

Efficacy of atenolol and captopril in reducing risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 39.

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**OBJECTIVE:** To determine whether tight control of blood pressure with either a beta blocker or an angiotensin converting enzyme inhibitor has a specific advantage or disadvantage in preventing the macrovascular and microvascular complications of type 2 diabetes. **DESIGN:** Randomised controlled trial comparing an angiotensin converting enzyme inhibitor (captopril) with a beta blocker (atenolol) in patients with type 2 diabetes aiming at a blood pressure of <150/<85 mm Hg. **SETTING:** 20 hospital based clinics in England, Scotland, and Northern Ireland. **SUBJECTS:** 1148 hypertensive patients with type 2 diabetes (mean age 56 years, mean blood pressure 160/94 mm Hg). Of the 758 patients allocated to tight control of blood pressure, 400 were allocated to captopril and 358 to atenolol. 390 patients were allocated to less tight control of blood pressure. **MAIN OUTCOME MEASURES:** Predefined clinical end points, fatal and non-fatal, related to diabetes, death related to diabetes, and all cause mortality. Surrogate measures of microvascular and macrovascular disease included urinary albumin excretion and retinopathy assessed by retinal photography. **RESULTS:** Captopril and atenolol were equally effective in reducing blood pressure to a mean of 144/83 mm Hg and 143/81 mm Hg respectively, with a similar proportion of patients (27% and 31%) requiring three or more antihypertensive treatments. More patients in the captopril group than the atenolol group took the allocated treatment: at their last clinic visit, 78% of those allocated captopril and 65% of those allocated atenolol were taking the drug ( $P < 0.0001$ ). Captopril and atenolol were equally effective in reducing the risk of macrovascular end points. Similar proportions of patients in the two groups showed deterioration in retinopathy by two grades after nine years (31% in the captopril group and 37% in the atenolol group) and developed clinical grade albuminuria  $\geq 300$  mg/l (5% and 9%). The proportion of patients with hypoglycaemic attacks was not different between groups, but mean weight gain in the atenolol group was greater (3.4 kg v 1.6 kg). **CONCLUSION:** Blood pressure lowering with captopril or atenolol was similarly effective in reducing the incidence of diabetic

complications. This study provided no evidence that either drug has any specific beneficial or deleterious effect, suggesting that blood pressure reduction in itself may be more important than the treatment used.