



# Orthostatic fall in blood pressure in the very elderly hypertensive: results from the Hypertension in the Very Elderly Trial (HYVET) — pilot

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## Introduction

In healthy elderly subjects, on standing, there is a tendency for the systolic blood pressure (BP) to fall between 0 and 5 mm Hg and the diastolic BP to be maintained. With increasing age there is attenuation of the haemodynamic responses to orthostasis.

Orthostatic hypotension (OH) occurs more frequently in the elderly. Prevalence estimates of orthostatic hypotension vary widely with the definition and characteristics of the population, in particular with the age range and health status.<sup>1</sup> The usual definition of OH (and that of the Consensus Committee of the American Autonomic Society and the American Academy of Neurology)<sup>2</sup> is a reduction of systolic pressure of at least 20 mm Hg or a diastolic BP of at least 10 mm Hg within 3 min of standing.

In one large survey<sup>1</sup> of non-institutionalised individuals over the age of 65 an overall prevalence of 18% was found but only 2% were symptomatic. The prevalence was 17% in the 65–74 age group but 26% in those over 85. As well as increasing age OH is associated with supine systolic hypertension, lower body mass index (BMI), history of myocardial infarction or stroke and carotid artery stenosis on ultrasound.<sup>1</sup>

## HYVET—pilot

This was a prospective randomised (with blinded end-point assessment) pilot trial in patients over the age of 80 years with sustained systolic and diastolic hypertension.<sup>3</sup> Patients were recruited from 34

centres from both eastern and western European countries.

Patients newly diagnosed as hypertensive, those known to be hypertensive but not on treatment and those who were previously on treatment could be included. All patients had a 2-month run-in period prior to randomisation. Patients already on treatment had their treatment stopped. During the run-in period the sitting BP was measured after at least 1 week off antihypertensive treatment, then 1 month later and again 1 month after that. On the final occasion (after 2 months off antihypertensive treatment) the standing BP was also recorded. The sitting BP was taken twice after sitting for 5 min and the standing BP twice after standing for 2 min.

Inclusion criteria were:

- (1) aged over 80 years;
- (2) average of the sitting systolic BP recordings of 160–219 mm Hg and a standing systolic BP of  $\geq 140$  mm Hg;
- (3) average of the diastolic BP recordings of 90–109 mm Hg (phase V); if phase V was less than 40 mm Hg, phase IV could be used in the absence of aortic regurgitation.

Patients on BP lowering treatment for reasons other than hypertension were excluded as were

**Table 1** Characteristics of patients with and without orthostatic hypotension

	With OH	Without OH
No. (%)	145 (12)	1096 (88)
Gender % women	91 (63)	694 (63)
Age (years)	84 $\pm$ 3	84 $\pm$ 3
Weight (kg)	69 $\pm$ 10	68 $\pm$ 11
Height (cm)	164 $\pm$ 8	164 $\pm$ 9
BMI (kg/m <sup>2</sup> )	25 $\pm$ 4	25 $\pm$ 4

**Table 2** Average orthostatic fall in untreated pressures

	Women			Men		
	80–84.9	85–89.9	>90	80–84.9	85–89.9	>90
Age (years)	80–84.9	85–89.9	>90	80–84.9	85–89.9	>90
Number	561	178	46	326	108	22
Systolic BP	8.0 (7.3–8.6)	6.8 (5.8–7.9)	10.4 (8.0–12.9)	7.9 (7.1–8.7)	8.1 (6.7–9.5)	7.0 (4.0–10.1)
Diastolic BP	1.3 (0.9–1.7)	1.0 (0.4–1.7)	2.3 (0.7–3.9)	1.2 (0.6–3.9)	1.3 (0.4–2.2)	1.2 (–0.7–3.0)

Average fall in untreated pressures on standing (mm Hg) (95% CI).

patients with dementia. The main HYVET trial is scheduled to start in 1999.

### Aim

Our aim was to investigate the factors associated with an orthostatic fall in pressure in a hypertensive population over the age of 80 at entry to the HYVET pilot trial. The average of the two sitting BP recordings and the average of the two standing BP recordings from the third visit were used to calculate the fall in both systolic and diastolic pressures (sitting average less standing average in mm Hg).

### Results

A total of 1283 patients were recruited to the trial and of these full data were available on 1241 patients for this analysis. The mean age of the patients was 83.8 ( $\pm 3.0$ ). There were 785 women and 456 men. The average untreated entry sitting BP was 182/100 mm Hg.

The average fall in systolic pressure on standing was 8 mm Hg (95% CI: 7.3–8.3) and in diastolic pressure 1.3 mm Hg (95% CI: 1.0–1.6). In 1123 subjects (90%) systolic BP fell and in 728 (59%) diastolic pressure fell. Ninety-six patients (7.7%) had a drop of  $\geq 20$  mm Hg systolic and 66 (5.4%) had a drop of  $\geq 10$  mm Hg diastolic. Of these 17 (1.6%) had a drop of  $\geq 20$  mm Hg systolic and  $\geq 10$  mm Hg diastolic. Therefore 145 patients (12%) had OH (by the American definitions). Table 1 shows the characteristics of those with OH and those without.

Table 2 shows the average fall in pressures for the ages 80–84.9, 85–89.9 and >90 years and both sexes for these age groups. The fall in systolic pressures were similar in men and women and in the different age ranges although there was a tendency ( $P = 0.10$ ) for women over the age of 90 years to have a greater fall in systolic pressure (9.3 mm Hg) than those 80–89 years (7.8 mm Hg).

### Discussion

It has been shown that systolic BP falls on average by 5 mm Hg in patients with isolated systolic hypertension at a mean age of 70 years and the fall increases by 1 mm Hg per decade.<sup>4</sup>

In our population, despite the fact that subjects with a standing systolic pressure of <140 mm Hg were excluded the average orthostatic fall was greater than expected and this fall tended to be greater for women over the age of 90. The number of men and women over the age of 90 was small and a linear correlation between age and orthostatic fall was not present. This probably reflects the screening bias in that only fitter individuals from the older age groups were selected. Also excluding patients below the age of 80 and having only small numbers over the age of 90 years limited the chance of finding a true correlation with age.

The prevalence of OH in this group was 12% which is lower than would be expected in this age group and again probably reflects the screening bias. As regards gender and orthostatic fall there was no significant difference between men or women.

However with regards to treatment, the fact that the fall in systolic pressure was greater than expected may affect tolerance to antihypertensive medication in this age group. This is certainly a concern for many physicians considering treatment for patients of this age with hypertension and often a reason for medication being withheld. This will be investigated further in the main trial.

### Acknowledgements

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### References

- Rutan GH *et al*. Orthostatic hypotension in older adults. The cardiovascular health study. *Hypertension* 1992; **19**: 508–519.
- Bulpitt CJ *et al*. The Hypertension in the Very Elderly Trial (HYVET): rationale, methodology and comparison with previous trials. *Drugs and Aging* 1994; **5**: 171–183.
- Consensus statement on the definition of orthostatic hypotension, pure autonomic failure, and multiple system atrophy. The Consensus Committee of the American Autonomic Society and the American Academy of Neurology. *Neurology* 1996; **46**: 1470.
- Vanhanen H *et al*. Prevalence and persistence of orthostatic blood pressure fall in older patients with isolated systolic hypertension. Syst-Eur Investigators. *J Hum Hypertens* 1996; **10**: 607–612.