**Efficacy of the Semont Maneuver in Benign Paroxysmal Positional Vertigo**

Emmanuel Levrat, MD; Guy van Melle, PhD; Philippe Monnier, MD; Raphael Maire, MD

**Objectives:** To assess the efficacy of the Semont maneuver in the treatment of benign paroxysmal positional vertigo (BPPV) of the posterior semicircular canal and to evaluate the possible effect of various factors on the efficacy of this maneuver.

**Design and Setting:** Retrospective study in an outpatient clinic.

**Patients:** Two hundred seventy-eight patients presenting with symptomatic, unilateral BPPV of the posterior semicircular canal, exclusively treated with the Semont maneuver.

**Interventions:** During the first consultation, each patient was treated with a Semont maneuver. When BPPV persisted, this maneuver was repeated during follow-up visits, performed at weekly intervals.

**Main Outcome Measures:** Patients were considered cured when vertigo disappeared within 30 days (allowing up to 4 maneuvers).

**Results:** More than 90% of patients were cured after a maximum of 4 maneuvers, and 83.5% were cured after only 2 maneuvers. The efficacy of the maneuver decreased each time it was repeated (from 62.6% at the first maneuver to 18.2% at the fourth). The duration of symptoms before initial consultation and the etiology of BPPV had a significant effect on the maneuver's efficacy ($P < .001$ and $P = .002$, respectively), whereas age ($P = .12$), sex ($P = .06$), and affected side ($P = .20$) had no effect.

**Conclusions:** The Semont maneuver demonstrated a 90.3% cure rate after a maximum of 4 sessions. Patients consulting late (>6 months after the beginning of symptoms) or having traumatic BPPV had lower recovery rates than patients without these factors (74.7% vs 96.5%).


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**Benign Paroxysmal positional vertigo (BPPV) is a frequent cause of dizziness and, according to Nedzelski et al., represents some 17% of vertigo cases investigated in an oto-neurologic unit. The annual incidence of this disease is estimated at 64 cases per 100,000 people. The most frequent cause is a mechanical disorder in the posterior semicircular canal; impairment stemming from the horizontal and anterior semicircular canal has been reported, but it is much rarer.**

Benign paroxysmal positional vertigo of the posterior semicircular canal (p-BPPV) occurs during rapid rotational motions of the head toward the affected ear when the neck is hyperextended. It can be clinically provoked using “triggering maneuvers,” such as those described by Dix and Hallpike or Brandt and Daroff. It is characterized by a brief attack of rotational vertigo, neurovegetative disturbances of varying intensity, and a characteristic nystagmus. This nystagmus is linear or rotatory, geotropic, and lasts less than 1 minute; has a latency period between the maneuver that evokes it and its appearance; lessens when this maneuver is repeated (fatigability); and changes direction as soon as the patient returns to a sitting position at the end of the maneuver (reversibility).

Following the histopathological discovery in 1969 of basophilic deposits on the cupula of the posterior canal, Schuknecht proposed the theory of cupulolithiasis as the causal mechanism of BPPV. This theory is based on the hypothesis that detached otolithic debris from the utricular macula can deposit on the vestibular side of the posterior canal cupula, thus transforming it into a linear acceleration transducer, sensitive to the effects of gravity. In 1992, Barnes and McClure identified free-floating particles in the endolymph of the posterior canal, thus supporting a canalolithiasis mechanism...
as the cause of BPPV. Canalolithiasis is considered a more probable pathophysiological mechanism for BPPV than cupulolithiasis and provides a better explanation for the clinical characteristics of this disease.8 In most cases, the etiology of BPPV cannot be identified, but the symptoms are frequently preceded by head trauma or vestibular neuritis.9,10 In addition, numerous pathologic conditions associated with BPPV have been described in the literature, but a causal relationship has not been established.9,17 Benign paroxysmal positional vertigo has a tendency to spontaneously disappear, usually after a few weeks, but if no treatment is undertaken, it may persist several months or years. Relapses can likewise occur.

The current treatment of choice for p-BPPV is physiotherapy, and 2 types of maneuvers have been developed: (1) positioning maneuvers based on repeating the triggering maneuver, the aim of which is to disperse debris into the utricular cavity or to promote central habituation mechanisms5,18 and (2) liberatory maneuvers aimed at dislodging inorganic fragments located on the cupula of the posterior canal or floating in the canal, such as the maneuvers by Semont et al12 and Epley.20

The aims of this retrospective study were to evaluate the efficacy of the Semont maneuver in treating p-BPPV and to assess the possible effect of various factors on the efficacy of this maneuver.

### METHODS

This retrospective study included 278 patients, examined between March 1, 1993, and March 1, 1999, who presented with a symptomatic, unilateral p-BPPV and who were exclusively treated with the Semont maneuver. There were 181 females and 97 males, with a median age of 53½ years (range, 13½ to 91½ years). The diagnosis of p-BPPV was made using the triggering maneuver of Brandt and Daroff7 as follows: the patient is seated on an examining table facing the examiner; then he or she is rapidly laid down on the affected side with the head rotated, nose facing up at 45° to the horizon, which provokes a vertigo with linear or rotatory (torsional), geotropic (ie, beating toward the undermost ear), or upbeatening nystagmus, according to the position of the eyes in the orbit.

Patients presenting with BPPV of the anterior and horizontal canals were excluded. Approximately 70% of patients sought medical attention within the first month following the onset of symptoms. Patients were classified according to the etiology of BPPV and subdivided into 4 categories similar to those of Baloh et al: idiopathic, traumatic, infectious, and miscellaneous.

The Semont maneuver was performed after the triggering maneuver: after maintaining the Brandt and Daroff position for approximately 2 minutes, the patient is rapidly returned to a contralateral decubitus position, nose down. If the maneuver is effective, a vertigo with nystagmus beating toward the uppermost ear is observed. After about 3 minutes, the patient is then gently raised to a seated position. Only a single maneuver was performed during any one session. The patient was then followed-up at intervals of approximately 1 week, and the maneuver was repeated if the vertigo persisted. The patient was considered cured when the symptoms had completely disappeared. Because p-BPPV can spontaneously resolve within a few weeks, a time limit of 30 days (allowing time to perform 4 Semont maneuvers) was fixed, after which recovery from p-BPPV was no longer attributed to the Semont maneuver.

### STATISTICAL ANALYSIS

The success of the Semont maneuver is described by a generalized linear model in which it is assumed that the probability of success at any given session is a fixed percentage of the probability that existed at the preceding maneuver. This type of model is flexible and requires only 2 factors, the initial success rate and the “deterioration” of this rate during repetitions that some patients require. If this coefficient of reproduction does not differ significantly from 100%, one can assume that the maneuver retains the same efficacy throughout the different repetitions.

To adapt the model to the data, the method of maximum likelihood was used, and the likelihood ratio test was used in a regression approach to determine the factors that played a significant role on the 2 factors of interest. The model was fitted at each level of the significant factors. To assess the quality of the fit, a classic goodness-of-fit χ2 test was performed that compared the observed counts with those predicted by the model for each specific category of the significant factors. A multivariate analysis was also performed to determine which combinations of the significant factors were important. The level of significance was set at P<.05.

As an example, the likelihood of success after the third maneuver can be written as: (1−P)×(1−αP)×αP, where P is the initial probability of success and α represents the effect of the maneuver repetition. The expression describes the failure of the first maneuver (1−P), then the failure of the second maneuver (1−αP), and the success of the third maneuver (αP), where α represents the double reduction of efficacy associated with the 2 previous attempts.

### RESULTS

Table 1 gives the various etiologies and their distribution by sex. The female-male ratio was more than 2:1 for all etiologies except trauma, for which there were more males than females. Among the 278 patients studied, 251 (90.3%) were cured after a maximum of 4 Semont maneuvers. Figure 1 shows the distribution of patients healed at each Semont maneuver performed and the 9.7% (27 patients) who were not cured within 30 days. Table 2 presents the classification of patients...
as a function of the different factors studied, as well as the global efficacy of the Semont maneuver (cumulative rate of recovery after a maximum of 4 maneuvers). Patients were subdivided according to age into 3 categories, each containing approximately the same number of patients. Figure 2 shows that the efficacy recorded was 62.6% (174/278) for the first Semont maneuver, 55.8% (58/104) for the second, 28.3% (13/46) for the third, and 18.2% (6/33) for the fourth. The other curve in the figure is obtained from the linear model defined in the “Statistical Analysis” subsection of the “Methods” section. This model accurately describes the observations and can be considered as a smoothing of the data. The probability of recovery after the first maneuver is thus estimated at 64% and decreases by an \( \alpha \) level of .71 for each repeated maneuver.

In the regression analysis, the duration of symptoms before consultation had a significant effect on the efficacy of the Semont maneuver (\( P = .001 \)). Table 3 gives the raw data and the goodness of fit of the model for the different categories of duration. Figure 3 shows the level of recovery among the 4 duration categories as smoothed out by the model. Patients who waited longer than 6 months had the poorest probability of initial recovery (46.2%) and the worst deterioration rate (\( \alpha = .42 \)), while patients who consulted within 1 week after symptom onset had a nonsignificant decrease in efficacy (\( P = .18 \)). The etiology of BPPV also had a significant effect on the efficacy of the Semont maneuver (\( P = .002 \)). Table 4 gives the data and goodness of fit of the model for the different etiologies. The quality of the fit in Table 4 is not as good as that for Table 3. However, the low \( P = .03 \) for the idiopathic category is not to be considered as a rejection of the proposed model. Indeed, the goodness-of-fit test was performed 8 times (4 in Table 3 and 4 in Table 4), and a Bonferroni approach requires that \( P \) be compared with .006; thus, \( P = .03 \) is far from significant. Figure 4 shows the recovery rate among the 4 etiological categories as smoothed out by the model. The traumatic category had the poorest probability of initial recovery (50.5%) and the worst deterioration rate (\( \alpha = .62 \)). For the infectious and miscellaneous categories, the deterioration was not significant (\( P = .20 \) and \( P = .70 \), respectively). Age (\( P = .12 \)), sex (\( P = .06 \)), and affected side (\( P = .20 \)) had no significant effect on the efficacy of the Semont maneuver. A multivariate regression analysis showed that patients presenting with traumatic BPPV or BPPV lasting longer than 6 months had a recovery rate of 74.7% (59/79), while patients not having any of these factors had a recovery rate of 96.5% (192/199).

The Semont maneuver is effective, demonstrating a 90.3% recovery rate after 4 maneuvers. We assume that this is primarily a result of the treatment, although spontaneous resolution may occur in some patients during the evaluation period. Similar results have been reported by Serafini et al,\(^1\) who obtained a 94% success rate after 4 maneuvers. Other therapeutic maneuvers have proven effective in curing p-BPPV, such as the Epley\(^2\) maneuver or its modifications as developed by various authors.\(^21-27\) However, studies that have compared the efficacy of some of these maneuvers with that of the Semont liberatory maneuver\(^23\) or a slightly modified Semont maneuver\(^44\) have not shown significant differences in the rates of patient recovery. Although the Semont liberatory maneuver was initially conceived based on the cupulolithiasis hypothesis, the way it is
Among the various factors of interest investigated, the etiology of BPPV and the duration of symptoms before initiating treatment prove to have a significant effect on the efficacy of the Semont maneuver. It appears that traumatic BPPV and BPPV lasting more than 6 months are less efficacious of the Semont maneuver. It may be indicated to replace this liberatory maneuver with an alternate treatment, as suggested by some authors. In light of our results, we suggest that the change should occur after the second Semont maneuver. On the other hand, the large group of patients who consulted within 1 week after the beginning of symptoms had a very good prognosis of healing (97.4%), because the probability of success remains the same at each maneuver. Therefore, for these patients, there is no indication to move to an alternate treatment. Two other categories of patient etiologies (infectious and miscellaneous) also showed a nondecreasing rate of success. The greater prevalence of women (2:1) among patients with BPPV, as well as the higher prevalence of women among patients with idiopathic BPPV (2.3:1), has been previously reported in the literature. The hypothesis of a hormonal effect on the formation of endolymphatic deposits, especially postmenopausal, has been proposed but, again, has never been demonstrated. The predominance of traumatic BPPV among men, primarily noted in young individuals, is likely because of a risk behavior that is usually more frequently observed among these individuals and may explain the near significance \( P = .06 \) of the effects of sex on the efficacy of the maneuver. Curiously, BPPV is preferentially localized to the right side (57.2%). We cannot propose a rational explanation for this phenomenon, which has also been observed in other studies. The Semont liberatory maneuver is an effective treatment for p-BPPV, curing 90.3% of patients in a maximum of 4 sessions and 83.5% after only 2 sessions.
When the patient belatedly seeks medical attention (>6 months from symptom onset) or when BPPV has a traumatic origin, the success rate is less satisfactory (74.7%) than in patients without these conditions (96.5%). In the less satisfactory groups, pursuing the treatment beyond the second maneuver yields little benefit and may indicate the need to change the treatment. On the contrary, some groups have a good prognosis, such as patients consulting within 1 week after symptom onset, in whom the Semont maneuver is a treatment of choice.

Accepted for publication October 24, 2002.

Corresponding author and reprints: Raphael Maire, MD, Unité d’Otoneurologie, Service d’Oto-rhino-laryngologie et chirurgie cervico-faciale, Centre Hospitalier Universitaire Vaudois (CHUV), 1011 Lausanne, Switzerland (e-mail: Raphael.Maire@chuv.hospvd.ch).

REFERENCES


Figure 4. Effect of the etiology of benign paroxysmal positional vertigo on the efficacy of the successive Semont maneuvers.

Table 4. Raw Data and Goodness of Fit of the Model for the Different Etiologies of Benign Paroxysmal Positional Vertigo

<table>
<thead>
<tr>
<th>Etiology</th>
<th>No. of Semont Maneuvers</th>
<th>Failure</th>
<th>Total</th>
<th>Success</th>
<th>Model Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Idiopathic</td>
<td>110 (65.1)</td>
<td>37 (62.7)</td>
<td>9 (40.9)</td>
<td>1 (7.7)</td>
<td>169</td>
</tr>
<tr>
<td>Traumatic</td>
<td>29 (50.0)</td>
<td>10 (34.5)</td>
<td>3 (15.8)</td>
<td>2 (12.5)</td>
<td>58</td>
</tr>
<tr>
<td>Infectious</td>
<td>22 (75.9)</td>
<td>6 (85.7)</td>
<td>0</td>
<td>0</td>
<td>1 (3.4)</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>13 (59.1)</td>
<td>5 (53.6)</td>
<td>1 (25.0)</td>
<td>3 (100.0)</td>
<td>0</td>
</tr>
<tr>
<td>Overall</td>
<td>174</td>
<td>58</td>
<td>13</td>
<td>6</td>
<td>27</td>
</tr>
</tbody>
</table>

*Data are given as number (percentage) unless otherwise indicated.
†χ².