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Review

# Angiotensin converting enzyme inhibitors effect on endothelial dysfunction: A meta-analysis of randomised controlled trials

YousefShahin ... Ian Chetter

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## Abstract

### Objective

Several studies have assessed the effect of angiotensin converting enzyme inhibitors (ACEIs) on endothelial dysfunction as measured by brachial flow-mediated vasodilatation (FMD). We conducted a meta-analysis to investigate this effect in comparison to placebo or no treatment and to other antihypertensive agents.

### Methods

MEDLINE, EMBASE and Cochrane Central Register of Controlled Trials (CENTRAL) were searched from 1996 to October 2010 on randomised controlled trials (RCTs) that assessed the effect of ACEIs on brachial FMD versus placebo or no treatment and

ACEIs versus angiotensin receptor blockers (ARBs), calcium channel blockers (CCBs) and  $\hat{I}^2$ -blockers. Data from included studies were pooled with use of random effects meta-analysis of the weighted mean change differences between the comparator groups. Heterogeneity across studies was assessed with the  $I^2$  statistic.

## Results

In 10 trials including 1129 patients, treatment with ACEIs ( $n = 498$ ) versus placebo or no treatment ( $n = 503$ ) significantly improved brachial FMD (pooled mean change difference 1.26%, 95% C.I. 0.46%–2.07,  $p = 0.002$  with significant heterogeneity). In 11 trials which included 805 patients, treatment with ACEIs ( $n = 264$ ) had a significant effect on brachial FMD when compared with other antihypertensives (ARBs, CCBs and  $\hat{I}^2$ -blockers) ( $n = 420$ ) (pooled mean change difference 0.89%, 95% C.I. 0.22%–1.56,  $p = 0.009$ ,  $I^2 = 83\%$ ,  $p$  for heterogeneity  $< 0.00001$ ). In 7 trials, treatment with ACEIs had no significant effect on FMD when compared with ARBs (pooled mean change difference = 0.21%, 95% C.I. -0.24 to 0.66,  $p = 0.36$ ,  $I^2 = 0\%$ ). However, in 4 trials ACEIs significantly improved FMD when compared with CCBs (pooled mean change difference 2.15%, 95% C.I. 0.55%–3.75,  $p = 0.009$ ,  $I^2 = 90\%$ ,  $p$  for heterogeneity  $< 0.00001$ ). When compared with  $\hat{I}^2$ -blockers in 4 trials, ACEIs also had a significant effect on FMD (pooled mean change difference = 0.59%, 95% C.I. 0.05%–1.13,  $p = 0.03$ ,  $I^2 = 34\%$ ,  $p$  for heterogeneity = 0.21).

## Conclusions

This study shows that ACEIs improve brachial FMD which is a marker of endothelial function in patients with endothelial dysfunction caused by various conditions and are superior to CCBs and  $\hat{I}^2$ -blockers. There was no significant difference between ACEIs and ARBs effect on brachial FMD.



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## Keywords

Flow mediated dilatation; Brachial FMD; Renin angiotensin system; Angiotensin converting enzyme inhibitors; Endothelial dysfunction; Endothelial function

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