

Conflicts of interest

The authors each declare no conflict of interest.

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Postal questionnaire survey: the use of sleeping with the head of the bed tilted upright for treatment of orthostatic hypotension in clinical practice

SIR—Orthostatic hypotension (OH) is common and affects one in five community-living older persons [1]. The incidence is higher amongst older in-patients [2] and those attending a syncope clinic [3].

The treatment of OH is through increasing peripheral vascular resistance and/or intravascular volume. Existing treatments such as increased water intake, salt replacement [4] and medications may lead to hypertension, and older people tend to tolerate these interventions poorly [5]. Drinking 2–2.5 l of fluids daily may be effective in younger patients [6, 7] but may be undesirable in older patients who can be prone to urinary incontinence.

Sleeping with the head of the bed elevated (SHU) is established as part of the treatment modality for OH [6, 8, 9]. The European Society of Cardiology guidelines [9] recommend raising the head of the bed on blocks to permit gravitational exposure during sleep, which results in chronic intravascular volume expansion. Mathias and Bannister [10] recommend SHU as first-line treatment for OH in patients with autonomic failure (AF).

Our literature review suggests that SHU at 12° or greater confers some benefit in patients with OH. However, the studies were small with sample sizes of eight subjects or less with varying ages (23–66 years), and the majority of the patients had AF (Table 1). A number of those studies used a

Table 1. Blood pressure (BP) improvement from sleeping in a 'head-up' position: a review of the literature

Author	Patient number	Age range	Patient type	SHU intervention	ΔBP (mm Hg) ^a (systolic/diastolic)
MacLean and Allen [11]	4	30–59	One patient with AF Three patients with NOH	12° for 3 days	+120/+70 (one patient) +102/+64 (one patient)
Corcoran <i>et al.</i> [12]	1	40	One patient post prolonged bed rest	40° for 2 months	+49/+34
Bannister <i>et al.</i> [13]	4	45–65	Three patients with AF One patient with NOH	90° for four nights Patients slept seated in chairs and prescribed fludrocortisone as well	+40/+17
Ten Harkel <i>et al.</i> [14]	6	23–65	Five patients with AF One patient with NOH	12° alone 12° and fludrocortisone for 1 week	+11/+5 +42/+21
Kardos <i>et al.</i> [19]	1	66	Not specified	15° for 2 weeks	Not available
van Lieshout <i>et al.</i> [15]	8	23–65	Eight patients with AF	12° and fludrocortisone for 3 weeks	+29/+10

AF, autonomic failure; NOH, neurogenic orthostatic hypotension or non-autonomic failure orthostatic hypotension; SDBP, supine diastolic BP; SHU, sleeping with the head of the bed elevated; SSBP, supine systolic BP; UDBP, upright diastolic BP; USBP, upright systolic BP.

$\Delta BP = [(SSBP_{\text{post}} - USBP_{\text{post}}) - (SSBP_{\text{pre}} - USBP_{\text{pre}})] / [(SDBP_{\text{post}} - UDBP_{\text{post}}) - (SDBP_{\text{pre}} - UDBP_{\text{pre}})]$.

^aBP denotes the change in mm Hg in supine and upright systolic/diastolic BP post-SHU compared with pre-SHU.

combination of SHU, fludrocortisone, and increased water and salt intake, so identifying the exact contribution from SHU is often not possible. The improvement in orthostatic blood pressure (BP) with SHU from the studies is summarised in Table 1.

SHU was first described by two American physicians, MacLean and Allen [11], in 1940. They observed that patients with OH were most symptomatic early in the morning after lying horizontal overnight but that they improved during the day. They therefore advised their patients to place the head-end of the bedposts on two 18-inch height chairs. This was equivalent to an angle of 13° in a standard 75-inch bed. This resulted in improvements in both BP and symptoms. In 1943, Corcoran *et al.* [12], also American, showed how SHU was beneficial to a 40-year-old woman after she slept at 40° tilt for 2 months. In 1969, Bannister *et al.* [13] reported that three out of four of his patients improved after sleeping in chairs and taking fludrocortisone. This improvement disappeared when the patients slept horizontal for one night.

More recently, Ten Harkel *et al.* [14] and van Lieshout *et al.* [15] described studies using SHU at 12° in combination with fludrocortisone, intake of fluid of at least 2 l and >150 mmol sodium per day. They found improvement in both BP and orthostatic tolerance. Finally, Kardos described how SHU at 15° rendered a 66-year-old man symptom-free when salt-enriched diet and fludrocortisone had been insufficient to prevent recurrent syncope.

The aim of our study was to determine the extent to which SHU is used in current clinical practice among experts for the treatment of OH and how it is prescribed.

Methods

We carried out a postal survey of medical practitioners who attended an international symposium on syncope in Newcastle upon Tyne, UK, which took place in November 2003. A total of 238 delegates attended the conference, of which 18 non-clinical delegates were excluded. We sent out 220 questionnaires at the first mailing in February 2004. The

breakdown of specialty of delegates was as follows: 128 (58%) were in geriatric medicine, 33 (15%) general medicine, 26 (12%) cardiology, 15 (7%) physiology, 11 (5%) neurology and 7 (3%) not determinable. The second mailing was carried out 2 months later to non-respondents. We completed the survey on 31 August 2004.

The structured questionnaire ascertained the respondents' country and positions in their departments. The rest of the questionnaire was divided into four sections. They were asked (i) if they routinely prescribed SHU, (ii) whether SHU was used before medications, (iii) about the angles and the heights of elevation of the head of the bed and (iv) their reasons for not using SHU. The other modalities of treatment for OH they used were also obtained. Where the respondents gave specific heights of elevation instead of angles, we calculated the corresponding angle of the tilt of bed based on the standard 75-inch bed.

Results

There were 149 respondents from 121 hospitals, who represented an overall 67% response rate. Of the respondents, 135 (91%) were from the United Kingdom. Consultants or heads of departments accounted for 105 (70%) of the replies, registrars or associate specialists 34 (23%) and three were clinical nurse specialists; seven doctors did not specify their positions. The specialties in which the respondents practised are as follows: geriatric medicine 96 (64%), general medicine 29 (20%), cardiology 12 (8%), physiology 7 (5%) and neurology 5 (3%).

Of the respondents, 90 (60%) prescribed SHU—40 (27%) routinely and 50 (33%) occasionally. Fifty-nine (40%) respondents never prescribed SHU. Thirty-eight respondents (25%) used SHU before prescribing medications. Geriatricians were no different in their prescription compared with other specialties whether in using it as part of OH treatment [geriatricians (G) versus non-geriatricians (non-G), 57/96 versus 33/53, chi-square = 0.1191, *df* = 1, *P* = 0.729] or in using it before medications (G versus non-G, 25/96 versus 13/53, chi-square = 0.411, *df* = 1, *P* = 0.839).

Table 2. The angle of tilt of the bed (based on a standard 75-inch bed), the corresponding height of elevation in inches and the number of medical practitioners prescribing it

Angles in degrees	Corresponding height in inches	Number of medical practitioners prescribing this angle
<3	<4	6
3–5	4–6	24
5.5–10	8–13	14
12–25	16–32	11
30–45	38–53	11

Of the respondents, 66 gave specific heights or angles they used. Of these, 44 (67%) used angles $<12^\circ$. Twenty-four (36%) prescribed angles between 3 and 5° (Table 2). The median [interquartile range (IQR)] angle of elevation was 6.5 (16) degrees. Of the 24 respondents who did not specify angles or heights, some suggested raising the head of the bed using pillows, telephone books, bricks, blocks or heights as ‘high as the patient could tolerate’.

In total, 68 (46%) respondents gave reasons for not prescribing SHU. The main reasons for not using were lack of belief in its effectiveness 37 (54%), patient inconvenience 18 (26%), patient intolerance 16 (24%) and because more effective treatments were available 16 (24%).

Fludrocortisone was the most commonly prescribed treatment with 135 (91%) of the medical practitioners using it for treatment of OH. SHU [79 (53%)] ranked fifth after increased fluid intake [108 (72%)], physical counter-maneuvres [98 (66%)] and salt loading [87 (58%)]. Other modalities used were midodrine [74 (50%)], exercise-training [42 (28%)], compression hosiery [29 (19%)], desmopressin [10 (7%)], caffeine tablets, ephedrine and non-steroidal anti-inflammatory medications.

Discussion

Our survey showed that SHU was regularly used by a significant proportion of syncope experts for the treatment of OH and that geriatricians were the largest specialty involved in this treatment.

The most common angles used were between 3 and 5° (corresponding to 4- to 6-inch elevation). Only a third of those who used SHU were recommending angles for which evidence exists (i.e. $\geq 12^\circ$). It is noteworthy, however, that a significant proportion of respondents were unconvinced about its efficacy or tolerability.

SHU is postulated to work through the renin-angiotensin system (RAS) by reducing overnight natriuresis and diuresis [16], as patients with OH can lose up to 1 kg in weight overnight [17] while recumbent. A reduction in renal arterial pressure by SHU is thought to activate the RAS, which results in sodium and water retention [10]. Given the physiological basis for its perceived mechanism of action, the angle of tilt may be important for efficacy.

Although the original studies demonstrated efficacy at angles of at least 12° , our literature review found a variety of recommendations for SHU angles. The European Society

of Cardiology [9] recommends $10\text{--}20^\circ$, while American physicians such as Bradley and Davis [8] and Engstrom and Aminoff [18] suggest angles of $5\text{--}20$ and $>30^\circ$, respectively. Other proponents [6] recommend raising the bed head by blocks or tilting the mattress, rather than the bed, with polystyrene wedges but did not specify an angle.

Some limitations to this study must be acknowledged. We did not ascertain the age range of the patients handled by the respondents although almost two-thirds were geriatricians, suggesting that a significant proportion of patients treated were elderly. Users of this therapy may have been more likely to respond, which may have led to an overestimation of its use. However, a response rate of 67% is good for a study of this type, and the specialty breakdown of respondents was similar to the overall sample.

The evidence for the effectiveness of SHU is sparse, and there is currently no literature to support SHU at $<12^\circ$ or indeed in older people at all. At 12° , some patients have complained of sliding down to the end of the bed [14] and some have developed peripheral oedema, so there must be some concern about compliance when advising older persons to sleep at this degree of elevation.

In conclusion, the conflicting recommendation of SHU angles in the literature is reflected in the lack of clarity in clinical practice. SHU is not an uncommon treatment, being used by more than half of the medical practitioners surveyed. The majority of respondents used smaller angles for which there is no literature support. Further studies are required to determine whether the more commonly prescribed lesser angles are effective and safe in older patients. The mechanisms of action of SHU and its effectiveness in those with and without AF need to be further investigated. Comparison with existing treatments would also be worthwhile.

Further research is required to determine if angles $<12^\circ$ are effective and safe in older patients.

Key points

- More than half of the medical practitioners surveyed used sleeping head-up as a treatment for OH.
- Two-thirds of respondents recommended angles ($<12^\circ$) for which there is no literature support.

Conflicts of interest

None.

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Appendix

Questionnaire on clinical practice: sleeping in the head-up position

Position in department					
Head of department	☐	Consultant	☐	Clinical fellow/registrar	☐
Nurse specialist	☐	Others	☐	Specify	
1. Do you routinely advise patient with orthostatic hypotension to sleep with the head of the bed raised?					
Yes	☐	No	☐	Sometimes	☐
Would you routinely use this before starting patients on medications?					
Yes	☐	No	☐	Sometimes	☐
2. If yes, how high do you ask patient to raise the head of the bed?					
Degree		Height raised		Exact height not specified (few inches)	
3. If no, why not?					
Patient inconvenience	☐	Not tolerated by patients			☐
Not convinced it is effective	☐	More effective treatment available			☐
Others					
4. Please tick the following measures you are advising for treatment of orthostatic hypotension (you may choose as many as you like).					
Drink 1.5–2l of non-cafeinated fluids	☐				
Salt loading	☐				
Physical counter-manoeuvres	☐				
Exercise training	☐				
Sleep head-up	☐				
Fludrocortisone	☐				
Midodrine	☐				
Desmopressin	☐				
Others (please specify)	☐				
Comments					