

# Effect of repetition of Semont's manoeuvre on benign paroxysmal positional vertigo of posterior semicircular canal

## *Effetto della ripetizione della manovra di Semont nella vertigine parossistica posizionale del canale semicircolare posteriore*

F. BROCCHETTI, G. GARAVENTA, F. AMELI, F. BARICALLA, M. CHIARLONE, M. PEIRANO, A. PRESTA, A. FIBBI  
Otorhinolaryngology Unit, S. Paolo Hospital, Savona, Italy

### Key words

Vertigo • Paroxysmal positional vertigo • Treatment • Semont liberatory manoeuvre

### Parole chiave

Vertigini • Vertigine parossistica posizionale • Trattamento • Manovra di Semont

### Summary

If Semont's liberating manoeuvre does not lead to relief of symptoms in benign paroxysmal positional vertigo of posterior semicircular canal after the first session, it can be repeated once again, in refractory cases, whilst symptomatic patients after second manoeuvre require rehabilitation therapy. Repeating Semont's manoeuvre several times has proven to progressively increase the percentage of cured patients or it may convert posterior semicircular canal forms to typical incomplete or lateral semicircular canal forms, hence requiring other manoeuvres to achieve vertigo resolution. Aim of study was to assess the effect of liberating manoeuvres repeated up to 4 times and to establish possible passages from one canal to the other during manoeuvres as well as percentage of cases refractory to this therapy, who would then need rehabilitation. Benign paroxysmal positional vertigo was diagnosed in 448 cases of whom 344 (76.8%) of the posterior semicircular canal, 20 (0.45%) the incomplete form of the posterior semicircular canal, 20 (0.45%) subjective positional vertigo and 74 of the lateral semicircular canal (4.2%). Right side was affected in 58.4% of cases, left in 34.5%, and bilateral in 7.1%. All 344 patients underwent Semont's liberating manoeuvre (1<sup>st</sup> manoeuvre) with first control after 48 hours: if symptoms (typical, atypical nystagmus or paroxysmal vertigo evoked by Dix-Hallpike's manoeuvre) persisted, Semont's liberating manoeuvre was repeated (2<sup>nd</sup> manoeuvre). In presence of lateral semicircular canal benign paroxysmal positional vertigo conversion, Lempert's manoeuvre was performed instead. Second control was performed after 48 hours and in cases of persistent typical, atypical or lateral semicircular canal nystagmus 3<sup>rd</sup> manoeuvre was performed. After further 48 hours, third control was carried out: symptomatic patients with typical forms were submitted to 4<sup>th</sup> manoeuvre, while typical incomplete forms or forms of the lateral semicircular canal underwent Lempert's manoeuvre. In conclusion, symptoms disappeared after 1<sup>st</sup> manoeuvre in 61.6% of cases; further manoeuvres, carried out in view of possible changes in semeiology of vertigo, increased the percentage of cured patients to 82.5% after the 2<sup>nd</sup>, 90.7% after 3<sup>rd</sup> and 94.1% after the 4<sup>th</sup>. Repeated positioning

### Riassunto

La manovra liberatoria di Semont (MLS) permette di risolvere la sintomatologia già dopo la prima seduta. In caso di insuccesso parte degli Autori concorda nel trattare ancora una volta i casi refrattari e avviare al trattamento riabilitativo i pazienti ancora sintomatici dopo la seconda manovra. Altri Autori ritengono invece utile ripetere più volte la MLS, perché hanno dimostrato che questa procedura può aumentare progressivamente la percentuale di guarigione, oppure può convertire forme del CSP (canale semicircolare posteriore) in forme tipiche incomplete o del CSL (canale semicircolare laterale), rendendo necessaria quindi l'esecuzione di altri tipi di manovre per ottenere la risoluzione della sintomatologia vertiginosa. Scopo del nostro lavoro è stato valutare gli effetti di manovre liberatorie ripetute fino a quattro volte su un gruppo di pazienti affetti da Vertigine Parossistica Posizionale Benigna (VPPB) e stabilire i possibili passaggi da un canale all'altro durante le manovre e la percentuale di soggetti refrattari a questa terapia, che devono quindi essere sottoposti ad un ciclo di riabilitazione. È stata quindi posta diagnosi di VPPB in 448 casi (244 donne e 204 uomini con età media 58,3 anni) di cui 344 VPPB CSP tipiche (76,8%), 20 VPPB CSP tipiche incomplete (0,45%), 20 Vertigine posizionale soggettiva (VPS) (0,45%) e 74 VPPB CSL (4,2%). Il lato destro è risultato colpito nel 58,4% e quello sinistro nel 34,5% e l'interessamento è risultato bilaterale nel 7,1% dei casi. Tutti i 344 pazienti affetti da tipica VPPB del CSP sono stati sottoposti alla MLS (I manovra). Dopo 48 ore è stato effettuato al primo controllo: nei casi di persistenza della sintomatologia verificata con la comparsa di un nistagmo tipico, atipico o di VPPB soggettiva alla manovra di Dix Hallpike, è stata ripetuta la MLS (II manovra). Nei casi in cui è stata invece riscontrata la presenza di una conversione a VPPB del CSL è stata eseguita la manovra di Lempert. Dopo ulteriori 48 ore è stato eseguito un secondo controllo e nei casi di persistenza di nistagmo tipico, atipico o da CSL si è proceduto come sopra indicato (III manovra). Dopo altre 48 ore è stato eseguito un terzo controllo: i pazienti ancora sintomatici con forme tipiche sono stati ulteriormente trattati con una MLS, mentre le forme tipiche incomplete e quelle del CSL con una manovra di Lempert (IV manovra). In conclusione, dall'analisi dei dati, la risoluzione della sintomatologia determinata da una singola manovra liberatoria è risultata essere del 61,6%: l'esecuzione di ulteriori manovre, scelte sempre sulla

manoeuvres in benign paroxysmal positional vertigo led to a progressive increase in percentage of cured vertigo, at the same time, allowing detection of those cases converted to multicanal pathology, hence offering the possibility to proceed with appropriate liberating manoeuvres.

## Introduction

Benign Paroxysmal Positional Vertigo (BPPV), first described by Bárány in 1921, and better defined by Dix and Hallpike <sup>1</sup> in 1952, is of great clinical and pathophysiological interest not only on account of its frequency but also the interpretation of queries that it presents.

There are several therapeutic proposals, all inspired by physical-rehabilitation principles, based on the pathogenetic hypotheses of cupulolithiasis and canalolithiasis.

According to the cupulolithiasis theory <sup>2</sup>, vertigo is caused by the utricular stimulation of the cupula of the semicircular canal by calcium carbonate crystals detached from the macula utriculi that come to rest on the cupula during certain movements of the head. Conversely, the canalolithiasis theory interprets vertigo as due to the deflexion of the crista ampullaris caused by the endolymphatic current induced by the movement of abnormal ear dust debris and cell derivatives present in the canal itself <sup>3-5</sup>.

These phenomena may occur within the posterior semicircular canal (PSC), more rarely within the lateral semicircular canal (LSC) or within the superior canal; rare bilateral or multicanal forms have been seen in a small number of cases <sup>6</sup>.

The clinical characteristics of typical PSC BPPV are well known: the onset is a violent vertigo crisis unleashed by the flexo-extension and/or lateral rotation of the head and is associated with an oscillatory horizontal nystagmus of the declive eye, with a contralateral vertical component that, after a short latency phase, shows an increase, a plateau and a decrease <sup>1</sup>. During the intercritical phase, the symptoms consist in a sensation of vague loss of balance, "floating" or "lightheadedness", hypothetically caused by the "otolithic depletion of the macula", in the absence of specific otoneurological signs.

Diagnosis, in the light of the history, is generally straightforward but needs to be confirmed by clinical otoneurological tests and by manoeuvres carried out to elicit the nystagmus described by Dix and Hallpike <sup>1</sup>.

*base dell'osservazione di eventuali modificazioni delle caratteristiche semeiologiche della vertigine, ha aumentato la percentuale di guarigione dei pazienti all'82,5% dopo il secondo trattamento e la ripetizione di una terza e di una quarta manovra ha ulteriormente innalzato la percentuale di successi rispettivamente al 90.7% e al 94,1%. L'esecuzione ripetuta delle manovre di posizionamento nel trattamento della VPPB permette di aumentare progressivamente la percentuale di risoluzione della sintomatologia vertiginosa e nello stesso tempo, di individuare i casi di viraggi in patologia pluricanalare, rendendo possibile quindi l'utilizzo di manovre liberatorie più adeguate.*

PSC BPPV is usually cured by repositioning manoeuvres, the best known of which is probably Semont's liberating manoeuvre (SLM), or with "rehabilitation" exercises that induce habit such as those described by Brandt and Daroff <sup>7</sup>, Cawthorne-Cooksey <sup>8</sup>, Norrè and Beckers <sup>9</sup> or Vicini <sup>10</sup>, while medical and surgical treatment have played a very limited role and are usually reserved for specific cases.

SLM leads to relief of symptoms after the first session in 35% to 83.96% of cases <sup>6</sup>: in the event of failure, most Authors <sup>11-15</sup> agree that treatment should be carried out once again in refractory cases to achieve a further increase in the percentage of success and to start rehabilitation in patients still refractory after the second manoeuvre.

Conversely, other Authors <sup>11 16 17</sup> consider it useful to repeat SLM several times since they have shown that this procedure may increasingly improve the percentage of cured patients or may convert PSC forms into atypical or LSC forms, hence making it necessary to carry out other types of manoeuvres to eliminate vertigo.

Aim of the present investigation was to assess the effects of liberating manoeuvres, repeated up to four times in a group of BPPV patients, to better understand the possible interactions between the different canals, conversions from one canal to another, as well as the percentage of patients refractory to this therapy who must, therefore, undergo a rehabilitation cycle - at home or as day-hospital patients, which is more demanding both for the patient and the physician.

## Patients and methods

From January 1998 to December 2001, 576 patients with positional vertigo came to our observation. All had undergone otoneurological evaluation including search for positional nystagmus by means of Dix Hallpike and McClure manoeuvres, clinical evaluation of the vestibulo-spinal system together with coordination tests, the study of cranial nerves as well as

a complete electronystagmography (ENG) recording with pursuit, saccades, optokinetic and bithermal-caloric tests carried out with MK12 Amplaid.

The onset, after Dix Hallpike's diagnostic manoeuvre, of a vertical-rotatory geotropic nystagmus, with a few seconds latency, mainly of the torsional type, with a rapid phase towards the affected side with a duration < 2 minutes (30-40 sec in most cases), has always been considered as characteristic of PSC BPPV.

The forms that Schuknecht<sup>2</sup> had defined as atypical, i.e., those in which just one of the characteristics of the nystagmus elicited in the typical forms was missing, were considered as PSC BPPV of the typical incomplete type.

BPPV of the subjective type (SPV) was diagnosed when, after Dix Hallpike's diagnostic manoeuvre, a subjective symptomatology similar to that of typical BPPV appeared, without nystagmus.

The presence of horizontal paroxysmic nystagmus with short latency, geotropic, bilateral and more intense in the affected side, at times associated with a second phase of apogeotropic nystagmus with a longer duration of the first phase after McClure's diagnostic manoeuvre, was diagnosed as LSC BPPV. All the other variations were excluded.

BPPV was hence diagnosed in 448 patients (244 female, 204 male, mean age 58.3 years) of whom 344 (76.8%) with typical PSC BPPV, 20 (0.45%) typical incomplete PSC BPPV, 20 (0.45%) SPV and 74 (4.2%) LSC BPPV. The right side was affected in 58.4% of cases, the left in 34.5% and bilateral involvement was seen in 7.1%.

All 344 typical PSC BPPV patients underwent SLM (1<sup>st</sup> manoeuvre), with the first control after 48 hours. In cases of persistent symptoms with the onset of typical, atypical nystagmus or BPPV after Dix Hallpike's manoeuvre, SLM was repeated (2<sup>nd</sup> manoeuvre). In those patients presenting conversion to LSC BPPV, Lempert's manoeuvre was carried out instead<sup>20</sup>.

After a further 48 hours, a second control was carried out and in patients with a persistent typical, atypical or LSC nystagmus, we proceeded as above (3<sup>rd</sup> manoeuvre).

After two days, a third control was carried out, exactly as before: symptomatic patients were treated in the same way (4<sup>th</sup> manoeuvre). Finally, those patients still symptomatic after the fourth control underwent a second level evaluation which included otovestibular assessment as well as neurological evaluation and diagnostic testing (sopraortic trunks Doppler, computed tomography, magnetic resonance) to detect conditions possibly responsible for the negative clinical outcome.

The patients not presenting other pathological conditions then underwent vestibular training, choosing

the most suitable technique between Five<sup>10</sup> and Vestibular Habituation Training (VHT)<sup>9</sup>.

## Results

Results of the 1<sup>st</sup> Semont manoeuvre, on 344 PSC BPPV patients, are summarised in Table I.

At the first control, 212 patients (61.6%) were cured and 132 (38.7%) were still symptomatic, 96 of whom (27.9%) still presented typical PSC BPPV, 12 typical incomplete PSC BPPV (3.4%), 8 had SPV (2.3%) and 16 LSC BPPV (4.6%) (Table I).

The 116 patients with typical, atypical and subjective BPPV after treatment were again submitted to Semont's manoeuvre (2<sup>nd</sup> manoeuvre), while the 16 patients with a conversion to LSC BPPV underwent Lempert's manoeuvre.

After the second control, 60 out of the 96 typical PSC BPPV patients were cured while 36 were still symptomatic. Of these, 8 had the typical, and 24 the atypical form, while 4 had converted to LSC BPPV (Table II). The 8 with typical forms (2.24%) underwent a third SLM (3<sup>rd</sup> manoeuvre), the 24 typical incomplete forms were considered interactions between the posterior and lateral canals and hence treated with Lempert's manoeuvre; also the 4 patients who had converted from a PSC to a LSC form were treated with Lempert's manoeuvre (Table III).

At the third control, all the typical forms were cured. Of the 24 patients (6.9%) with typical incomplete forms, 20 were cured while 4 converted to typical forms and were then treated with SLM (4<sup>th</sup> manoeuvre) (Table II).

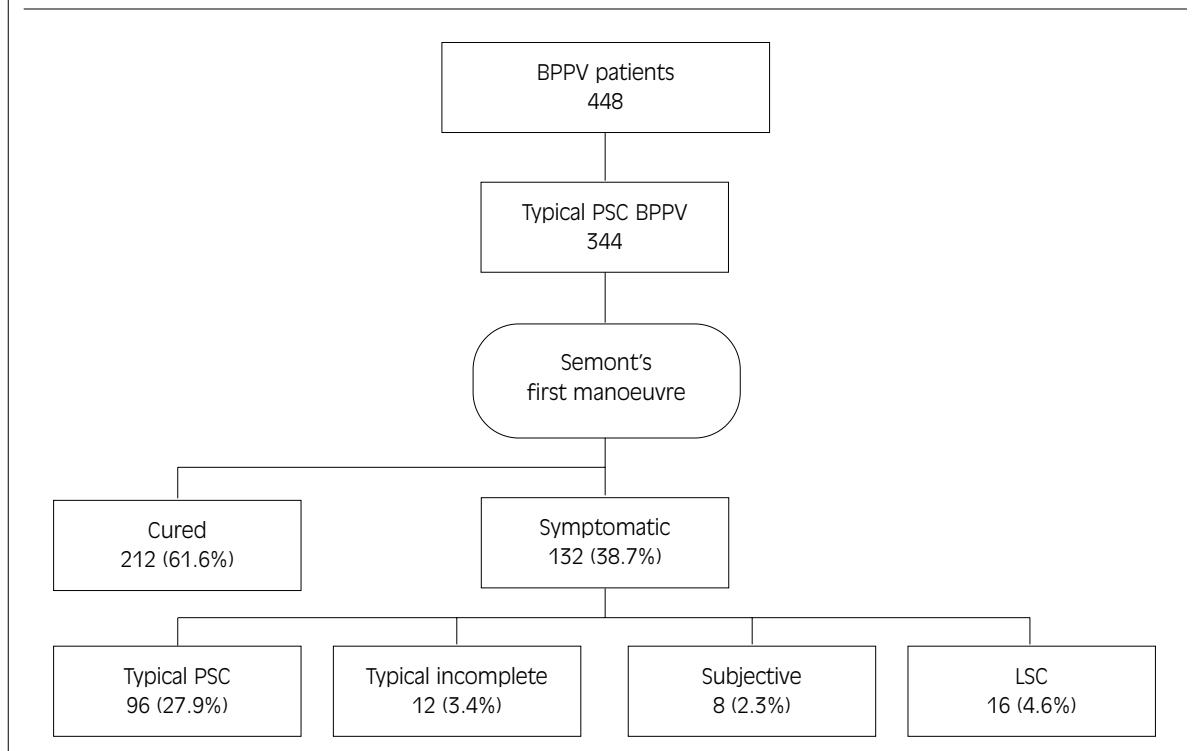
The 4 LSC BPPV cases treated with Lempert's manoeuvre (3<sup>rd</sup> manoeuvre) converted to typical forms and then underwent a fourth SLM (Table II).

At the fourth control, all 96 patients initially presenting typical PSC BPPV were cured (Table II).

The 12 typical incomplete PSC BPPV patients were cured by simply carrying out a second SLM. Evolution of the 8 SPV is shown in Table III. After the second SLM, only 4 patients were cured. The other 4 patients were treated with Lempert's manoeuvre, repeated in the light of the hypothesis that the persistent symptoms could be due to the presence of ear dust in the LSC. However, the manoeuvre was not successful in these 4 patients. An extended daily rehabilitation programme at home was, therefore, started: two patients started VHT and two the Five technique. Only one patient benefited from VHT and only one from the Five technique.

Treatment of the 16 patients that converted from PSC to LSC forms after the first SLM is outlined in Table IV. These patients were all submitted to Lempert's manoeuvre which eliminated symptoms in 4 cases. In the remaining 12, the lateral forms persisted in 8 cas-

**Table I.** Flow diagram depicting conversion of posterior semicircular canal benign paroxysmal positional vertigo during first manoeuvre.



es whilst the remaining 4 cases converted to a typical incomplete PSC.

The 4 typical incomplete forms were, at first, treated with Semont's manoeuvre (3<sup>rd</sup> manoeuvre), which was successful in 2 cases (0.58%). The other 2 cases responded successfully to Lempert's manoeuvre (4<sup>th</sup> manoeuvre). The 8 patients, in whom LSC BPPV persisted, underwent a third Lempert's manoeuvre. The symptoms disappeared in 6 cases (1.7%). The other 2 were cured with a fourth Lempert's manoeuvre (Table IV).

In conclusion, analysis of these data shows that symptoms disappeared after a single liberating manoeuvre in 61.6% of cases: further liberating manoeuvres, selected after observing possible changes in the semeiology of vertigo, led to an increase in the percentage (82.5%) of cured patients after the second treatment. After a third and fourth manoeuvre, a further increase in the success rate was observed rising to 90.7% and 94.1%, respectively.

Following this protocol, only 4 patients (1.16%) required home vestibular rehabilitation with Vicini's Five technique<sup>8</sup> or Norrè's VHT<sup>9</sup>, with acceptable therapeutic results in two cases after two rehabilitation cycles.

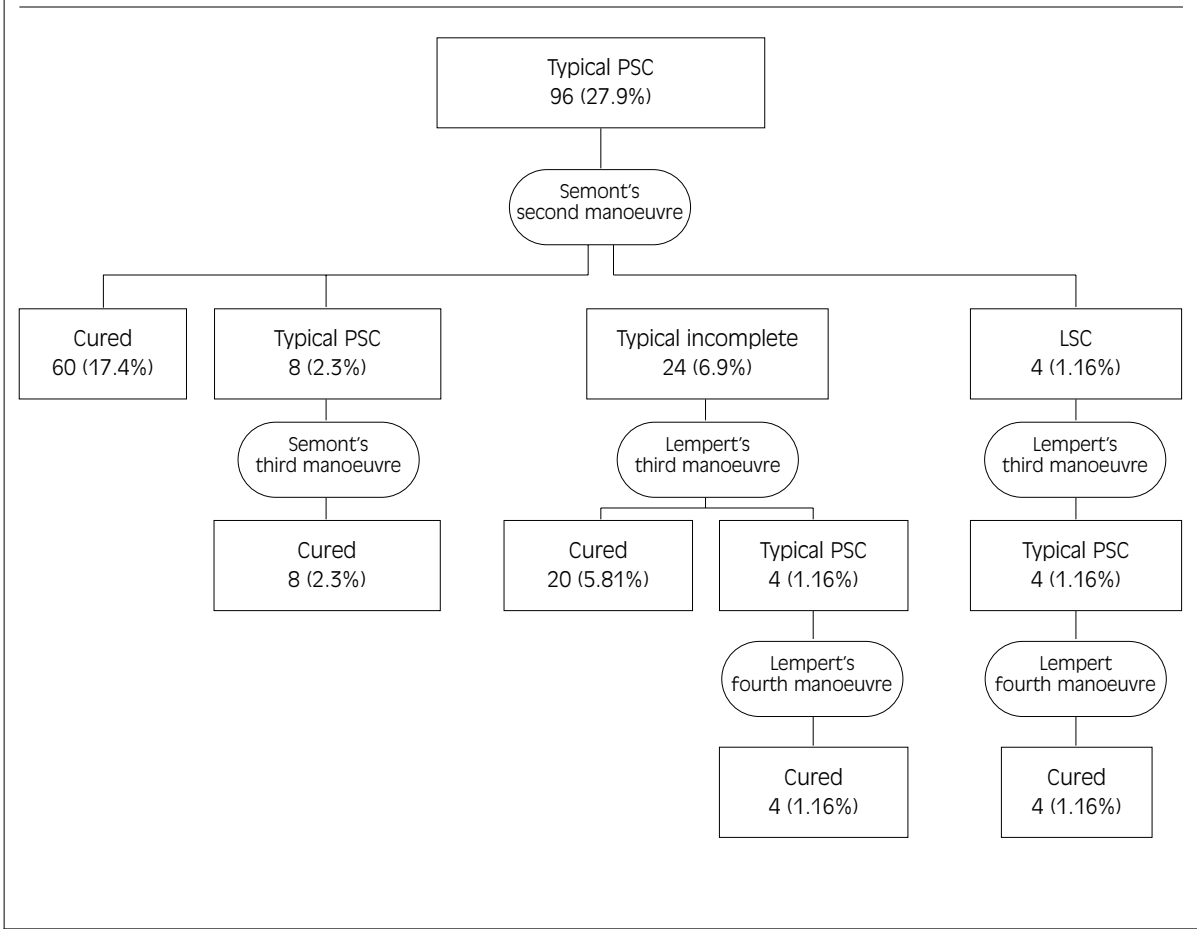
## Discussion

According to most Authors, treatment for PSC BPPV should, in general, envisage only a single repetition of SLM, reserving the use of rehabilitation techniques for refractory forms<sup>11-15</sup>.

In fact, Semont reported that repetition of the liberating manoeuvre may increase the percentage of cured PSC BPPV from 84 to 93%; likewise, Hausler and Pampurik<sup>12</sup> achieved increases in the percentage of cured cases from 40 to 70% and Herdman et al.<sup>18</sup> from 64 to 79%.

Norrè<sup>19</sup> confirmed these findings studying two groups of patients treated with SLM that were not cured: the first group was treated with a second SLM, while the second group was treated with rehabilitation exercises. The Authors noted that the vertigo symptoms were solved in 52% of cases in the first group and in 32% in the second group. Instead, according to other Authors 11 carrying out at least 3 or 4 successive SLMs may further increase the percentage of cured patients. Data emerging from the present study confirmed the latter observations since the repeated SLMs, combined with Lempert's manoeuvre, depending on the semicircular canal involved, led to percentages of cured patients that progressive-

**Table II.** Flow diagram depicting conversion of typical posterior semicircular canal benign paroxysmal positional vertigo during following manoeuvres.



ly rose from 61.6%, with the first manoeuvre, to 94.1% with the fourth.

Of particular interest, in our opinion, was the conversion of PSC to LSC or to atypical forms: 20 PSC forms converted to LSC or to atypical forms and 8 patients treated with Lempert's manoeuvre for a LSC form converted to typical or atypical PSC forms.

The possibility of transforming BPPV characteristics, already described both by Epley and Hughes<sup>17</sup> and Nuti et al.<sup>16</sup>, is considered a consequence of the spontaneous movements of patients or a "complication" of the liberating manoeuvre, based on the hypothesis that debris may move from one canal to the other during the manoeuvres.

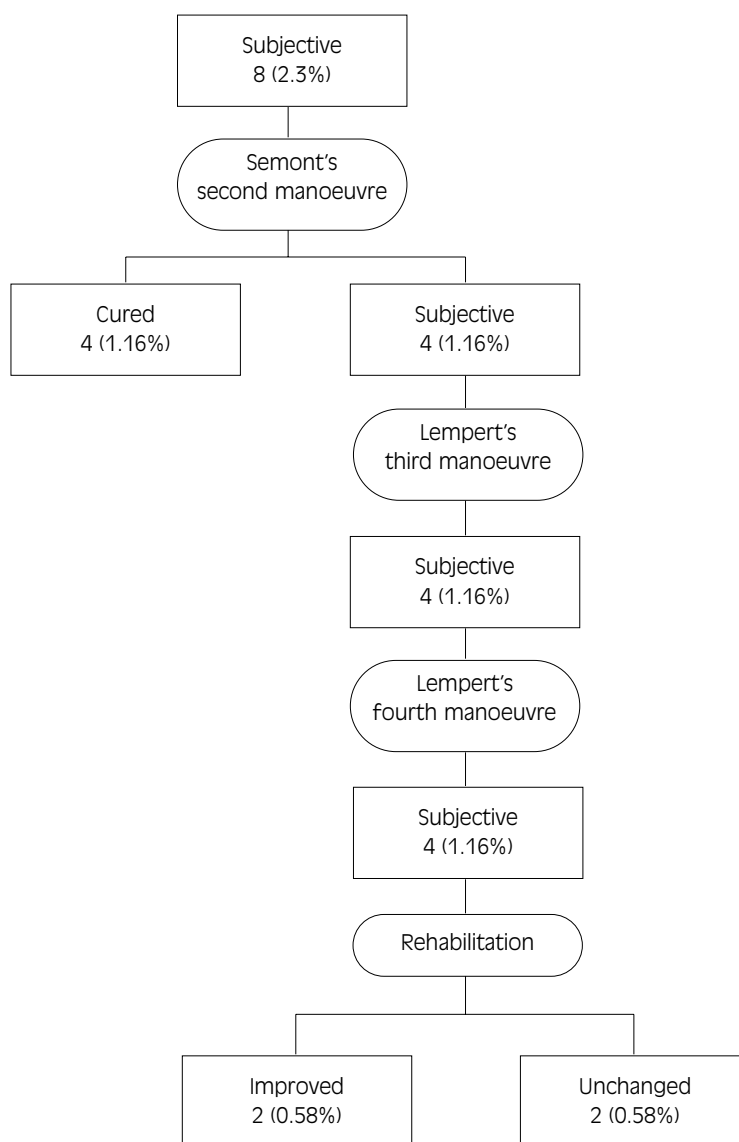
Ear dust particles may migrate to the different canals and this may be favoured by the particular individual anatomy of the horizontal canal outlet and of the common crus in the utricle and would thus explain the conversion between the various forms as well as the symptoms of the "typical incomplete" form.

In the light of these hypotheses, we consider typical incomplete BPPV forms as a possible transformation of a pure PSC form into a mixed one, with the simultaneous involvement of the LSC. This pathogenetic hypothesis seems to be proven by the relief of symptoms that we achieved with the combined use of Semont's and Lempert's liberating manoeuvres.

In our series, subjective forms, i.e., those perceived by the patient as a sensation of movement without evidence of nystagmus, accounted for 2.3% of the total, a smaller percentage than that reported by Epley<sup>17</sup>, namely, 8.86% in a group of 400 patients.

The results obtained in the treatment of these forms have been rather disappointing (50%) thus confirming Beyon's<sup>8</sup> theory that considers these as incomplete BPPV, determined by the presence of ear dust particles of inadequate mass to create a cupular deflexion strong enough to cause a nystagmus but sufficient to stimulate the receptor threshold and to give rise to the subjective sensation of vertigo. In these

**Table III.** Flow diagram depicting conversion of subjective posterior semicircular canal benign paroxysmal positional vertigo during following manoeuvres.

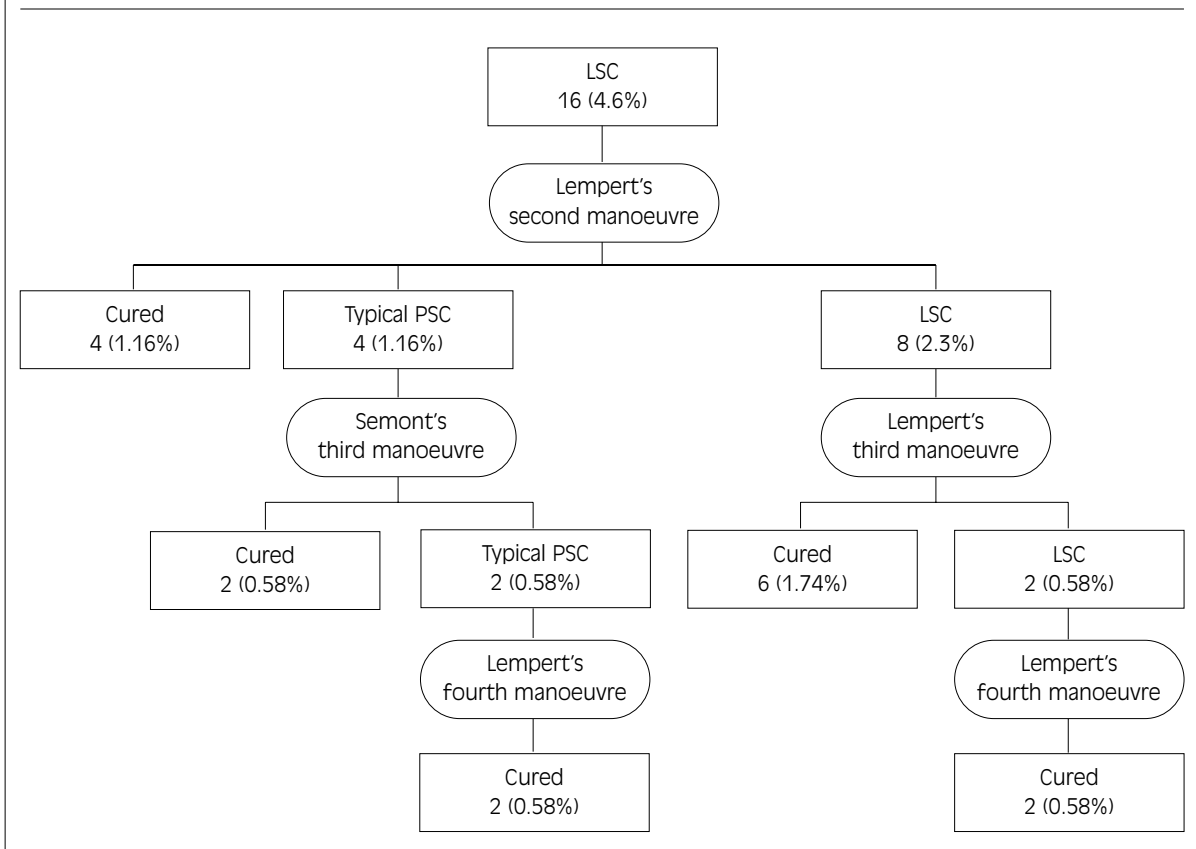


cases, the most effective treatment seems to be rehabilitation therapy. Furthermore, in our opinion, the persistence of vertigo after two SLM calls for a new control of the semeiology to establish whether this is caused by the persistence of the primitive situation, refractory to liberating manoeuvres (anatomical variations of the canal, poor patient compliance during the manoeuvre, or a manoeuvre not carried out perfectly/correctly, etc.) or rather by the transformation into a different pathophysiological situation (conversion to LSC BPPV, posterior atypical BPPV or sub-

jective BPPV), that need to be treated with an adequate manoeuvre.

### Conclusions

Repetition of positioning manoeuvres in the treatment of BPPV leads to a progressive increase in the percentage of patients cured from vertigo and, at the same time, identifies cases that convert to multicanal pathology, thus offering the possibility to choose the most suitable liberating manoeuvres.

**Table IV.** Flow diagram depicting conversion of lateral semicircular canal benign paroxysmal positional vertigo during the following manoeuvres.

This possibility must always be borne in mind since this situation may occur in a significant percentage of patients and must be checked with control diagnostic manoeuvres.

Subjective forms do not respond adequately to either liberating manoeuvres or to rehabilitation therapy since minimal volumes of ear dust in the semicircu-

lar canals are difficult to mobilise.

Repetition of liberating manoeuvres is always recommended in order to reduce to a minimum the percentage of these forms that require more involved forms of treatment, considering the time they need and the possibility that they may not offer a solution for these patients.

## References

- Dix R, Hallpike CS. *The pathology, symptomatology and diagnosis of certain common disorders and of the vestibular system*. Proc R Soc Med 1952;54:341-54.
- Schuknecht HF. *Positional vertigo: clinical and experimental observations*. Trans Am Acad Ophthalmol Otolaryngol 1962;66:319-32.
- Epley JM. *Positional vertigo related to semicircular canalithiasis*. Otolaryngol Neck Surg 1994;112:154-61.
- Kveton JF, Kashgarian M. *Particulate matter within the membranous labyrinth pathologic or normal?* Am J Otol 1994;15:173-6.
- Parnes LS, Mc Clure JA. *Free floating endolymph particles: a new operative finding during posterior semicircular canal occlusion*. Laryngoscope 1992;102:988-92.
- Guidetti G. *Diagnosi e terapia dei disturbi dell'equilibrio*. Second Edition. Rome: Marrapese; 1997.
- Brandt T, Daroff RB. *Physical therapy for benign paroxysmal positional vertigo*. Arch Otolaryngol 1980;106:484-5.
- Cawthorne TE. *The physiological basis of head exercises*. Chart Soc Physioter 1944;106:1.
- Norré ME, Beckers A. *Benign paroxysmal positional vertigo in the elderly. Treatment by habituation exercises*. J Am Geriatric Soc 1988;36:425-6.

- <sup>10</sup> Vicini C. *Considerazioni metodologiche su di una tecnica semplificata di rieducazione vestibolare del paziente con vertigine provocata*. Atti del LXXII Congresso Nazionale SIO, Viareggio 1985.
- <sup>11</sup> Guidetti G, Manzoni D, Galletti G. *Il contributo della manovra di Semont alla diagnosi e alla risoluzione delle vertigini parossistiche di posizionamento*. Acta Otolaryngol Ital 1988;8:493-502.
- <sup>12</sup> Hausler R, Pampurrik J. *Die chirurgische und die physiotherapeutische Behandlung des benignen paroxysmalen Lagerunsschwindels*. Laryngol Rhinol Otol 1989;68:342-6.
- <sup>13</sup> Magnano M, Canale G, Lacilla M, Roberto C, Albera R. *La manovra di Semont modificata nel trattamento della vertigine parossistica posizionale benigna*. Acta Otolaryngol Ital 1990;10:499-503.
- <sup>14</sup> Semont A, Freyss G, Vitte E. *Curing the BPPV with a liberatory manoeuvre*. Adv Otorhinolaryngol 1988;42:290-3.
- <sup>15</sup> Vannucchi P, De Vito F, Vicini C. *Terapia della vertigine parossistica posizionale benigna – tre tecniche a confronto*. Audiol Ital 1989;6:102-10.
- <sup>16</sup> Nuti D, Agus G, Barbieri MT, Passali D. *The management of horizontal-canal paroxysmal positional vertigo*. Acta Otolaryngol (Stockh) 1998;118:455-60.
- <sup>17</sup> Epley JM, Hughes DW. *Positional vertigo: new methods of diagnosis and treatment*. Instruction course for the annual meeting of the American Academy of Otolaryngology Head Neck Surgery 1980.
- <sup>18</sup> Herdman SJ, Ronald DJ, Tusa MD. *Complication of the canalith repositioning procedure*. Arch Otolaryngol Head Neck Surg 1996;122:281-6.
- <sup>19</sup> Norré ME. *Exercise treatment for paroxysmal positional vertigo: comparison of 2 types of exercises*. Arch Otolaryngol Head Neck Surg 1997;244:291-4.
- <sup>20</sup> Lempert T. *Horizontal benign positional vertigo*. Neurology 1994;44:2213-4.

■ Received January 25, 2003.  
Accepted May 24, 2003.

■ Address for correspondence: Dott. F. Brocchetti, U.O. di Otorinolaringoiatria, Ospedale San Paolo, Via Genova, 17100 Savona, Italy.  
Fax: +39 019 8428091. E-mail: brocket@tin.it