Rate of cerebral vasospasm as determined by transcranial Doppler sonography or digital subtraction angiography.

Fig. 2: Rates of delayed postoperative ischaemic deficit.

Fig. 3: Neurological outcome 3 and 12 months after microsurgical clipping of an aneurysmal SAH as determined by the modified rankin scale (mRS).

CONCLUSIONS:

In this retrospective cohort study, the incidence of a delayed ischaemic deficit due to cerebral vasospasm was lower in the group treated with early intravenous MgSO₄. Neurological outcome showed a tendency of better recovery from ischaemic deficits in the magnesium group, however, sample sizes are too small to show statistical significance.