Orthostatic Hypotension in the First Minute After Standing Up

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What Is the Clinical Relevance and Do Symptoms Matter?

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See related article, pp 946–954

After 1980, techniques became available to monitor rapid hemodynamic changes continuously and noninvasively.[1] These extraordinary scientific developments enabled clinicians and researchers at the end of the 20th century to noninvasively study the physiological mechanisms underlying the transient fall in blood pressure (BP) that occurs in the first 30 s of standing. TILDA (The Irish Longitudinal Study on Ageing), a large prospective randomly selected population-based study of over 8000 community-dwelling adults aged >50 years, has shown that an impaired recovery of BP after the initial fall is associated with long-term adverse cardiovascular health outcomes (see later).[2] In this issue of *Hypertension*, the longitudinal association between symptomatic orthostatic hypotension (OH) at 30 s of standing and the occurrence of incident late-life depression in the TILDA cohort is reported.[3]

In this editorial commentary, we address the clinical and prognostic significance of symptomatic OH in the first 30 s after standing up because of impaired orthostatic BP recovery patterns and incident late-life depression. For this, we will focus first on the classification and pathophysiology of short-term (first 180 s) orthostatic adjustments because it is important to ground observational associations in physiology.

Physiology

It is useful to classify the short-term orthostatic circulatory response on active standing in

1. the initial response (first 30 s) and
2. the early phase of stabilization (30–180 s).[2]

Details of the physiological mechanisms underlying the typical transient fall in BP that occurs in the first minute of standing in healthy subjects (Figure, top) have been addressed recently.[2]

Spectrum of Abnormal Circulatory Responses

Initial OH

Initial OH (IOH) has been defined as a transient decrease in systolic BP (SBP) of >40 mm Hg and/or >20 mm Hg in diastolic BP within 15 s of standing, with complete recovery within 30 s (Figure). In clinical practice, the systolic cutoff is usually used. Initial OH is a clinical sign and may be symptomatic or asymptomatic. The physiological mechanism underlying initial OH is a mismatch between cardiac output and systemic vascular resistance and can be either based on a fall in cardiac output or systemic vascular resistance during the BP nadir.[2]

Delayed Recovery

Delayed recovery has been defined as the inability of SBP to recover to ≤20 mm Hg of supine baseline values at OH-30, but not meeting the criteria of classical OH (see below). The delay can be considerable, but recovery occurs by definition within 3 minutes of standing. An abnormally large initial fall in SBP (>40 mm Hg) occurs in ≈60% of the patients with a delayed initial recovery of BP.[3] A delayed recovery of BP is reported to occur after surgical denervation of the carotid sinus baroreceptors (operation for carotid body tumors) and with medications interfering with vasoconstrictor mechanisms, such as central sympathetic outflow blocking agents and α-blockers, indicating that impaired baroreflex functioning is involved.[2] In healthy aging, a delayed recovery is rare.[2]

Classical OH

Classical OH has been defined as a sustained decrease of ≥20 mm Hg in SBP or ≥10 mm Hg in diastolic BP between 60 and 180 s of standing. It is a clinical sign and can be symptomatic or asymptomatic. In clinical practice, only the systolic cutoff is used because an abnormal orthostatic fall in diastolic BP without an abnormal fall in SBP is very rare among patients with classical OH.[2] The physiological mechanism underlying classical OH can be largely divided into cardiac output–mediated OH (volume depletion) or systemic vascular resistance–mediated OH (neurogenic OH, drug-induced).

Clinical and Prognostic Significance of the Circulatory Response in the First 30 s After Standing Up

Clinical Significance

The presence of any of these abnormal BP recovery patterns can be accompanied with or without symptoms on standing.

The opinions expressed in this article are not necessarily those of the editors or of the American Heart Association.

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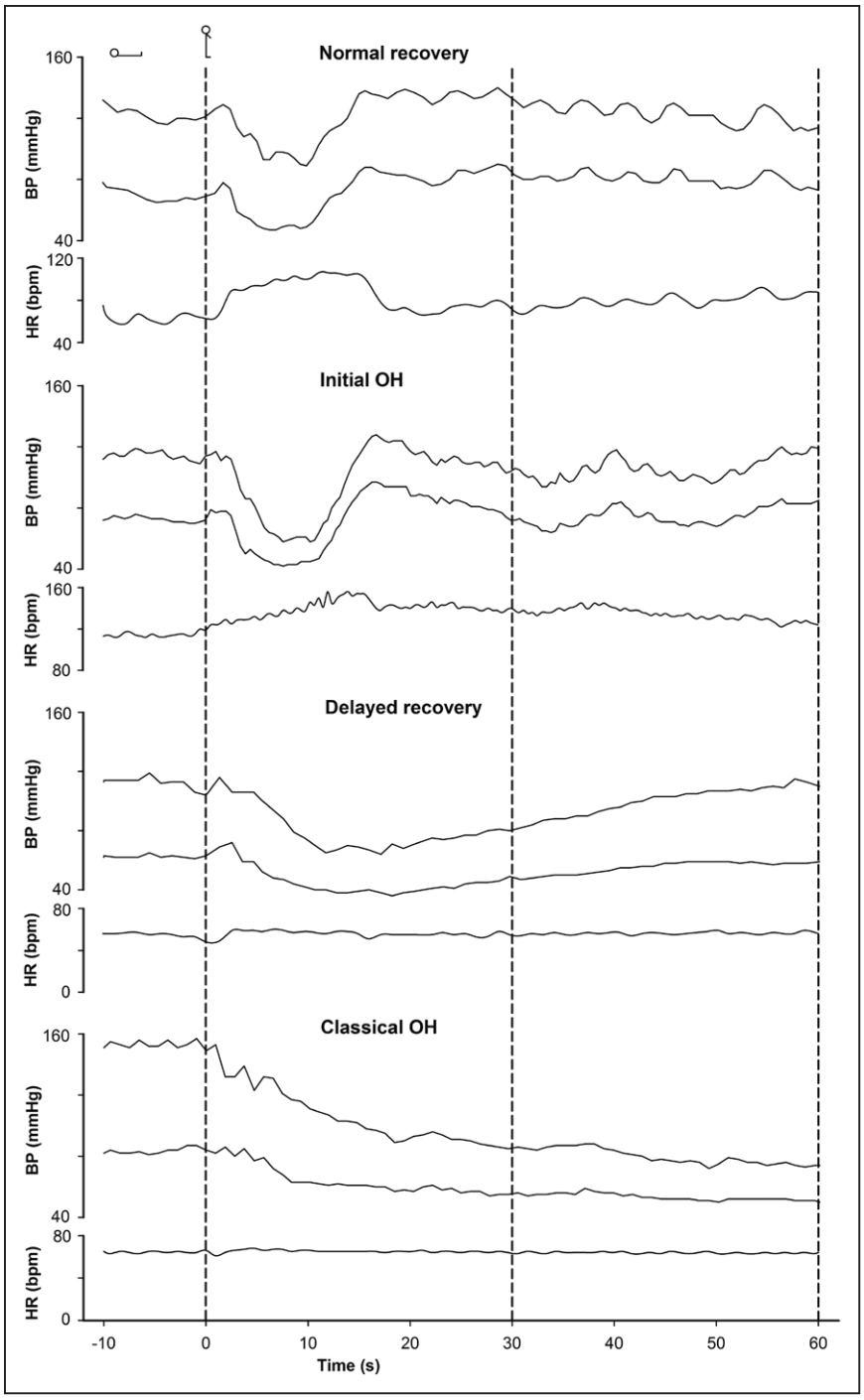

Figure. Spectrum of normal and abnormal circulatory responses. Normal blood pressure (BP) recovery in a 26-year-old healthy female, initial orthostatic hypotension (OH) in a 14-year-old healthy male, delayed BP recovery in a 76-year-old man with a history of hypertension on 3 vasoactive drugs, and classical OH in a 76-year-old man with primary autonomic failure are illustrated. HR indicates heart rate

Complaints of light-headedness, visual disturbances, and (near) syncope on standing are an important clinical issue because they are a common reason for referral to an emergency setting or a syncope unit. These complaints are characterized by their time of onset (5–10 s after standing up) and short duration (disappearance within 20–30 s). The complaints are common in teenagers and young adults and in older subjects using vasoactive medication.[2] Case reports are given in http://en.syncopedia.org/wiki/Case_reports.

Symptomatic OH typically occurs when SBP falls to values <80 mm Hg.[4] The results of Briggs et al[3] correspond to this, with BP nadir in the symptomatic OH-30 group of around 80 mm Hg after standing up. Recognition of symptomatic OH is important because effective advice can be given to young adults, clench the buttocks when standing up.[2] In elderly subjects, standing up slowly to antagonize the large fall in BP is more appropriate. In addition, use of vasoactive and psychoactive drugs should be evaluated and discontinued if possible (see below).

Prognostic Significance

Besides the association with symptoms of light-headedness and (near)syncope, delayed recovery (OH-30) has been associated with unexplained injurious falls, cognitive decline, and

cardiovascular mortality.[2,3] Many age-related mechanisms have been linked to late depression, but cardiovascular disease has been best studied. Imaging studies have consistently demonstrated cerebral perfusion deficits in frontal regions and increased white matter hyperintensities in depressed older patients.[5] Moreover, a relationship of late-life depression with OH has been described in cross-sectional studies.[2,3,5] The association found by Briggs et al[3] in a controlled longitudinal study between symptomatic OH in the first minute of standing and late-life depression is therefore an important finding.

This complex and possibly multifactorial relationship may be partly explained by the strain of repetitive episodes of arterial hypotension resulting in cerebral hypoperfusion. The brain anoxia reserve time has been estimated to be around 6 s.[4] Thus, a period of ≈6 s of arterial hypotension centered around 12 s after standing up is likely to be needed before symptomatic OH will occur. Importantly, cerebral autoregulation with a latency of ≈10 s is too slow to adjust brain flow during short episodes of arterial hypotension.[2,4] Therefore, it is suggested that subjects with symptomatic OH-30, characterized by a low nadir and delayed recovery of BP (Figure), will repetitively experience a greater hypotensive load on standing, resulting in recurrent episodes of cerebral hypoperfusion. The concept of the importance of repetitive episodes of hypotension is supported by results in animal models, whereby repeated hypotensive insults in mice produced significantly more brain tissue injury than single insults.[5] Although most studies in elderly may be difficult to interpret because of multiple concurring risk factors, a strong clinical argument supporting a causative role for OH and white matter lesions is the increased risk of white matter brain lesions for frequent syncope and orthostatic intolerance in a young population-based cohort (aged 30–60 years) of migraineurs and healthy controls.[6]

In conclusion, it is appropriate to recognize the complaints of initial OH, and checking BP shortly after standing can provide clinically meaningful information. It is an important issue given new guidelines about the treatment of hypertension in the elderly.

Physicians who treat older patients with depressive symptoms should question them about their history of light-headedness when standing. This because OH can be a potential modifiable factor in the complex cause of depression in older people[3] and maybe even more importantly, because of the known side effect of psychoactive drugs, that is, OH.

Disclosures

None.

References

1. Westerhof BE, Settels JJ, Bos WJ, Westerhof N, Karemaker JM, Wieling W, van Montfrans GA, van Lieshout JJ. Bridging cardiovascular physics, physiology, and clinical practice: Karel H. Wesseling, pioneer of continuous noninvasive hemodynamic monitoring. *Am J Physiol Heart Circ Physiol*. 2015;308:H153–H156. doi: 10.1152/ajpheart.00839.2014.
2. van Wijnen VK, Finucane C, Harms MPM, Nolan H, Freeman RL, Westerhof BE, Kenny RA, Ter Maaten JC, Wieling W. Noninvasive beat-to-beat finger arterial pressure monitoring during orthostasis: a comprehensive review of normal and abnormal responses at different ages. *J Intern Med*. 2017;282:468–483. doi: 10.1111/joim.12636.
3. Briggs R, Carey D, Kennelly SP, Kenny RA. Longitudinal association between orthostatic hypotension at 30 seconds post-standing and incident late-life depression. *Hypertension*. 2018;71:946–954. doi: 10.1161/HYPERTENSIONAHA.117.10542.
4. Wieling W, Thijs RD, van Dijk N, Wilde AA, Benditt DG, van Dijk JG. Symptoms and signs of syncope: a review of the link between physiology and clinical clues. *Brain*. 2009;132(pt 10):2630–2642. doi: 10.1093/brain/awp179.
5. Colloby SJ, Vasudev A, O'Brien JT, Firbank MJ, Parry SW, Thomas AJ. Relationship of orthostatic blood pressure to white matter hyperintensities and subcortical volumes in late-life depression. *Br J Psychiatry*. 2011;199:404–410. doi: 10.1192/bjp.bp.110.090423.
6. Kruit MC, Thijs RD, Ferrari MD, Launer LJ, van Buchem MA, van Dijk JG. Syncope and orthostatic intolerance increase risk of brain lesions in migraineurs and controls. *Neurology*. 2013;80:1958–1965. doi: 10.1212/WNL.0b013e318293e1c7.

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