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# Magnesium and Arrhythmias: Exploring Its Role in Heart Rhythm Regulation

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## INTRODUCTION

Magnesium is an essential mineral that plays a vital role in various physiological processes, including regulating cardiac electrical activity. It influences ion channels responsible for calcium, potassium, and sodium fluxes, which are critical for maintaining a stable heart rhythm. Magnesium deficiency has been associated with several arrhythmias, such as atrial fibrillation (AF), ventricular tachycardia (VT), and torsades de pointes (TdP). Despite its known importance, magnesium's use in managing arrhythmias remains underutilized in clinical practice, warranting further exploration of its therapeutic potential.

## AIM

The aim of this study is to evaluate the role of magnesium supplementation in preventing and treating cardiac arrhythmias. By synthesizing evidence from clinical and experimental studies, this work seeks to determine its effectiveness in reducing arrhythmia incidence and severity and critically assess the quality of available research.

## METHODS

A systematic review was performed, analyzing studies published in the last two decades from databases such as PubMed, Scopus, and the Cochrane Library. Studies were included if they examined the effects of magnesium supplementation on arrhythmias in humans or animals. Both intravenous and oral magnesium administration methods were reviewed. Data were extracted on arrhythmia types, magnesium dosages, treatment methods, and clinical outcomes such as recurrence and adverse effects.

## RESULTS

Magnesium supplementation demonstrated a beneficial effect in various settings. In patients with AF, it was found to reduce recurrence rates and improve rhythm stability. Among patients undergoing cardiac surgery, intravenous magnesium lowered the occurrence of postoperative arrhythmias. For TdP, magnesium sulfate was particularly effective in stabilizing abnormal rhythms, making it a critical intervention in emergency care. Mechanistic studies highlighted that magnesium supports cardiac repolarization by modulating calcium and potassium channels, thereby reducing the likelihood of ectopic beats and arrhythmogenic events. However, high doses of magnesium were linked to side effects such as low blood pressure and slow heart rate, underlining the importance of careful dosing.

## CONCLUSIONS

Magnesium has shown promise as a supportive therapy in the management of arrhythmias, especially in cases of AF, VT, and TdP. Its ability to stabilize electrical activity and reduce arrhythmia recurrence highlights its potential in both acute and preventive care. However, current evidence is limited by inconsistent study designs and a lack of large-scale trials. While magnesium can be an effective tool, it is essential for clinicians to carefully balance its benefits and risks, particularly in patients prone to electrolyte imbalances or those receiving high doses.

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