

Effect of Verapamil on Kidney Function Using Radionuclide Imaging

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Keywords

Verapamil · Calcium channel blockers · Technetium-99m mercaptoacetyltriglycine · Renogram

Abstract

Background and Objective: Calcium channel blockers (CCBs) are among the most widely used prescribed drugs for the treatment of cardiovascular diseases. The present study investigates the effect of verapamil, which is most commonly used as a CCB, on kidney function using radionuclide imaging. **Methods:** Ten New Zealand white rabbits were used in vitro (4) and in vivo (6) studies. Isometric tensions were recorded for isolated renal artery ring segments, while renographic studies were performed using Technetium-99m mercaptoacetyltriglycine and Gamma camera. Time to peak activity (T_{max}) and time from peak to 50% activity ($T_{1/2}$), were calculated from the renograms for control and treated rabbits with verapamil. **Results:** In vitro, verapamil shifted the curve of phenylephrine concentration-dependent contraction on renal artery to the right, and decrease the highest contraction by $30 \pm 3\%$. In vivo, the average values of T_{max} for control and treated rabbits were 2.8 ± 0.1 and 2.2 ± 0.2 min respectively. The $T_{1/2}$ for control and treated rabbits were 4.7 ± 0.05 and 4.2 ± 0.08 min respectively. The differences were statistically significant: $p < 0.05$. There is $30 \pm 4\%$ decrease in the 2 values. This indicates that there is a rapid

renal uptake of the tracer and clearance of the radioactivity after verapamil. **Conclusion:** Verapamil dilates the renal artery and accelerates both the T_{max} and $T_{1/2}$ in the renogram. It increases renal blood perfusion and protects kidney function and therefore improves its work. However, verapamil should not be used while performing renograms to avoid misleading results.

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Introduction

Calcium channel blockers (CCBs) are widely used in clinical practice. These drugs have been prescribed with increasing frequency because of their valuable therapeutic effects. They are used for the treatment of cardiovascular diseases such as hypertension, angina pectoris, cardiac arrhythmias, and other disorders [1–3]. All CCBs inhibit the L-type calcium channels, preventing the entry of calcium, which has a vital role in the cell. Verapamil is one of the most commonly used drug in this group [4–7]. CCBs exert also important vascular and tubular effects on the kidney [8–10]. Experimental studies in animals and humans showed the potential therapeutic uses of CCBs in decreasing the course of acute renal failure and reducing the progression of chronic renal failure. They also assist in preserving renal function in renal transplantation.