

Original Article

A Comparison between Intravenous Magnesium Sulfate and Oral Magnesium Chloride in Mild Preeclampsia

A. Ghahiri MD*, K. Berjis MD**

ABSTRACT

Background: Preeclampsia is the second cause of maternal mortality in the United States and accounts for 25% of perinatal mortality. Mild Preeclampsia could be treated without hospitalization, however in some cases, hospitalization seems necessary. Administration of magnesium sulfate (MgSO₄) in mild preeclampsia is a matter of controversy.

It is obvious that replacing intravenous magnesium sulfate with an oral preparation of magnesium, of course if it gains a sufficiently high serum level, can be easier to use and less expensive. Up to the present time, we have not been able to find any previously done studies using oral magnesium preparations to treat preeclampsia. Thus, we tried to compare serum magnesium level with oral magnesium chloride and intravenous (IV) magnesium sulfate therapy.

Methods: This was a comparative experimental study. From January 2002 until April 2003, pregnant patients with mild preeclampsia admitted to Al-Zahra and Beheshti hospitals, Isfahan, Iran, between their 27th and 38th weeks of gestation were divided into 2 groups randomly. There were 33 patients in each group. The first group was treated with IV magnesium sulfate (2 g/h) and the second group received oral magnesium chloride (4 g/2h). Magnesium level was checked in 0, 3, 6, 12 hours. The collected data were analyzed with t-Student test on a computer applying SPSS software.

Results: There was no statistical difference between the two groups regarding age, gravidity and gestational age. Magnesium level rose in both groups (P<0.01).

Increase of magnesium level in IV magnesium sulfate group was greater than in the other group, and in the magnesium chloride group, therapeutic level could not be achieved.

Conclusion: Increase of serum Mg level in IV Mg sulfate group and reaching the therapeutic level was the same as reported before. Increase of Mg level with oral Mg chloride, though measurable, did not reach the therapeutic level. Perhaps with more cases or higher amounts of the drug or other types of Mg preparations we could reach the therapeutic level.

Key words: Preeclampsia, Serum magnesium level, Magnesium chloride, Pregnancy Induced Hypertension (PIH), Oral administration

In most countries; the incidence of pregnancy induced hypertension (PIH) has been reported to be about 5%. Preeclampsia is responsible for 20% of maternal mortality and 25% of perinatal mortality¹⁻⁶.

Preeclampsia is not a detectable process, however mild preeclampsia transforms to eclampsia and only termination of pregnancy stops this phenomenon. Therefore, early determination and treatment improves pregnancy and neonatal outcome^{3, 4}.

Most patients are primigravida. Only 30% of patients are superimposed with hypertension¹.

In 19th century, maternal mortality rate due to PIH was 20% to 30% but today, it has decreased to nearly 0% which may be due to the use of magnesium (Mg) sulfate and hydralasine^{1, 5}. The use of Mg sulfate in mild PIH is controversial, but has been

*Assistant Professor, Department of Obstetrics and Gynecology, Isfahan University of Medical Sciences, Isfahan, Iran.

**Resident, Department of Obstetrics and Gynecology, Isfahan University of Medical Sciences, Isfahan, Iran.

Correspondence to: Dr. Ataollah Ghahiri, Department of Obstetrics and Gynecology, Al-Zahra University hospital, Isfahan, Iran. Email: ghahiri@med.mui.ac.ir

proved useful in severe cases^{1, 2, 3, 6}. In mild preeclampsia when the diagnosis is confirmed, outpatient management may be more beneficial than inpatient admitting¹.

It is obvious that the use of oral Mg products in outpatient settings, of course provided that a sufficient serum level is obtained, can be more comfortable and less expensive with more compliance.

Some previous studies have shown the effectiveness of oral Mg administration in preterm labor and other circumstances. We selected Mg as 20% chloride solution mainly for better gastrointestinal (GI) tolerance⁷⁻²⁰.

This study was designed to determine serum Mg level after oral administration of magnesium and to compare its result with intravenous (IV) administration.

Materials and Methods

This was a randomized controlled open clinical trial. Sixty-eight mild preeclamptic patients, admitted to Al-Zahra and Shahid Beheshti hospitals, Isfahan, Iran, from January 2002 until April 2003 were randomly put into two groups to receive either IV Mg sulfate or oral Mg chloride. Each group included 33 patients. Gestational age was determined after asking the patients their last menstrual period (LMP). When the patient was not able to remember her LMP, she was excluded from the study.

Preeclampsia was defined as blood pressure >140/90mmHg after the 20th week of gestation and proteinuria greater than 300 mg in 24 hours. Preeclampsia was considered mild when severe signs such as headache, epigastric pain, blurred vision, abnormal renal or liver function tests, LDH>600Iu/V or PLT<100,000/mm³ were not detected. The first group was treated with IV Mg sulfate (2 g/h) and the second with oral Mg chloride (4g/2h). Patients were informed of their treatment and each one agreed verbally.

Serum Mg level was determined before and 3, 6, and 12 hours after oral and intravenous administration of Mg preparations using calorimetric method.

During the course of study, the patients were monitored for their urine output, deep tendon reflex, vital signs, and severe signs of preeclampsia.

We applied t-Student test to make our statistical comparisons. Collected data were analyzed on a

computer using SPSS and were presented as mean \pm SD.

Results

Two patients were excluded from the study because of GI disturbances. Therefore, final analysis was carried out on the remaining 66 patients.

The two groups were comparable regarding age, gestational age and gravidity (table 1). Both groups showed a significant increase in serum Mg level between 0-3 hours after administration (figure 1) but the rise in oral group was not sufficient to reach the therapeutic level (4 – 7 mEq/L). The rise in Mg level after intravenous administration was significantly higher than it was after oral administration (figure 1).

Table 1. Demographic features in the two groups

	IV Mg		Oral Mg	
	Mean \pm SD	CI 95%	Mean \pm SD	CI 95%
Age (year)	25 \pm 5.4	24– 25.9	24 \pm 4.6	23.5– 25.1
Gravidity (n)	2.4 \pm 1.2	2.3 – 2.4	2 \pm 1.1	1.8 – 2.2
Gestational Age (week)	34 \pm 1.6	33.8 – 34.4	34.4 \pm 1.6	34.1 – 34.7

No significant differences found between the two groups

Discussion

Use of magnesium (Mg) preparations for controlling preeclampsia has been proved useful since it was first applied sixty years ago^{6,7}.

Orally or intravenously administered magnesium forms have wide application in Obstetrics. Applying Mg preparations in anesthesia in order to decrease consumption of analgesics has been already studied⁸.

Its applications in preterm labor and as an anti convulsant in eclampsia have also been documented.^{9,10}

Oral administration of Mg for the treatment of preterm labor has been compared with intravenous Mg preparations and other drugs such as ritodrin^{11,12}. Other studies have shown the beneficial effects of Mg sulfate on intra uterine growth restriction and increasing the incidence of full-term delivery rate^{9,10}.

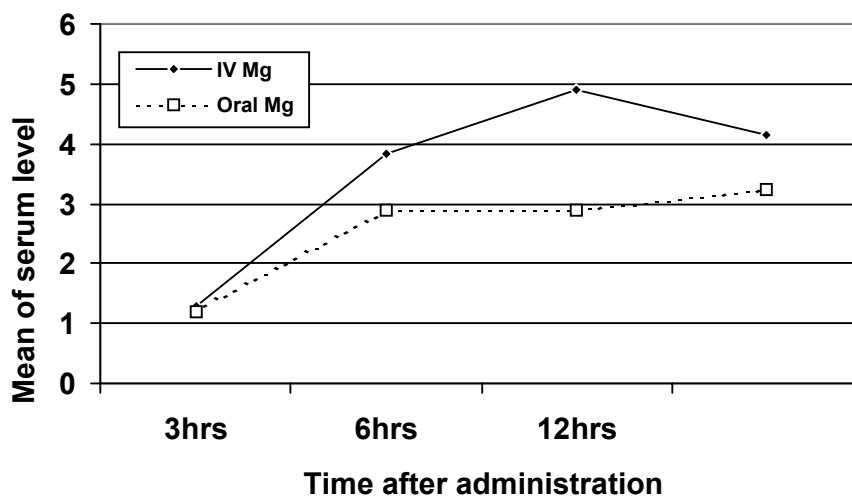


Figure 1. Comparison between serum Mg level in IV Mg sulfate and oral Mg chloride groups

On the other hand, oral treatment with Mg preparations, especially as tocolytic in preventing preterm labor and preeclampsia has been associated with better maternal and fetal outcomes¹³⁻¹⁹.

Application of oral Mg preparations for prevention of preeclampsia has recently been considered by some researchers²⁰. Martin et al¹⁴ showed that the results of intravenous Mg sulfate infusion followed by oral Mg gluconate ingestion were comparable to intravenous administration of Mg alone.

One of the most important problems of Mg in the gluconated form is digestive sufferings^{2,3}. For this reason, in this study, Mg chloride which induced lower digestive problems was chosen to be used¹⁵⁻²⁰.

The result of this study shows that Mg serum level increases following oral and intravenous ad-

ministration which is almost compatible with the reported statistics^{2,3,13,14}.

Studies done indicated that therapeutic serum Mg level is between 4 to 7 mg/dl following a dose of about 2g/h administered intravenously^{1,3,5}.

This study shows that in contrast to intravenous administration of Mg sulfate, oral intake of Mg chloride though giving a sensibly high serum level of Mg, does not reach the therapeutic level.

It can be concluded that serum level of Mg after oral Mg chloride can increase to subtherapeutic level; therefore, it may be necessary to design other studies with higher doses or different forms of Mg preparations in future.

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