Comparison of extended infusion versus standard infusion magnesium repletion in adult trauma intensive care unit patients

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Background

- Hypomagnesemia in the critically ill is linked with hypokalemia and increased mortality[1]
- Rapid infusion of magnesium sulfate leads to high rates of urine excretion[2]
- A clinical review recommends infusing magnesium doses over 8 to 24 hours[3]
- Common practice is to infuse each gram of magnesium over 30 minutes to 1 hour[4]
- No clinical trial to date has compared different infusion times on magnesium repletion efficacy

Objective

To determine if there is a difference in effectiveness of magnesium repletion with two rates of infusion:

- Standard infusion: magnesium sulfate 2 grams over 2 hours
- Extended infusion: magnesium sulfate 2 grams over 6 hours

Methods

Study Design

- Retrospective chart review of magnesium sulfate infusions orders from Jan 2013 to Oct 2015
- Mann-Whitney U test for primary outcome

Inclusion	Exclusion
Age ≥ 18	eGFR < 30 mL/min
Admission to trauma ICU	HD, PD, CRRT
Received IV magnesium*	Enteral Repletion or TPN
Serum Mg < 2 mg/dL	Preeclampsia/Vasospasm

Methods, continued

Matching

- Extended infusion doses were matched to standard infusion doses based on:
  - Renal function using eGFR (mL/min):
    - 30 – 59
    - 60 – 89
    - ≥ 90
  - Baseline serum magnesium level (mg/dL):
    - < 1.5
    - 1.5 – 1.9

Primary Outcome

- Median change in serum magnesium level per gram of magnesium administered

Secondary Outcomes

- Change in serum potassium
- In-hospital mortality, ICU and hospital length of stay, disposition upon discharge

Results

Doses reviewed
N = 6673

Exclusion Reasons	N
TPN	216
Vasospasm in SAH	115
Enteral magnesium	95
GFR < 30	93
Age < 18	25
Magnesium ≥ 2.0	6

Extended infusion
N = 148

Standard infusion
N = 148

Results, continued

Baseline Demographics

Patient Characteristic	Standard (N=148)	Extended (N=148)
Age, years (mean±SD)	50 ± 19	47.7 ± 21
Male, n (%)	95 (64)	92 (60)
BMI, kg/m^2 (mean±SD)	29.9 ± 9.1	27.7 ± 7.2
Admission Diagnosis • Trauma • Surgical	 87 (59) 17 (11)	 88 (59) 21 (14)
Diabetes, n (%) • Type 1 • Type 2	 1 (0.7) 29 (20)	 1 (0.7) 19 (13)
Sepsis, n (%)	4 (3)	8 (5)
Small Bowel Resection, n (%)	11 (7)	15 (10)
Alcohol Abuse, n (%)	34 (23)	44 (29)
Creatinine, (mean±SD)	0.8 ± 0.4	0.77 ± 0.43
Fluid balance, mL, (mean±SD)	485 ±1993	594 ± 1548
Loop diuretic, n (%)	7 (4)	7 (4)
Diarrhea, n (%)	18 (12)	23 (16)

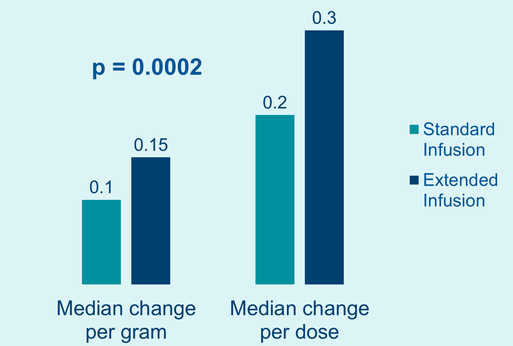
Matching

	Baseline Magnesium	
GFR	< 1.5	1.5 – 1.9
≥ 90	5	99
60 - 89	3	11
30 - 59	4	13

Results, continued

Primary Outcome

Change in Serum Magnesium Level with Standard versus Extended Infusion Doses



Secondary Outcomes	Standard	Extended
Change in potassium, mEq/L	-0.07	-0.01
ICU Length of Stay, days	10.5	7.4
Discharge to home, n (%)	40 (27)	36 (22)

Conclusion

- Extended infusion magnesium sulfate resulted in a significant increase in serum magnesium levels.
- These results encourage standardization of the electrolyte repletion protocol in the trauma ICU.

References

1) Rubeiz GJ et al. Crit Care Med 1993;21(2):203-9.
2) Oster JR, Epstein M. Am J Nephrol 1988;8:349-54.
3) Kraft MD et al. Am J Health-Syst Pharm 2005;62:1663-82.
4) Bartel B, Gau E. Critical Care Pharmacotherapeutics, Ch 7. 2013.

Disclosure

The authors of the presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.