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Roll maneuvers versus side-lying maneuvers for geotropic horizontal canal BPPV: a systematic review

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ABSTRACT

Background: The vertigo associated with horizontal canal benign paroxysmal positional vertigo (BPPV) is usually much more intense than that associated with posterior canal BPPV. In addition, horizontal canal BPPV often adversely affects dynamic balance.

Objectives: The purpose of this systematic review was to determine which current roll and side-lying maneuvers are most effective while treating individuals with geotropic horizontal canal BPPV.

Methods: CINAHL Complete, PubMed, and Web of Science were the databases accessed from inception through 2020 by all four authors. The search terms were geotropic AND (horizontal OR lateral) AND vertigo. The methodological rigor of the included studies was evaluated using a 10-item tool created by Medlicott and Harris.

Results: All of the maneuvers included in this systematic review demonstrated high efficacy and few contraindications. Horizontal canal BPPV tends to spontaneously resolve in a relatively short period of time secondary to the anatomical positioning of the semicircular canals. However, the maneuvers described in this systematic review may expedite the natural remission process in individuals with long-term symptoms associated with horizontal canal BPPV.

Conclusions: It is recommended that clinicians utilize one of the maneuvers identified in this systematic review for individuals with geotropic horizontal canal BPPV. The Gufoni maneuver might be preferable to the Baloh 360-degree roll maneuver and/or the Lempert 270-degree roll maneuver when treating individuals who are elderly, who are obese, and/or who experience immobility. If an individual is unable to tolerate a maneuver or prefers not to have one performed, forced prolonged positioning is another possible option.

KEYWORDS

Baloh; benign paroxysmal positional vertigo; Gufoni; horizontal canal; Lempert

Introduction

Horizontal canal BPPV was originally discovered by McClure [1] in 1985. Individuals with horizontal canal BPPV usually complain of vertigo when they roll over in bed and sometimes experience vertigo when they turn their head side to side [2]. Moving the head or body in a vertical direction seldom induces their symptoms. The gold standard evaluation tool used to diagnose horizontal canal BPPV is the supine roll test [3]. When this test is performed, an individual with horizontal canal BPPV generally demonstrates a horizontal nystagmus that has a relatively short latency, a relatively long duration, and no fatigability if the test is re-executed [2]. If the individual displays right-beating nystagmus when the head is rotated to the right and left-beating nystagmus when the head is rotated to the left, the horizontal canal BPPV is classified as the geotropic subtype [1]. In this particular subtype, the otoconia are free floating in the posterior arm of the horizontal semicircular canal. If the nystagmus is right-beating when the head is turned

to the left and left-beating when the head is turned to the right, the apogeotropic subtype of horizontal canal BPPV is identified [4]. The otoconia are either free floating in the anterior arm of the horizontal semicircular canal or are adhered to the cupula in this particular subtype. In addition, Pagnini *et al.* [5] discovered that a greater intensity of nystagmus is directed toward the affected ear than toward the unaffected ear when the supine roll test is performed.

Although posterior canal BPPV is the most common type of BPPV, a 2010 study [6] found that over 40 percent of the participants had horizontal canal BPPV. Because of the anatomical positioning of the semicircular canals, horizontal canal BPPV tends to spontaneously resolve in a relatively short period of time [5, 7, 8]. However, the vertigo associated with horizontal canal BPPV is usually much more intense than that associated with posterior canal BPPV. Individuals with BPPV generally state that their emotional, functional, and physical well-being is negatively affected [9]. In addition,

Table 1. Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> • individuals diagnosed with geotropic horizontal canal BPPV not related to light cupula • replicable maneuver interventions for geotropic horizontal canal BPPV that are performed by a healthcare professional in the clinic and that do not require specialized equipment to perform • complete alleviation of nystagmus and/or vertigo as the outcome measure • studies with level 2 (randomized trials or observational studies with dramatic effect) or level 3 evidence (non-randomized controlled cohort/follow-up studies) 	<ul style="list-style-type: none"> • individuals diagnosed with apogeotropic horizontal canal BPPV or light cupula • individuals diagnosed with anterior canal BPPV or posterior canal BPPV • non-maneuver interventions for geotropic horizontal canal BPPV • interventions that are not replicable • interventions that are performed by an individual at home • interventions that require the use of specialized equipment to perform • studies with level 4 (case-series, case-control studies, or historically controlled studies) or level 5 evidence (studies that use mechanism-based reasoning)

horizontal canal BPPV often adversely affects dynamic balance [10]. Because of their subjective complaints and objective problems, individuals with horizontal canal BPPV should be provided with targeted interventions designed to expedite the natural remission process.

The primary interventions that have been developed for the geotropic subtype of horizontal canal BPPV include roll maneuvers and a side-lying maneuver. The first roll maneuver was administered by Baloh *et al.* [2] in 1993. This maneuver consisted of rolling two participants from supine 180 degrees toward the unaffected ear. In 1994, Lempert [11] recommended using a 270-degree roll; and Baloh [12] suggested using a 360-degree roll, also known as the barbecue (BBQ) roll. Although the 180-degree roll maneuver was not effective, both the Lempert 270-degree roll maneuver [11] and the Baloh 360-degree roll maneuver [12] successfully resolved the vertigo of the two individuals who participated in each study. Then in 2001, Appiani *et al.* [13] reported on a side-lying maneuver that was originally created by Gufoni and Mastro Simone. The Gufoni maneuver [13] is performed in two steps. During step one, the individual is moved from a seated position to a side-lying position toward the unaffected ear. During step two, the individual's head is turned 45 degrees downward.

In 2012, Kinne *et al.* [14] published a systematic review that examined the efficacy of techniques designed for the specific management of horizontal canal BPPV. However, since that time, several additional treatment options have been developed. Although a 2014 systematic review [15] and a 2020 meta-analysis [16] have also been published on the topic, they focused exclusively upon the impact of the Gufoni maneuver. Therefore, the purpose of this systematic review was to determine which current roll and side-lying maneuvers are most effective while treating individuals with geotropic horizontal canal BPPV.

Methods

Databases and search terms

CINAHL Complete, PubMed, and Web of Science were the databases accessed from inception through 2020 by all four authors. The search terms were geotropic AND (horizontal OR lateral) AND vertigo. The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement [17] was used to select the studies identified through the database search and then to evaluate and analyze the selected studies. This PRISMA process was based upon the inclusion and exclusion criteria (Table 1). Using the Cochrane Library, no similar systematic reviews were found. This systematic review excluded non-English studies which introduced a potential language bias.

Methodological rigor

The methodological rigor of the included studies was evaluated using a 10-item tool created by Medlicott and Harris [18]. The tool utilizes a point system in which one point is awarded for each item that meets the criteria. Studies with a methodological rigor score of 0 to 5 are considered “weak”, studies with a methodological rigor score of 6 to 7 are considered “moderate”, and studies with a methodological rigor score of 8 to 10 are considered “strong” (Table 2). To minimize bias, the four authors evaluated each article and obtained agreement on the article's methodological rigor.

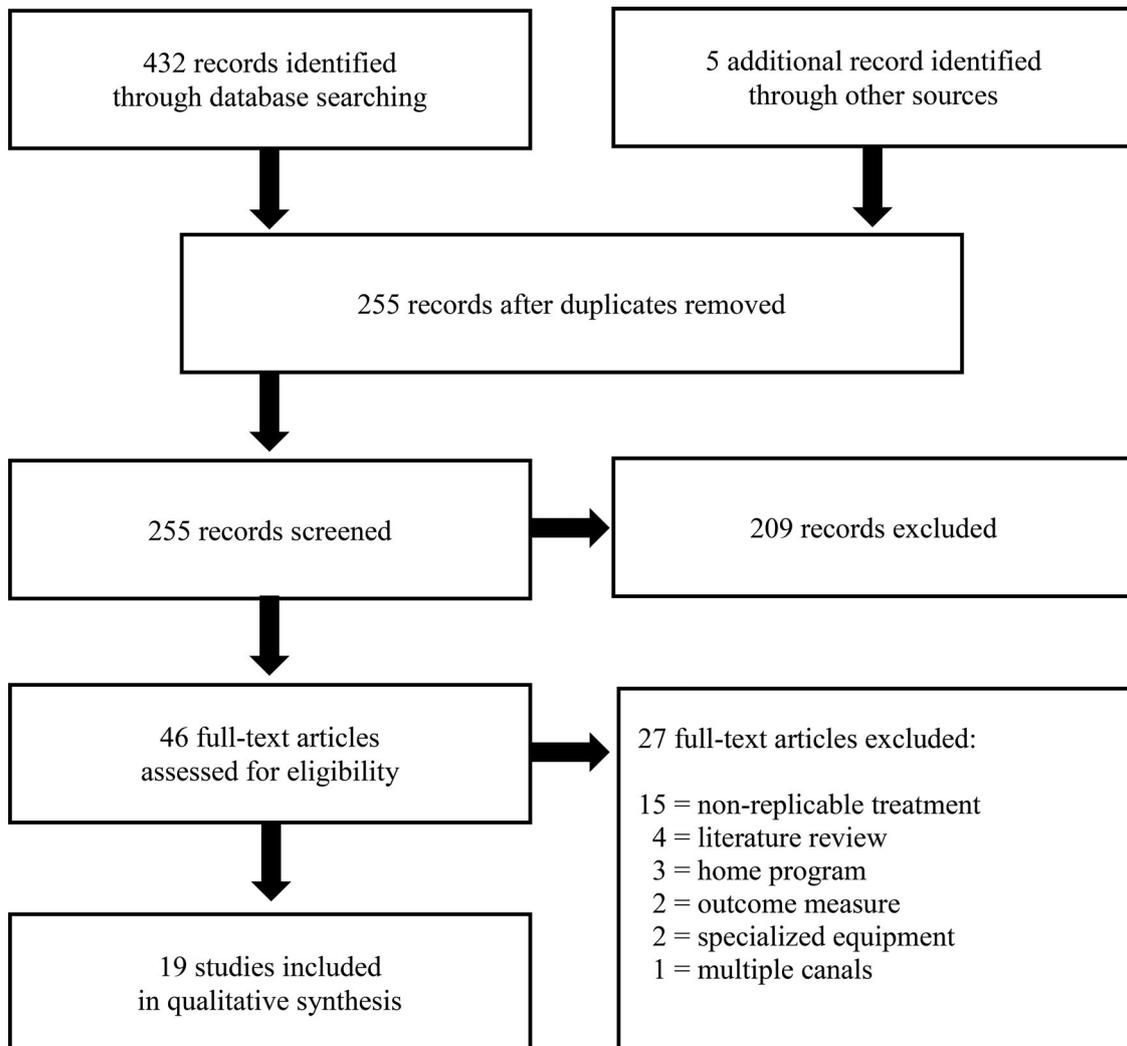
Results

Search strategy

As displayed in the PRISMA flow diagram [17], 432 articles were identified in a search of three online databases; and five additional articles were identified using supplemental sources (Figure 1). After assessing for duplicate articles, 255 articles were evaluated for relevance based upon their title and abstract.

Table 2. Methodological rigor (MR) overview [18].

Item	MR Criteria
1	randomization
2	inclusion and exclusion criteria were listed for the subjects
3	similarity of groups at baseline
4	the treatment protocol was sufficiently described to be replicable
5	reliability of data obtained with the outcome measures was investigated
6	validity data obtained with the outcome measures was addressed
7	blinding of patient, treatment provider, and assessor
8	dropouts were reported
9	long-term results were assessed <i>via</i> follow-up
10	adherence to home programs was investigated

**Figure 1.** PRISMA 2009 flow diagram [17].

Following this assessment, 46 full-text articles were evaluated. Based upon the inclusion and exclusion criteria, 19 articles [13, 19–36] were qualitatively analyzed.

Methodological rigor

The methodological rigor for each of the 19 included studies [13, 19–36] was determined using the Medlicott and Harris scale [18]. One study [29] had a score of 6/10, indicating moderate methodological rigor. The rest of the studies [13, 19–28, 30–36] had scores ranging from 2/10 to 5/10, indicating weak methodological rigor (Table 3).

Summary of studies

The methodological rigor, population, interventions, and outcomes of the 19 included studies [13, 19–36] are outlined in Table 4.

The following eight studies evaluated the efficacy of the Baloh 360-degree roll maneuver: Fife [20], White *et al.* [23], Escher *et al.* [25], Korres *et al.* [28], Maranhao and Maranhao-Filho [31], Shan *et al.* [32], Ban *et al.* [33], and Li *et al.* [35]. The Baloh 360-degree roll maneuver consists of rolling the participant from supine 360 degrees toward the unaffected ear in four 90-degree increments. Each of the four positions was held 30 s in three studies

Table 3. Methodological rigor (MR) results [18].

Author & Date	1	2	3	4	5	6	7	8	9	10	MR
Appiani <i>et al.</i> (1997) [19]	N	N	N	Y	N	N	N	Y	Y	N	3/10
Fife (1998) [20]	N	N	N	Y	N	N	N	Y	N	N	2/10
Nuti <i>et al.</i> (1998) [21]	N	N	N	Y	N	N	N	Y	Y	N	3/10
Appiani <i>et al.</i> (2001) [13]	N	N	N	Y	N	N	N	Y	N	N	2/10
Tirelli & Russolo (2004) [22]	N	Y	N	Y	N	N	N	Y	N	N	3/10
White <i>et al.</i> (2005) [23]	N	Y	N	Y	N	N	N	Y	N	N	3/10
Sekine <i>et al.</i> (2006) [24]	N	Y	Y	Y	N	N	N	N	N	N	3/10
Escher <i>et al.</i> (2007) [25]	N	N	N	Y	N	N	N	Y	Y	N	3/10
Riggio <i>et al.</i> (2009) [26]	N	Y	N	Y	N	N	N	Y	N	N	3/10
Casani <i>et al.</i> (2011) [27]	Y	Y	Y	Y	N	N	N	Y	N	N	5/10
Korres <i>et al.</i> (2011) [28]	N	Y	Y	Y	N	N	N	Y	N	Y	5/10
Kim <i>et al.</i> (2012) [29]	Y	Y	Y	Y	N	N	Y	Y	N	N	6/10
Mandala <i>et al.</i> (2013) [30]	Y	Y	Y	Y	N	N	Y	N	N	N	5/10
Maranhao & Maranhao-Filho (2015) [31]	N	N	N	Y	N	N	N	Y	Y	N	3/10
Shan <i>et al.</i> (2015) [32]	N	Y	Y	Y	N	N	N	Y	N	N	4/10
Ban <i>et al.</i> (2016) [33]	N	Y	Y	Y	N	N	N	Y	N	N	4/10
Ichijo (2017) [34]	N	N	N	Y	N	N	N	Y	N	N	2/10
Li <i>et al.</i> (2018) [35]	Y	Y	Y	Y	N	N	N	Y	N	N	5/10
Ichijo (2019) [36]	N	N	N	Y	N	N	N	Y	N	N	2/10

Item 1 = randomization.

Item 2 = inclusion and exclusion criteria were listed for the subjects.

Item 3 = similarity of groups at baseline.

Item 4 = the treatment protocol was sufficiently described to be replicable.

Item 5 = reliability of data obtained with the outcome measures was investigated.

Item 6 = validity data obtained with the outcome measures was addressed.

Item 7 = blinding of patient, treatment provider, and assessor.

Item 8 = dropouts were reported.

Item 9 = long-term results were assessed *via* follow-up.

Item 10 = adherence to home programs was investigated.

[25, 32, 33], 30 to 60 s in three other studies [23, 28, 31], and 60 s in another study [35]. Fife [20] did not report how long each position was held. The results of these eight studies are located in Table 4.

The following study evaluated the efficacy of the Tirelli 360-degree roll maneuver: Tirelli and Russolo [22]. The Tirelli 360-degree roll maneuver is similar to the Baloh maneuver. However, the participant keeps the head in 30 degrees of flexion throughout the maneuver; and the therapist shakes the participant's head after each 90-degree increment of movement. Each of the four positions is held 2 to 3 min. The results of this study are located in Table 4.

The following five studies evaluated the efficacy of the Lempert 270-degree roll maneuver: Appiani *et al.* [19], Fife [20], Nuti *et al.* [21], Sekine *et al.* [24], and Kim *et al.* [29]. The Lempert 270-degree roll maneuver consists of rolling the participant from supine 270 degrees toward the unaffected ear in three 90-degree increments. Each of the three positions was held 30 s in one study [19] and 30 to 60 s in two other studies [21, 29]. Fife [20] and Sekine *et al.* [24] did not report how long each position was held. The results of these five studies are located in Table 4.

The following study evaluated the efficacy of the Ichijo 120-degree roll maneuver: Ichijo [34]. The Ichijo 120-degree roll maneuver consists of rolling the participant from supine 120 degrees toward the unaffected ear in one continuous movement. The results of this study are located in Table 4.

The following study evaluated the efficacy of the Ichijo 90-degree roll maneuver: Ichijo [36]. The

Ichijo 90-degree roll maneuver consists of rolling the participant from supine 90 degrees toward the unaffected ear in two 45-degree increments. Each of the two positions is held until the participant's nystagmus subsides. The results of this study are located in Table 4.

The following study evaluated the efficacy of the Li quick repositioning maneuver: Li *et al.* [35]. The Li quick repositioning maneuver consists of rolling the participant from supine 90 degrees toward the affected ear followed by a rapid roll 180 degrees toward the unaffected ear. The first position is held until the participant's vertigo subsides then the second position is held for 2 min. The results of this study are located in Table 4.

The following seven studies evaluated the efficacy of the Gufoni maneuver, the only side-lying maneuver included in this systematic review: Appiani *et al.* [13], Riggio *et al.* [26], Casani *et al.* [27], Korres *et al.* [28], Kim *et al.* [29], Mandala *et al.* [30], and Maranhao and Maranhao-Filho [31]. The Gufoni maneuver is performed by moving the participant from sitting into a side-lying position toward the unaffected ear. The participant's head is then turned 45 degrees downward. The first position was held 1 min in one study [13], 2 min in three other studies [26, 29, 31], and 2 to 3 min in another study [28]. Casani *et al.* [27] and Mandala *et al.* [30] did not hold this position before immediately proceeding on to the second position. The second position was held 2 min in five studies [13, 26, 27, 29, 31] and 2 to 3 min in two other studies [28, 30]. The results of these seven studies are located in Table 4.

Table 4. Summary of studies (Page 1).

Author & Date	MR	Population	Interventions	Outcomes
Appiani <i>et al.</i> (1997) [19]	3/10	11 participants	Lempert 270-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 10 participants (90.9%) after one treatment session (one maneuver was performed during this session)
Fife (1998) [20]	2/10	group one = 5 participants	Baloh 360-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 3 participants (60.0%) after one treatment session (one maneuver was performed during this session)
		group two = 3 participants	Lempert 270-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 2 participants (66.7%) after one treatment session (one maneuver was performed during this session)
Nuti <i>et al.</i> (1998) [21]	3/10	36 participants	Lempert 270-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 24 participants (66.7%) after one treatment session (one to two maneuvers were performed during this session)
Appiani <i>et al.</i> (2001) [13]	2/10	32 participants	Gufoni maneuver	complete alleviation of vertigo and/or nystagmus in 32 participants (100.0%) after one treatment session (one to two maneuvers were performed during this session)
Tirelli & Russolo (2004) [22]	3/10	62 participants	Tirelli 360-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 51 participants (82.3%) after one treatment session, 56 participants (90.3%) after two treatment sessions, 57 participants (91.9%) after three treatment sessions, & 58 participants (93.5%) after four treatment sessions (one maneuver was performed during each session)
White <i>et al.</i> (2005) [23]	3/10	10 participants	Baloh 360-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 7 participants (70.0%) after one treatment session & 9 participants (90.0%) after two treatment sessions (one to several maneuvers were performed during each session)
Sekine <i>et al.</i> (2006) [24]	3/10	29 participants	Lempert 270-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 27 participants (93.1%) after one treatment session (one maneuver was performed during this session)
Escher <i>et al.</i> (2007) [25]	3/10	36 participants	Baloh 360-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 32 participants (88.9%) after three treatment sessions (one maneuver was performed during each session)
Riggio <i>et al.</i> (2009) [26]	3/10	58 participants	Gufoni maneuver	complete alleviation of vertigo and/or nystagmus in 46 participants (79.3%) after one treatment session (two maneuvers were performed during this session)
Casani <i>et al.</i> (2011) [27]	5/10	58 participants	Gufoni maneuver	complete alleviation of vertigo and/or nystagmus in 50 participants (86.2%) after one treatment session, 52 participants (89.7%) after two treatment sessions, & 54 participants (93.1%) after three treatment sessions (one maneuver was performed during each session)
Korres <i>et al.</i> (2011) [28]	5/10	group one = 13 participants	Baloh 360-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 5 participants (38.5%) after one treatment session (one maneuver was performed during this session)
		group two = 18 participants	Gufoni maneuver	complete alleviation of vertigo and/or nystagmus in 16 participants (88.9%) after one treatment session (one maneuver was performed during this session)
Kim <i>et al.</i> (2012) [29]	6/10	group one = 55 participants	Lempert 270-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 38 participants (69.1%) after one treatment session (one to two maneuvers were performed during this session)
		group two = 64 participants	Gufoni maneuver	complete alleviation of vertigo and/or nystagmus in 39 participants (60.9%) after one treatment session (one to two maneuvers were performed during this session)
Mandala <i>et al.</i> (2013) [30]	5/10	37 participants	Gufoni maneuver	complete alleviation of vertigo and/or nystagmus in 31 participants (83.8%) after one treatment session (two maneuvers were performed during this session)
Maranhao & Maranhao-Filho (2015) [31]	3/10	group one = 12 participants	Baloh 360-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 11 participants (91.7%) after one treatment session (one to two maneuvers were performed during this session)
		group two = 14 participants	Gufoni maneuver	complete alleviation of vertigo and/or nystagmus in 9 participants (64.3%) after one treatment session (one to two maneuvers were performed during this session)
Shan <i>et al.</i> (2015) [32]	4/10	48 participants	Baloh 360-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 26 participants (54.2%) after one treatment session, 43 participants (89.6%) after two treatment sessions, 46 participants (95.8%) after three treatment sessions, 47 participants (97.9%) after four treatment sessions, & 48 participants (100.0%) after five treatment sessions (one maneuver was performed during each session)
Ban <i>et al.</i> (2016) [33]	4/10	30 participants	Baloh 360-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 27 participants (90.0%) after one treatment session & 29 participants (96.7%) after two treatment sessions (one to two maneuvers were performed during each session)
Ichijo (2017) [34]	2/10	31 participants	Ichijo 120-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 29 participants (93.5%) after one treatment session (one maneuver was performed during this session)
Li <i>et al.</i> (2018) [35]	5/10	group one = 60 participants (6 dropped out after session 1)	Baloh 360-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 32 participants (53.3%) after one treatment session, 38 participants (70.4%) after two treatment sessions, & 49 participants (90.7%) after three treatment sessions (one maneuver was performed during each session)
		group two = 60 participants (3 dropped out after session 1)	Li quick repositioning maneuver	complete alleviation of vertigo and/or nystagmus in 37 participants (61.7%) after one treatment session, 46 participants (80.7%) after two treatment sessions, & 53 participants (93.0%) after three treatment sessions (one maneuver was performed during each session)
Ichijo (2019) [36]	2/10	23 participants	Ichijo 90-degree roll maneuver	complete alleviation of vertigo and/or nystagmus in 19 participants (82.6%) after one treatment session (one maneuver was performed during this session)

MR = methodological rigor.

Discussion

The purpose of this systematic review was to determine which current roll and side-lying maneuvers are most effective while treating individuals with geotropic horizontal canal BPPV. Based upon the inclusion and exclusion criteria, 19 articles [13, 19–36] were qualitatively analyzed. Four studies [27, 29, 30, 35] were randomized controlled trials, seven studies [19–21, 24, 28, 31, 32] were non-randomized studies, and eight studies [13, 22, 23, 25, 26, 33, 34, 36] were pre-test/post-test studies.

Eight studies [20, 23, 25, 28, 31–33, 35] evaluated the efficacy of the Baloh 360-degree roll maneuver. In these studies, the maneuver demonstrated a one-treatment session efficacy from 38.5 percent [28] to 91.7 percent [31]. Five studies [19–21, 24, 29] evaluated the efficacy of the Lempert 270-degree roll maneuver. In these studies, the maneuver demonstrated a one-treatment session efficacy from 66.7 percent [20–21] to 93.1 percent [24]. Seven studies [13, 26–31] evaluated the efficacy of the Gufoni maneuver, the only side-lying maneuver included in this systematic review. In these studies, the maneuver demonstrated a one-treatment session efficacy from 60.9 percent [29] to 100.0 percent [13]. Four studies [22, 34–36] evaluated the efficacy of a more recent treatment maneuver. The one-treatment session efficacy of these maneuvers was 82.3 percent using the Tirelli 360-degree roll maneuver [22], 93.5 percent using the Ichijo 120-degree roll maneuver [34], 82.6 percent using the Ichijo 90-degree roll maneuver [36], and 61.7 percent using the Li quick repositioning maneuver [35]. Although these maneuvers demonstrated high efficacies, only one study has been completed on each of the techniques. Only two of the four randomized controlled trials [29, 35] compared one maneuver against another. Kim *et al.* [29] found that the Lempert 270-degree roll maneuver had a one-treatment session efficacy of 69.1 percent compared to a one-treatment session efficacy of 60.9 percent using the Gufoni maneuver. Li *et al.* [35] found that the Baloh 360-degree roll maneuver had a one-treatment session efficacy of 53.3 percent compared to a one-treatment session efficacy of 61.7 percent using the Li quick repositioning maneuver.

The maneuvers identified in this systematic review were generally considered to be safe [13, 19, 25, 26, 29, 30, 32, 35]. Of the 19 included studies, only two [22, 29] discussed specific contraindications for performing their respective maneuvers. Tirelli and Russolo [22] excluded individuals with whiplash injuries or cervical arthrosis, and Kim *et al.* [29] excluded individuals with recent cervical surgery or severe lumbar pain. Two studies [25, 32] reported that the Baloh 360-degree roll maneuver

might be difficult to perform on individuals who are elderly, who are obese, and/or who experience immobility (due to arthritic conditions, cervical issues, muscle stiffness, traumatic injuries, etc.). Seven studies [13, 26–31] suggested that the Gufoni maneuver might be preferable to the Baloh 360-degree roll maneuver and/or the Lempert 270-degree roll maneuver when treating these types of individuals. Because the Ichijo 120-degree roll maneuver [34], the Ichijo 90-degree roll maneuver [36], and the Li quick repositioning maneuver [35] involve less movement than the Baloh and Lempert maneuvers, they might also be better tolerated. If an individual is unable to tolerate a maneuver or prefers not to have one performed, forced prolonged positioning (FPP) is another possible option [19]. FPP involves having individuals lie on their unaffected side for a prolonged period of time. The intent of this intervention is to liberate the otoconia from the affected horizontal semicircular canal through the use of gravity. Three studies [19, 21, 28] utilized FPP as an alternative treatment. In these studies, FPP proved to be effective in resolving geotropic HC-BPPV symptoms in 73.0 percent [21] to 100.0 percent [19] of the cases.

As mentioned in the introduction, horizontal canal BPPV tends to spontaneously resolve in a relatively short period of time secondary to the anatomical positioning of the semicircular canals [5, 7, 8]. Some researchers have discovered that the resolution rate of horizontal canal BPPV in untreated individuals may be as high as 53 percent [37] to 69 percent [24] in one week and that only 7 percent [24] to 11 percent [37] of these individuals will continue to experience their vertigo for longer than one month. Other researchers have found that the average time from the onset to the resolution of horizontal canal BPPV symptoms in untreated individuals is 4.9 +/- 5.3 days [38] to 16 +/- 19 days [37]. However, two studies included in this systematic review reported that 40 percent [27] to 52 percent [21] of untreated individuals with horizontal canal BPPV continued to experience their vertigo one month after its onset. In addition, some of the participants in two of the included studies [23, 31] began vestibular rehabilitation several years after their symptoms began. This revelation is problematic because the vertigo associated with horizontal canal BPPV is usually much more intense than that associated with posterior canal BPPV [5, 7, 8]. In addition, horizontal canal BPPV often adversely affects dynamic balance [10]. Therefore, the maneuvers described in this systematic review may expedite the natural remission process in individuals with long-term symptoms associated with horizontal canal BPPV.

Strengths and limitations of the systematic review

In this systematic review, the following strengths were identified: (1) no recent systematic reviews have reported on the effectiveness of all available maneuvers for geotropic horizontal canal BPPV; (2) 19 studies [13, 19–36] were included in this systematic review; (3) all of the maneuvers included in this systematic review demonstrated high efficacy; and (4) to minimize bias, the methodological rigor of the 19 studies was independently evaluated by the four authors.

The following limitations were identified in this systematic review: (1) it was difficult to compare the efficacy of the maneuvers because there were differences in how long each position was held, how many maneuvers were performed during each treatment session, and how long after the treatment session the participants were reevaluated; (2) only four randomized controlled trials [27, 29, 30, 35] were included in this systematic review; (3) 18 of the 19 included studies [13, 19–28, 30–36] had weak methodological rigor; and (4) the presence of a potential language bias existed due to excluding non-English studies.

Implications for clinical practice and future research

All of the maneuvers included in this systematic review demonstrated high efficacy and few contraindications. Horizontal canal BPPV tends to spontaneously resolve in a relatively short period of time secondary to the anatomical positioning of the semicircular canals [5, 7, 8]. However, the maneuvers described in this systematic review may expedite the natural remission process in individuals with long-term symptoms associated with horizontal canal BPPV. Because the Baloh 360-degree roll maneuver and the Lempert 270-degree roll maneuver might each be relatively difficult to perform on individuals who are elderly, who are obese, and/or who experience immobility, it is recommended that clinicians consider utilizing the Gufoni maneuver as the first treatment option for horizontal canal BPPV.

Future research should include additional randomized controlled trials that compare horizontal canal BPPV maneuvers head-to-head, especially those four techniques on which only one study has been completed [22, 34–36]. In addition, there is a need for studies with higher methodological rigor. Finally, a systematic review on the efficacy of FPP as a treatment option for geotropic horizontal canal BPPV is indicated.

Conclusion

It is recommended that clinicians utilize one of the maneuvers identified in this systematic review for individuals with geotropic horizontal canal BPPV. The Gufoni maneuver might be preferable to the Baloh 360-degree roll maneuver and/or the Lempert 270-degree roll maneuver when treating individuals who are elderly, who are obese, and/or who experience immobility [13, 26–31]. If an individual is unable to tolerate a maneuver or prefers not to have one performed, FPP is another possible option [19].

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Notes on contributor

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