Influence of VA hemodynamics on orthostatic vertigo

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Objective

Patients with vertigo experience different symptoms such as rotary sensation, swaying sensation, or faintness when rising to the standing position. These symptoms, hereafter referred to as orthostatic vertigo (OV), are believed to occur because of hypoperfusion of the brain, with an orthostatic decrease in blood pressure (BP). When moving from the horizontal to the vertical position, in patients with vertigo, the BP decreases by 0.38 cm Hg/beat/min for every 1°/min of head rotation. When rising to the standing position, BP is generally considered to be facilitated by the VA perfusion pressure and vascular resistance in the VA. However, in some cases, the orthostatic decrease in BP is not directly involved in the onset of OV. Because the vertebral artery (VA) supplies blood to the central vestibular system, which is involved in the onset of vertigo, an investigation of the relationship between orthostatic hypotension (OH) and orthostatic decrease in VA blood flow velocity (VAFV) was performed to determine whether these 2 factors trigger OV.

Methods

In the 251 subjects, BP and extracranial Doppler (ECD) sonography spectrum of the VA were recorded in the supine and standing positions. Subjects were categorized into the OH and non-OH groups, and the orthostatic decrease in VAFV in patients with and without OH was evaluated in each group.

Results

Because a significantly greater orthostatic decrease in VAFV was observed in patients with OV than in those without OV in this study, the VA hemodynamics during orthostasis may be strongly associated with the onset of OV.

Discussion

Results

Table 1. Relationship between OH and OV

Discussion

Our results suggest that the decrease in VAFV induced by standing triggered OV, irrespective of the OH status and that ECD sonography is a useful method for detection of orthostasis and examination of hemodynamics in the VA.

Conclusion

Because a significantly greater orthostatic decrease in VAFV was observed in patients with OV than in those without OV in this study, the VA hemodynamics during orthostasis may be strongly associated with the onset of OV. When the mechanism for maintaining the BP during the standing position is disturbed due to the autonomic dysfunction, an orthostatic decrease occurred in VAFV in patients with a marked orthostatic decrease in BP while standing. In contrast, in some patients without OH, the VAFV decreased while rising to the standing position. If not otherwise autoregulation was impaired in patients, the VA decreased even with a slight orthostatic decrease in BP. Furthermore, the VA blood flow was generally considered to be facilitated by the VA perfusion pressure and vascular resistance. Therefore, an organic abnormality in the VA (e.g., VA stenosis or winding) or high blood viscosity (e.g., hyperlipidemia or diabetes mellitus) affecting vascular resistance in the VA was presumed to be present.

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![Figure 1. Methods of measuring VAFV by ECD](image1)

![Figure 2. The orthostatic decrease in VAFV in all patients](image2)

![Figure 3. The orthostatic decrease in VAFV in the OH group](image3)

![Figure 4. The orthostatic decrease in VAFV in the non-OH group](image4)