Review: Magnesium is effective and safe for acute management of rapid atrial fibrillation

Onalan O, Crystal E, Daoulah A, et al. **Meta-analysis of magnesium therapy for the acute management of rapid atrial fibrillation.** Am J Cardiol. 2007;99:1726–32.

Clinical impact ratings: Emergency Med ★★★★★★☆ Hospitalists ★★★★★★☆ Cardiology ★★★★★★☆

QUESTION

In patients with rapid atrial fibrillation (AF), does magnesium therapy improve rate or rhythm control?

METHODS

Data sources: MEDLINE, old MEDLINE, EMBASE/Excerpta Medica, CENTRAL, Web of Science, ISI Proceedings, Biosis Previews, CINAHL, and HealthSTAR (all to June 2005); abstracts from scientific meetings in the past 10 years; and reference lists.

Study selection and assessment: Randomized controlled trials (RCTs) that compared intravenous magnesium with routine care, placebo, or antiarrhythmic drugs in adults with chronic or paroxysmal AF and rapid ventricular rate. Studies of patients with postoperative AF were excluded. 9 RCTs met the selection criteria. 8 RCTs (n = 476, range of mean ages 56 to 73 y) that compared magnesium with placebo, verapamil, diltiazem, amiodarone, or ajmaline were included in the meta-analysis; 1 RCT (n = 86) was excluded because most patients had rheumatic heart disease and mean age (38 y) was much younger than in the other trials. Total dose of magnesium ranged from 1.2 to 10 g. Quality assessment of individual trials was based on the 5-point Jadad scale (4 RCTs had scores ≥ 3).

Outcomes: Success in achieving rate control (< 90 or 100 beats/min) or rhythm control measured at ≤ 24 hours (median 5 h); time to response; and adverse events.

MAIN RESULTS

Magnesium was more effective than placebo in achieving rate control but did not differ from placebo for rhythm control (Table). Magnesium was less effective than verapamil in achieving rate control (Table). For rhythm control, magnesium was more effective than verapamil or diltiazem and similarly effective to amiodarone or ajmaline (Table), although significant statistical heterogeneity was noted for the latter. Time to response was shorter with magnesium than with placebo or verapamil (weighted mean difference –7.0 h, 95% CI –9.3 to –4.7). Groups did not differ for adverse events (Table); the most common side effect reported with magnesium was a transient sensation of warmth and flushing.

CONCLUSIONS

In patients with rapid atrial fibrillation, magnesium is safe and more effective than placebo for rate control. Magnesium is less effective than calcium-channel blockers for rate control but more effective for rhythm control.

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Magnesium vs placebo or antiarrhythmic drugs in patients with rapid atrial fibrillation at ≤ 24 hours*

Outcomes	Number of trials (n)	Comparison group	Weighted event rates	RBI/RBR/RRR (95% CI)	NNT/NNH (CI)
Rate control (< 90 or 100 beats/min)	3 (258)	Placebo	61% vs 35%	RBI 74% (33 to 128)	NNT 4 (3 to 8)
	1 (45)	Verapamil	24% vs 58%†	RBR 59% (6 to 82)	NNH 3 (2 to 3)
Rhythm control	4 (273)	Placebo	24% vs 17%	RBI 41% (–11 to 124)	Not significant
	2 (91)	Verapamil or diltiazem	57% vs 17%	RBI 231% (68 to 552)	NNT 3 (2 to 5)
	2 (112)	Amiodarone or ajmaline	39% vs 48%	RBR 19% (–30 to 50)	Not significant
Adverse events	8 (476)	All	5.1% vs 9.1%	RRR 37% (–13 to 65)	Not significant

*Abbreviations defined in Glossary. RBI, RBR, RRR, NNT, NNH, and CI calculated from data in article using a fixed-effects model.
†Unweighted event rate.

COMMENTARY

Magnesium has several effects on the heart that may be beneficial for patients with rapid AF, including prolongation of the refractory period of the atrioventricular node. Onalan and colleagues synthesized the data from previous studies to examine whether these biological effects are translated into clinically beneficial outcomes relative to placebo or active treatment. They used a rigorous search strategy to identify 9 RCTs and concluded that magnesium is effective and safe for the management of rapid AF. However, several limitations raise concerns about the strength of the conclusions. Most notably, comparing magnesium with placebo when active treatments are available is of questionable clinical relevance. Similarly, the importance of an outcome combining rate and rhythm control into an "overall response" is unclear. The small sample size of the aggregated data, wide variation in magnesium dosages, and marked heterogeneity among trials also limit confidence in the results. A further concern is the exclusion of a study (1), which found that a calcium-channel blocker was superior to magnesium for rate control, because of factors that were not prespecified as exclusion criteria for the meta-analysis.

The authors found that calcium-channel blockers improve rate control to a greater degree than does magnesium, confirming that these drugs, along with β-blockers and digoxin, will continue to be the primary means of improving rate control for most patients with AF (2). The finding that magnesium may be effective for rhythm control is provocative and given the safety of magnesium, warrants further study in a large randomized trial.

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References

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