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Canalith repositioning in apogeotropic horizontal canal benign paroxysmal positional vertigo: Do we need faster maneuvering?

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ABSTRACT

A correct diagnosis and a proper treatment may yield a rapid and simple cure for benign paroxysmal positional vertigo (BPPV). Although the Gufoni maneuver is widely used to treat apogeotropic horizontal-canal BPPV (HC-BPPV), few studies have clarified the relationship between the speed and intensity of maneuver execution and successful canalith reposition. To evaluate the effect of accelerated execution of the Gufoni maneuver, a prospective randomized controlled study was conducted with HC-BPPV patients in a single dizziness clinic. The patients had been diagnosed with apogeotropic HC-BPPV and were undergoing treatment at the dizziness clinic of a tertiary university hospital from January 2013 to August 2014. Two groups were treated with the maneuver performed at different speeds and the resolution rate was compared. The accelerated maneuver group was subjected to faster position changing—within 1 s—during the reposition maneuver, while the non-accelerated maneuver group underwent slower maneuvers. Therapeutic efficacy was defined as dizziness relief or resolution of nystagmus within 1 h. Fifty patients with apogeotropic HC-BPPV were enrolled and treated with the Gufoni maneuver in two groups of 25 patients. The overall resolution rate was 48% (24 of 50; $p = 1.00$), regardless of acceleration. Our results suggest that a faster, more intense execution of the Gufoni maneuver provides little benefit in treating apogeotropic HC-BPPV. Detachment of the otolith from the cupula or the gravitational force—when the otolith is in the anterior arm of the HC—may be more important contributors to treatment efficacy.

1. Introduction

Benign paroxysmal positional vertigo (BPPV) is one of the most common causes of dizziness [1–4]. The prevalence of BPPV increases with age and is two to three times more frequent in women than in men [3,4]. Pathophysiologically, BPPV occurs when detached otolith particles from the otolith organ in the inner ear float freely in the semicircular canal (canalolithiasis) or are attached to the cupula of the semicircular canal (cupulolithiasis), producing aberrant rotational stimulation upon movement of the head [5,6].

BPPV may resolve spontaneously without specific treatment. A prospective longitudinal study showed that the median interval between the onset of symptoms and spontaneous resolution in untreated patients was 7 days when the horizontal canal was affected and 17 days when the posterior canal was affected [7]. However, appropriate canalith repositioning can improve symptoms more quickly and effectively; a recent meta-analysis supported intervention rather than waiting for spontaneous resolution in BPPV [4,8].

The modified Gufoni maneuver for the apogeotropic variant is widely used to treat apogeotropic HC-BPPV [4,9–11]. It consists of three major head position changes; the 1st step is to lay the affected ear down from a seated position; the 2nd step is to turn the head toward the ceiling, and the 3rd is to sit back up (Fig. 1). In the original description of the Gufoni maneuver for the apogeotropic variant [10], the head is turned downwards in the second step. The method used in our study, therefore, is a "modified" Gufoni maneuver specific for the apogeotropic variant. However, the common, simpler term "Gufoni maneuver" has been used in this paper to describe the modified version.

Rapid position changes have been recommended in most studies [9,11]. However, few studies have explored how fast the rotation between the positions should be [11,12]. To our knowledge, it remains unclear whether or not the acceleration–deceleration between the positional changes facilitates movement of the otoliths. Rapid turning of the head and neck may result in injury, especially with elderly patients who are apt to suffer from BPPV and osteoporosis. If slower position

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Table 1
Comparisons of clinical characteristics and the treatment effect of each group in the patients with benign paroxysmal positional vertigo involving the horizontal canal.

	Gufoni's maneuver (apogeotropic) (n = 50)		
	A (n = 25)	Non-A (n = 25)	*p*
Clinical and demographic			
Age, mean ± SD	64.5 ± 11.7	64.7 ± 16.2	0.96
Age >65 years, n (%)	13 (52.0)	15 (60.0)	0.57
Male, n (%)	14 (56.0)	10 (40.0)	0.26
Hypertension, n (%)	12 (48.0)	10 (40.0)	0.76
Diabetes, n (%)	4 (16.0)	3 (12.0)	1.00
Hx of dizziness, n (%)	17 (68.0)	13 (52.0)	0.25
Hx of headache, n (%)	8 (32.0)	7 (28.0)	0.76
Right*, n (%)	13 (52.0)	16 (64.0)	0.39
Treatment effect			
Resolution, n (%)	12 (48.0)	12 (48.0)	1.00
Complication, n (%)	5 (20.0)	2 (8.0)	0.46

A: acceleration group, Non-A: non-acceleration group.
P: *p-value*
* The affected ear is the right.

changing is not inferior to its faster counterpart, it would have a benefit in terms of safety and comfort.

We performed a prospective randomized comparative study of patients with apogeotropic HC-BPPV at the dizziness clinic of a university hospital to determine whether faster repositioning (acceleration and deceleration) during each step of the Gufoni maneuver would influence treatment efficacy

2. Subjects and methods

2.1. Subjects

Patients who visited the Dizziness Clinic of the Department of Neurology of Chonnam National University Hospital between January 2013 and August 2014, and who were compatible with HC-BPPV criteria were enrolled. The inclusion criteria for this study were 1) a history of positional vertigo, 2) direction-changing horizontal nystagmus beating toward the uppermost ear (apogeotropic nystagmus) in both lateral head turning positions, and 3) absence of identifiable CNS disorders that could explain the positional vertigo and dizziness [9]. To exclude patients with apogeotropic nystagmus from central pathologies, all patients underwent neuro-otologic examinations including spontaneous and gaze-evoked nystagmus (GEN), horizontal and vertical smooth pursuit and saccades, limb ataxia, and balance function in addition to routine neurologic examinations. The study design was thoroughly explained to the subjects, and the patients voluntarily consented to participate. This study was approved by the Institutional Review Board of Chonnam National University Hospital.

2.2. Diagnostic procedure: lateralization of the lesion side of HC-BPPV

The supine roll test (also called the log-roll test) was performed to diagnose HC-BPPV [4,13]. The subjects were asked to lie in a supine position, fold their head toward the chest at 30°, and then turn it to one side and then the other. Since ampullopetal flow of the endolymph evokes a greater response than ampullofugal flow in the horizontal canal (Ewald's second law), the induced nystagmus is stronger toward the healthy ear in apogeotropic HC-BPPV [14,15]. Nystagmus was observed after lying down from a seated position (lying-down nystagmus) and after bending the head down while seated (head-bending nystagmus) [14,15]. The patients also underwent right and left Dix–Hallpike maneuvers and a straight head-hanging test to exclude BPPV in the posterior or anterior canal.

Nystagmus was observed without fixation using a video-Frenzel goggle system (SLMED, Seoul, Korea). When the intensity of the nystagmus on one side was similar to that on the other, and the treatment side could not be determined, lying-down nystagmus or head-bending nystagmus was utilized for lateralization of the lesion side. The lying-down nystagmus mostly beats to the ipsilesional side, and head-bending nystagmus usually beats to the opposite side of the lying-down nystagmus [14,15].

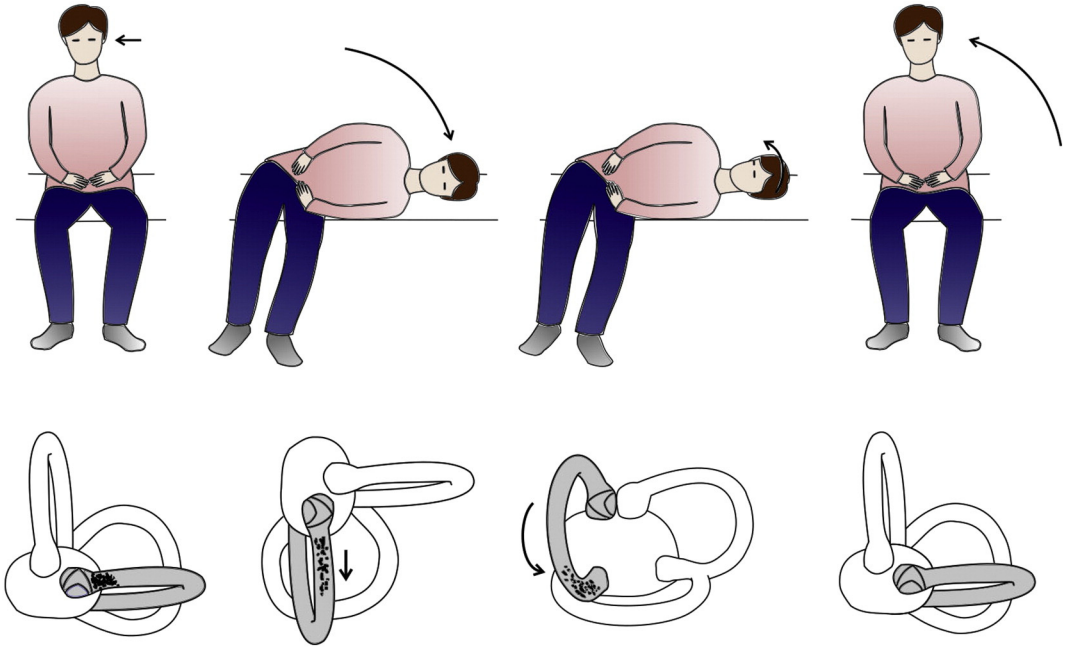

Fig. 1. Gufoni maneuver for treatment of the apogeotropic variant of horizontal canal paroxysmal positional vertigo. In the sitting position (a), the debris is attached to the cupula or in the anterior part of the left HC. Side-lying on the affected side (b) causes the particles to move toward the posterior part of the HC and produces an ampullofugal endolymph flow and intense horizontal nystagmus, beating away from the ground (right beating nystagmus, in this case). After rotating the head toward the ceiling (c), particles move further toward the posterior part and fall into the vestibule, again causing an ampullofugal endolymph flow and nystagmus beating toward the healthy side (right). Each position is maintained for at least 2 min or until the nystagmus disappears. After then, the patient is returned to the upright position (d).

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