IMPACT OF MAGNESIUM SULFATE LOADING DOSE ON DOPPLER VELOCIMETRY PARAMETERS IN SEVERE PREECLAMPSIA

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Introduction

Preeclampsia is a disease characterized by vascular endothelium dysfunction and vasoconstriction typically occurring after 20 weeks of pregnancy and potentially persisting for 4 to 6 weeks postpartum. Reduced placental perfusion due to shallow cytotrophoblast migration towards uterine spiral arterioles is believed to be the main cause. severe preeclampsia is a serious pregnancy complication characterized by high blood pressure (systolic blood pressure of 160 mm Hg or higher, or diastolic blood pressure of 110 mm Hg or higher) and damage to organs such as the kidneys and liver. It may also involve symptoms such as low platelet count, severe headaches, visual disturbances, impaired kidney function, liver dysfunction, pulmonary edema, and upper abdominal pain. If left untreated, it can lead to life-threatening complications for both the mother and the baby. Magnesium sulfate is considered as a recommended treatment for women experiencing severe preeclampsia or eclampsia by WHO. Doppler ultrasound plays a crucial role in identifying obstetric complications related to utero-placental insufficiency, which can have significant impacts on both mother and fetus throughout pregnancy and delivery.

Aim of the work

This study sought to assess the influence of a loading dose of MgSo4 on Doppler Indices "RI, PI, and S/D ratio" in uterine, UA, and fetal MCA arteries for pregnant women diagnosed with severe preeclampsia.

Subjects and Methods

This prospective cohort study was conducted at El-Shatby Maternity University Hospital, Alex University from Aug 2022 until May 2023, Our inclusion criteria were pregnant women with severe preeclampsia between 18–40 years of age with gestational age more than or equal 28 weeks, any Gravidity or Parity, Singleton pregnancy, and BMI between 25-35 kg/m2. We excluded those with Any maternal chronic diseases notably chronic hypertension, renal disease, diabetes mellitus, CNS lesion, epilepsy, as well as autoimmune disorders, Morbid obesity more than or equal 35 kg/m2, Abnormal Placentation, Fetal congenital anomalies.

The study included history taking, physical examination, blood pressure measurement, laboratory investigations, fetal assessment, studies of Doppler was done, and the values of parameters were recorded (regard to RI, PI, as well as S/D ratio in uterine artery, UA, and MCA) before and following the administration of the loading dose of MgSO4 as 4 gm of MgSO4 in 250 ml saline intravenously infusion over 20 minutes according to hospital protocol.

Results

Our results after MgSO4 administration revealed that Maternal heart rate significantly increased, while systolic, diastolic, and mean blood pressure significantly decreased. Also Doppler parameters in the Uterine, UA, and MCA exhibited marked reductions. after administration a loading dose of MgSO4 on Doppler parameters (resistance index [RI], pulsatility index [PI], systolic/diastolic [S/D] ratio,, peak systolic velocity [PSV],and End diastolic velocity [EDV]) to pregnant women with severe preeclampsia. In addition MgSO4 administration resulted in an increased C/U ratio, which is an appropriate indicator of fetal growth and prognosis.

Table 1: Comparison between the mean value of the blood pressure and heart rate before and following administration of MgSO4 of cases (n=100)

	All patients (n= 100)		
	Mean ±SD		P
	Before MgSO4	After MgSO4	
SBP (mmHg)	169.95±8.42	149.65±9.14	$<0.001^{*pW}{}_{X}$
DBP (mmHg)	115.45±3.19	95.15±4.95	$<0.001^{*pW}{}_{X}$
Heart rate	82.78±4.17	89.97±4.53	$<0.001^{*pW}{}_{X}$

PW_X: P Value for Wilcoxon Signed Ranks Test.P_t P Value for Paired Samples T. test (2-Related Samples).* Statistically significant at (P<0.05).

Table 2: Comparison between (Uterine artery, UA, and MCA) Doppler indices before and following administration of MgSO4 (n=100)

All patients (n= 100)				
Parameters		**Mean ±SD Before MgSO4**	**Mean ±SD After MgSO4**	**P**
Uterine Artery	RI	0.64±0.030	0.57±0.031	$<0.001^{*pW}{}_{X}$
	PI	1.31±0.16	1.13±0.12	$<0.001^{*pW}{}_{X}$
	SD Ratio	2.78±0.25	2.36±0.2	$<0.001^{*pW}{}_{X}$
	PSV	90.81±14.2	62.08±9.69	$<0.001^{*pW}{}_{X}$
	EDV	32.81±5.08	26.43±4.24	$<0.001^{*pW}{}_{X}$
Umbilical Artery	RI	0.65±0.02	0.60±0.02	$<0.001^{*pW}{}_{X}$
	PI	1.24±0.14	1.09±0.11	$<0.001^{*pW}{}_{X}$
	SD Ratio	2.91±0.17	2.49±0.15	$<0.001^{*pW}{}_{X}$
	PSV	38.98±6.34	26.64±4.78	$<0.001^{*pW}{}_{X}$
	EDV	13.48±2.48	10.73±2.03	$<0.001^{*pW}{}_{X}$
MCA	RI	0.67±0.02	0.61±0.03	$<0.001^{*pW}{}_{X}$
	PI	1.49±0.07	1.40±0.07	$<0.001^{*}P_t$
	SD Ratio	3.05±0.22	2.61±0.19	$<0.001^{*}P_t$
	PSV	38.09±8.28	25.97±6.35	$<0.001^{*pW}{}_{X}$
	EDV	12.57±2.91	9.95±2.28	$<0.001^{*pW}{}_{X}$
CPR		1.22±0.11	1.29±0.10	$<0.001^{*pW}{}_{X}$

Conclusion

MgSO4 significantly improved the fetoplacental blood flow; also it had a crucial role in ensuring fetal growth and development, and detected any potential issues such as fetal distress or growth restriction. Significantly, MgSO4 decreased Doppler parameters (RI, PI, S/D ratio, PSV, and EDV) in uterine, umbilical and middle cerebral arteries to pregnant women with severe preeclampsia. MgSO4 significantly increased C/U ratio which is an appropriate indicator of fetal growth and prognosis.