Treatment of Benign Paroxysmal Positional Vertigo of posterior semicircular canal by "Quick Liberatory Rotation Manoeuvre"

Trattamento della Vertigine Parossistica Posizionale da labirintolitiasi posteriore con "Rotazione Rapida Liberatoria"

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Key words

Paroxysmal Positional Vertigo • Canalolithiasis • Posterior Semicircular Canal • Treatment • Liberatory Manoeuvres • Repositioning Manoeuvres

Parole chiave

Vertigine Parossistica Posizionale • Canalolitiasi • Canale Semicircolare Posteriore • Trattamento • Manovre liberatorie • Manovre riposizionanti

Summary

Treatment of Benign Paroxysmal Positional Vertigo is based on Semont's Liberatory Manoeuvre and on so-called "Canalith Repositioning Manoeuvres", derived from the original Epley technique. Both manoeuvres are very effective and choice of which to use depends on the experience of the physician. Semont's manoeuvre requires a quick movement of the patient in mass in the frontal plane, from the involved, to the contralateral side, which sometimes causes symptoms such as nausea or vomiting. In this technique, a secondary liberatory nystagmus is often observed as sign of the success of the manoeuvre. Repositioning manoeuvres are less fastidious because of the slow movements, but we rarely observe an objective sign of success like the liberatory nystagmus. In the present randomised trial, 300 patients with posterior canalo/cupulolithias were divided into 3 treatment groups: 100 treated by Semont Technique; 100 by a Repositioning procedure (Parnes technique); 100 by a new manoeuvre called "Quick Liberatory Rotation". Results of treatment are also compared with the natural evolution of Benign Paroxysmal Positional Vertigo observed in 18 untreated patients. Quick Liberatory Rotation is similar in the sequence of the positions of the head in the horizontal plane, to repositioning procedures, but is more like the Semont manoeuvre in the speed of the movement (about 180° in less than one second). Quick Liberatory Rotation is easy to perform, well tolerated and very effective (success rate: 98% in one-three cycles). In the present investigation, a secondary liberatory nystagmus was observed in 76.1%, with a sensitivity of 81.9% in detecting patients who had completely recovered and a specificity of 43.8% in detecting failures. Effectiveness, in short and medium period (1-15 months), is similar to Semont and Parnes techniques. Authors consider Quick Liberatory Rotation, at present, a possible first choice technique in the treatment of posterior canalolithiasis.

Riassunto

La terapia della Vertigine Parossistica Posizionale da labirintolitiasi posteriore è basata sull'applicazione di due tipi di manovre: le manovre di tipo liberatorio (m. di Semont), basate sul concetto dell'espulsione dei detriti otoconiali dal canale interessato mediante una rapida accelerazione impressa al paziente; le manovre cosiddette riposizionanti (manovre Epley-derivate) basate sul concetto di condurre via in modo graduale gli otoliti dal canale, guidandoli progressivamente verso l'uscita utricolare. I due tipi di manovra sono ugualmente efficaci e la scelta dell'una o dell'altra dipende unicamente dall'esperienza dell'operatore. Le manovre liberatorie sono gravate da una maggiore incidenza di effetti collaterali di tipo neurovegetativo, ma forniscono in elevata percentuale di casi un parametro obiettivo di efficacia nel "Nistagmo liberatorio". Le manovre riposizionanti sono meglio tollerate dal paziente ma più raramente forniscono il parametro prognostico del nistagmo liberatorio. In uno studio randomizzato, gli Autori hanno assegnato 300 pazienti consecutivi (100 per gruppo) a tre gruppi di trattamento: manovra di Semont, manovra di Parnes ed una nuova manovra definita Rotazione Rapida Liberatoria la cui validazione clinica essi hanno assunto come obiettivo primario del lavoro, effettuando anche un confronto con una popolazione di 18 pazienti non trattati. La Rotazione Rapida Liberatoria richiama nel movimento le manovre di tipo riposizionante (rotazione della testa del paziente sul piano orizzontale di circa 180°) con la differenza sostanziale che essa è stata eseguita in modo molto rapido (circa un secondo), con una dinamica, quindi, che la avvicina anche alla manovra di Semont. La Rotazione Rapida Liberatoria è risultata di agevole esecuzione, con scarsi effetti collaterali neurovegetativi, di notevole efficacia (98% di guarigione in tre manovre), frequentemente evocatrice del nistagmo liberatorio (76,1%) con una sensibilità dell'81,9% dei casi nell'individuare i pazienti effettivamente liberati, una specificità del 43,8% nell'individuare i pazienti non liberati ed una efficacia nel breve e medio periodo perlomeno pari agli altri due gruppi (una riacutizzazione entro un mese ed una recidiva in un follow-up compreso tra uno e quattordici mesi). La sommatoria dei dati disponibili (praticabilità, tollerabilità, presenza di un valido indice prognostico, rilevante efficacia e immediata e nel breve e medio periodo) fa sì che gli Autori la considerino attualmente di prima scelta nel trattamento delle labirintolitiasi posteriori, pur confermandosi pienamente anche nella loro Casistica, l'efficacia e della manovra di Semont e della manovra di Parnes.

Introduction

Benign Paroxysmal Positional Vertigo (BPPV) is the most common vertiginous syndrome, accounting for about 20% of new patients in a vestibular clinic.
As is well known, its pathophysiology is the mechanism of cupulo/canalolithiasis.
Treatment of canalolithiasis of the posterior semicircular canal is successfully based on Semont's "Liberatory Manoeuvre" (MS) [1-3] and on "Canalith Repositioning Manoeuvres" (CRMs) [4-9].
The very high success rate has been reported with both types of manoeuvres, no differences having been observed between them: MS and CRMs are equally effective in treating BPPV and results are better than non-treatment or placebo [10-25].
CRMs are performed by a slow rotation of the head; so, otoconia are guided towards their natural exit: common crus and utricle.
These are more comfortable for the patients and, sometimes, easier to perform, altough they seldom cause the "Secondary Liberatory Nystagmus (Ny)" [11 17 23], that mimics, in direction, the diagnostic one and is a sign of a positive response to the therapeutic manoeuvre.
MS requires a quick movement from the involved to the contralateral side in mass: otoconia are ejected towards the utricle, thus frequently producing symptoms such as nausea, vomiting or residual imbalance. For this reason in MS, a secondary Ny response is more frequently observed than in CRMs, thus predicting a good therapeutic result.
The manoeuvre to be used depends on the experience of the physician, more rarely on the particular conditions of the patient: neck, thorax or leg injury, obesity, anxiety, recent hip replacement, etc.; even more rarely, if diagnostic Ny is caused by just one diagnostic manoeuvre (Hallpike or Semont).
Since July 2001, we have been using a new manoeuvre, which we devised from a synthesis of MS with CRMs and which we have called "Quick Liberatory Rotation" (QLR).
Aim of the present report is to: 1. describe in detail the QLR; 2. present results of a prospective randomised trial carried out to test QLR vs MS and vs a CRM (Parnes technique: CRMP [6]) in effectiveness in short and medium time; 3. observe the rate of the secondary liberatory Ny in QLR, MS and CRMP and if it is really a sign of a positive response.

Patients and methods

From July 2001 to September 2002, we treated 300 consecutive in and outpatients affected by unilateral posterior canalolithiasis attending the ENT Department of our Hospital.
All patients underwent a complete neuro-otological investigation (audiometry, ABR and NMR, and, if required, caloric test).
All patients have been observed by Infra-Red Video-Oculography.
Patients were randomised into three groups according to treatments: 100 in QLR, 100 in MS, 100 in CRMP.
The study population comprised 189 females and 111 males (ratio 1.7/1), mean age 53.8 ± 9.73 years (range: 17-87), with no significant difference among the three groups.
Of these patients, 52% had idiopathic BPPV: 24% were vasculopathic; 14% post-traumatic; 8% were suffering from chronic otitis media, otosclerosis (5 stapedectomies), Ménière disease; 2% autoimmune diseases.
In this study, there is no control group (placebo-treated or non treated patients), since we did not consider it justifiable (even for a comparative study) to abstain from treatment in BPPV.
However, we are able to compare the present groups with a previous "involuntarily made" group of 18 untreated patients who had refused treatment or were not amenable to treatment on account of a recent trauma. The only significant difference in this group is a higher incidence of post-traumatic BPPV (22.2 vs 14%).
BPPV is diagnosed by a typical response to the Dix-Hallpike diagnostic manoeuvre (DHM): torsional paroxysmal Ny clockwise in left-sided, and counter clockwise in right-sided posterior canalolithiasis, reversing when the patient is returned to the sitting position.
A secondary "liberatory" Ny can be evoked by the therapeutic manoeuvre: it must be similar to the diagnostic one, since it indicates that otoconia are moving in an ampullofugal direction towards the common crus and utricle; on the contrary, secondary "non-liberatory" Ny presents a reversal oculomotorial pattern: otoliths reverse their movement towards the ampulla, returning into the canal.
One exception is cupulolithiasis, in which, in the final position of each manoeuvre, we can expect an utriculupetal displacement of the cupula, observing a reversed liberatory Ny.
A Head Shaking Test, in the horizontal plane, always precedes each manoeuvre.
Patients are tested again by DHM after 30 minutes, then after two-three days and thereafter every two days if DHM is still positive (max: three times).
If BPPV persists, Brandt- Daroff exercises are performed [26].
A further control is carried out one month after the last visit: at this appointment, we monitored 52 patients submitted to QLR, 51 to CRMP, 43 to MS (total: 146 patients = 48.7%).

Fig. 1. Starting position in QLR.

Fig. 3. Final lying position of QLR.

The primary outcome is absence of paroxysmal positional Ny induced by DHM.

Comparisons between groups were performed by χ^2 test, using Primer® Software (significance: $p < 0.05$; 95% confidence interval).

The "Quick Liberatory Rotation" manoeuvre.

1. The patient is tested by DHM (Fig. 1);
2. Two minutes after paroxysmal Ny disappears, the patient is brought from the affected, to the contralateral, side by a quick rotation (less than one second) of the head of about 180° in the horizontal plane (Fig. 2) in the final lying position (Fig. 3), the head is about 45° downward;

In this position, it is possible to observe a secondary Ny similar, in direction, to that evoked by DHM ("liberatory" Ny);

3. The patient remains in this last position for two minutes after secondary Ny disappears or four minutes, if secondary Ny is not detected;
4. The patient then returns to the sitting position; we rarely observed a "tertiary Ny", either with a similar pattern to the diagnostic one ("liberatory" again), or with a reversal pattern (sign of failure).

In our opinion, QLR causes sudden ejection of the otoconia into the utricle either in the final lying position (possible liberatory Ny) or, more rarely, when the patient is sitting again (Figs. 4, 5).

Results

Canal involvement, in the three therapeutic groups, is reported in Table I.

We consider as possible cases of cupulolithiasis 8 patients in the MS group, 9 in QLR, 5 in CRMP from the subjective parameters: less paroxysmal and/or non-fatiguing Ny; and the objective parameters: torsional Ny induced by Head Shaking Test [27] and/or secondary reversed Ny in comparison with that observed at diagnosis [6 27 28].

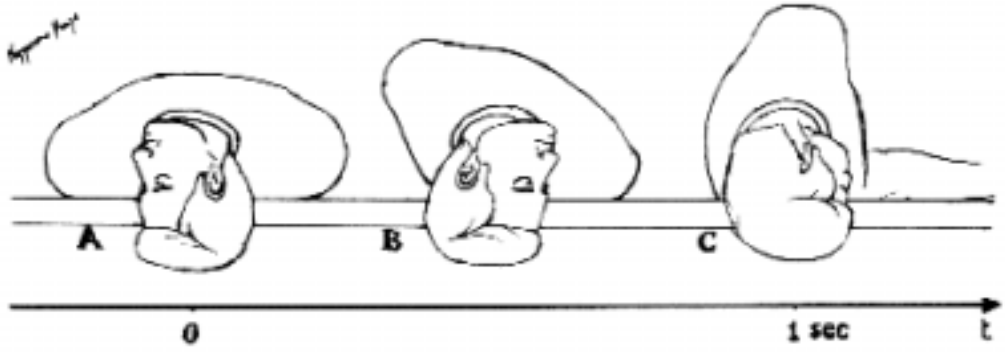

Fig. 2. Dynamics of QLR. From left to right: A. Starting position (–45°); B. "Dynamic" middle position (about +45°); C. Final lying position (about +135°). Velocity of head is about 180°/sec.

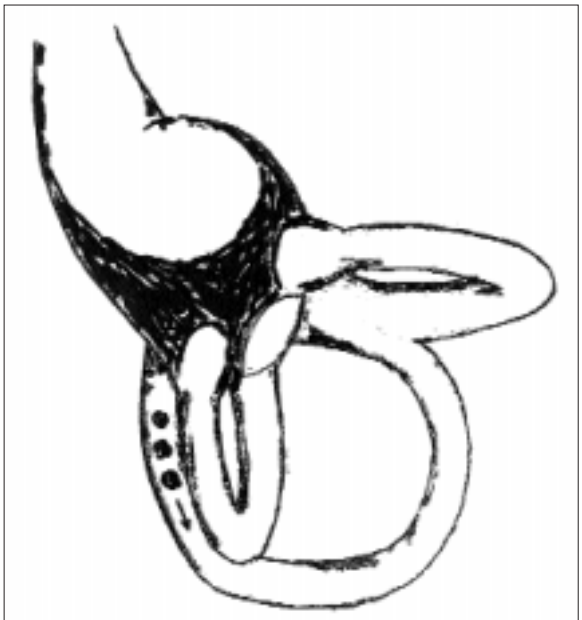

Fig. 4. Canalar orientation in starting position of QLR and ampullifugal movement of otoconia.

We performed 136 therapeutic cycles for MS, 130 for QLR, 125 for CRMP. The efficacy of these manoeuvres are shown in Table II. Differences between groups are not significant.
Four failures (one in MS, one in QLR, two in CRMP) concern a possible cupulolithiasis.
The rates of secondary "liberatory" Ny are shown in Table III. Differences between MS and QLR vs CRMP are statistically significant (both: $p < 0.001$).
Correlations between the presence or the absence of liberatory Ny and "Real no evidence of disease" (i.e., DHM-) in the initial follow-up are shown in Table IV.
Differences between "Real no evidence of disease" in MS and those in QLR ($p = 0.015$) and in CRMP ($p < 0.001$) are statistically significant.
In "False failures", differences between MS vs QLR ($p = 0.011$), MS vs CRMP ($p < 0.0001$), QLR vs CRMP ($p = 0.023$) are significant, denoting the superiority of MS vs QLR and CRMP and of QLR vs CMRP.

Table I. Canalar involvement.

	MS	QLR	CRMP	Total
Right posterior canal	59	63	64	186
Left posterior canal	41	37	36	114
Total	100	100	100	300

MS: Semont's Liberatory Manoeuvre; QLR: Quick liberatory rotation; CRMP: canalith repositioning manoeuvres.

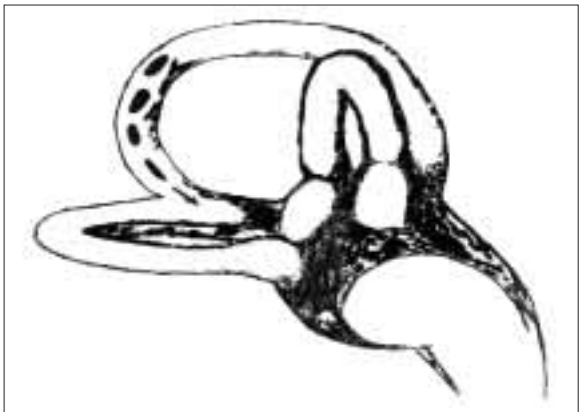

Fig. 5. Canalar orientation in final lying position of QLR: otoconia leave posterior canal through common crus.

A "tertiary liberatory Ny" in the final sitting position was observed in 5 cases in MS, in 3 cases in QLR: it was always followed by the resolution of BPPV.
A "tertiary reversed Ny" was observed in 3 cases in MS and in 2 cases in CRMP: it was always correlated with failure of the treatment, even when we had observed a "secondary liberatory Ny" in the final lying position of each manoeuvre.
The sensitivity of secondary liberatory Ny to detect effectively cured patients is 91.7% for MS, 81.9% for QLR, and 20.7% for CRMP.
Specificity (identification of real failures) is 70% in MS, 43.8% in QLR and 75% in CRMP.
Concordance between retest and two-day control is high in each group: 97% in MS, 96% in QLR and CRMP.

Complications observed:

- In MS: 5 cases of nausea and retches, 3 frank vomiting, 11 cases of postural imbalance, from 1 to 7 days;
- In QLR: 2 cases of nausea, 1 of vomiting, 6 cas-

Table II. Efficacy of manoeuvres.

	MS	QLR	CRMP
1 manoeuvre	72%	80%	83%
2 manoeuvres	20%	10%	9%
3 manoeuvres	5%	8%	4%
Success rate	97%	98%	96%
Failures	3%	2%	4%
Total	100	100	100

MS: Semont's Liberatory Manoeuvre; QLR: Quick liberatory rotation; CRMP: canalith repositioning manoeuvres.

Table III. Liberatory Nystagmus.

Liberatory Ny	MS	QLR	CRMP
+	100 (73.4%)	99 (76.1%)	27 (21.6%)
-	36 (26.6%)	31 (23.9%)	98 (78.4%)
Total manoeuvres	136	130	125

MS: Semont's Liberatory Manoeuvre; QLR: Quick liberatory rotation; CRMP: canalith repositioning manoeuvres; Ny: nystagmus.

es of postural imbalance, from 1 to 7 days;
- In CRMP: 2 cases of nausea, 6 cases of postural imbalance, from 1 to 7 days;
- In 3 cases (1 for each group) therapeutic manoeuvres caused a secondary horizontal canalolithiasis, successfully treated by the technique of Gufoni et al. [29].

Follow-up

During the first month, we observed a new crisis of ipsilateral BPPV in 3 patients in MS, in 1 in QLR, in 2 in CRMP.

At one-month control (we performed DHM in 146 patients, as reported above in detail), therapeutic results were confirmed.

At the same time, in the group of untreated patients, 10/18 (55.5%) were still DHM+, thus showing the efficacy of treatment vs no treatment ($p < 0.001$).

In a medium period follow-up (1-15 months), we observed 4 relapses (2 contralateral) in MS, 1 in QLR, 2 in CRMP.

Discussion

Treatment of posterior canalolithiasis is based upon two groups of manoeuvres: "liberatory manoeuvres" [1-3] in which ejection of the otoconia from canal is induced, "using the addition of the pressure of the endolymph and the inertia of the heavy materials" (Semont [1]) by a strong acceleration; "repositioning manoeuvres" in which we would "guide" otoconia out of the canal into the utricle by slowly moving the head of the patient from the affected to the opposite side.

In our overall personal experience (1245 cases of posterior canalolithiasis), we have performed primarily the Semont manoeuvre, using CRMP in 254 cases.

Both manoeuvres were very effective, with > 95% success rates in 1-3 cycles.

Furthermore, in our experience, we stressed the effectiveness of MS and the frequency of the secondary liberatory Ny, which predicts resolution of the pathological condition; in CRMP, a similar effectiveness and better tolerability are achieved but an infrequent liberatory Ny is observed.

Then why did we look for something else?

1. MS is sometimes difficult to perform either for the patient or the physician, because it is necessary to quickly swing the patient's body side-to-side in the frontal plane: in some cases, weight could be considerable and patient collaboration, during the movement, might be lacking!
2. Side-effects and secondary imbalance can be very troublesome for some patients.
3. CRMs which are better tolerated and equally effective, rarely induce the liberatory Ny, sign of possible recovery.

Table IV. Liberatory nystagmus and initial outcome.

	MS	QLR	CRMP
Real "no e. of d." (Lib Ny + DHM–)	88/100	81/99 (81.9%)	20/27 (74.1%)
False "no e. of d." (Lib Ny+ DHM–)	12/100	18/99 (18.2%)	7/27 (25.9%)
Real failures (Lib Ny– DHM+	28/36 (77.8%)	14/31 (45.1%)	21/98 (21.4%)
False failures (Lib Ny– DHM–)	8/36 (22.2%)	17/31 (54.9%)	77/98 (78.6%)

MS: Semont's Liberatory Manoeuvre; QLR: Quick liberatory rotation; CRMP: canalith repositioning manoeuvres; no e. of d.: no evidence of disease; Lib Ny: liberatory Nystagmus; DHM: Dix-Hallpike Diagnostic Manoeuvre.

4. Epley-derived manoeuvres are substantially similar and all maintain the philosophy of slowly and accurately driving the otoconia out of the posterior canal into the utricle through the common crus.

Therefore, we aimed to:

1. limit the rotation only to the head of the patient in the horizontal plane, while the trunk follows its movement, likewise in CRMs, so that efforts of both the patient and physician are limited;
2. perform this technique with a very important doctrinaire and practical difference: the movement is carried out very quickly (about 180°/sec), so that our manoeuvre resembles the dynamics of MS.

We have called this manoeuvre, "Quick Liberatory Rotation".

It is almost always feasible and easy to perform: only patients presenting recent neck trauma or cervical hernia are excluded; it is as effective as MS and CRMP (initial success in 98%); the results are persistent both in the short and medium period: at 15-month follow-up, we observed only two relapses.

It often causes (76.1%) "liberatory Ny" in the final lying position (contralateral "nose-down").

It seldom causes nausea, vomiting or postural imbalance.

Liberatory Ny is deemed a positive sign, since it has been correlated with clinical recovery of BPPV in 81.9% of cases, but 54.9% of patients without liberatory Ny were negative to test of DHM (i.e., free of disease) either in the retest or in the two-day control (sensitivity: 81.9%; specificity: 43.8%).

We confirm that MS and CRMP are very effective: with MS 97% of positive results and seven recurrences, with CRMP 96% success rate and four relapses. MS appears to be better in detecting "Real free of disease" and "Real failures" (sensitivity: 91.7%; specificity: 70%); sometimes, it is difficult to perform (but only rarely impossible) and shows the most frequent side-effects.

CRMP induces the liberatory Ny in only 21.6% of treatments, while 77.6% of patients without it, were free of disease in the two-day control (sensitivity: 20.7%; specificity: 75%); it seldom caused side-effects.

At present, we agree with Nuti et al. [19] and Campanini et al. [17] in proceeding with retest of DHM only in patients treated by MS without liberatory Ny, if the first cycle did not cause side-effects, while in QLR and CRMP, because of the higher rate of "false failures" (recovery without liberatory Ny), we control our patients only after two-three days.

After the present study, even if MS and CRMP are very effective also in our experience, we use QLR as first choice treatment of posterior canalolithiasis: in our opinion, it can effectively enter into the therapeutic strategies of BPPV.

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