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What Is Balance and Vestibular Rehabilitation Therapy?

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This document discusses current ideas about physical therapy for dizziness and imbalance, also called vestibular rehabilitation, or more generally, balance rehabilitation. While there is some data regarding the efficacy vestibular rehabilitation (for example, Cowand et al, 1998), much remains to be done. Accordingly, this review is opinionated, based on 15 years of clinical experience of the author who is a specialist in the diagnosis and treatment of dizziness. The main message is that therapy is often worthwhile, but selection of the best type depends on both the diagnosis and health care situation. This page is primarily intended to be a reference for patients who have been referred for therapy.

What are the Indications for Therapy?

There are three clear indications for vestibular rehabilitation referrals:

- Specific interventions for benign paroxysmal positional vertigo (BPPV)
  - The Epley and Semont maneuvers
  - The Brandt-Daroff exercises
  - Log roll exercises (for lateral canal BPPV)
- General interventions for vestibular loss
  - Unilateral loss, such as for vestibular neuritis or acoustic neuroma
  - Bilateral loss, such as for gentamicin toxicity and related conditions
- Empirical treatment for common situations where the diagnosis is unclear
  - Post-traumatic vertigo
  - Multifactorial disequilibrium of the elderly

Individuals not likely to benefit from vestibular therapy include:

- Persons without a vestibular problem, for example
  - low blood pressure
  - medication reactions (other than ototoxicity)
  - anxiety, malingerers, depression (although T'ai Chi may be helpful for anxiety)
  - migraine associated vertigo (although it has been reported to be helpful nonetheless)
  - transient ischemic attacks (TIA)
- Persons with fluctuating vestibular problems

Meniere's disease

perilymphatic fistula

There are some conditions where it is not entirely clear whether rehabilitation is helpful, but it seems likely at this writing that it is not.

Mal de debarquement (MDD)

cerebellar degenerations

idiopathic motion intolerance

How Can the Success of Rehabilitation Be Measured?

Measuring success is more difficult than it sounds. There are several fallacies:

Tincture of time: Most disorders have a tendency to get better on their own, so one possible fallacy is to attribute improvement to physical therapy, without controlling for passage of time.

What is important? Most people limit their activities by their overall risk. As they feel more stable, they move around more. Measurement of falls or trips is related to activity and objective risk. Given that people want to increase their activity, they may keep their number of falls constant, as they improve.

What is balance? There presently is no method of measuring "balance." There are numerous methods of measuring things that are associated with balance.

How do you separate psychological aspects (that is, fear of falling) from objective aspects (that is, risk of falling)?

Probably the most valid measures right now are subjective measures (questionnaires). Examples include the dizziness handicap inventory (DHI) and the activities-specific confidence scale (ABC). Nevertheless, these measures are greatly handicapped by their intrinsic variability, and tendency for people to scale their responses according to what they think they should be doing, rather than actual performance.

Other measures of "balance" include posturography, rotatory chair testing, ENG testing; and mobility oriented scales, such as the timed "get up and go" test, and the Berg balance scale.

A Medline search performed in February 2008 found numerous clinical reports

supporting the use of vestibular rehabilitation therapy. A recent and very thourough review (Hillier, 2007) of 21 clinical trials found that vestibular rehabilitation resulted in significant improvement in patients with unilateral peripheral vestibular dysfunction. The exception to this finding was in patients with BPPV, who benefited more from specific interventions (described below) than from general vestibular rehabilitation therapy.

Several individual clinical trials also showed patients to benefit from vestibular rehabilitation, including both genetic and individualized interventions. Patients showed improvement both on subject questionnaires and on clinical vestibular testing (Enticott, 2008; Badaracco, 2007; Venosa, 2007; Meli, 2006; Nishino, 2005, Macias, 2005, Bittar, 2005, Badke, 2005; Yardley, 2004; Hansson, 2004; Dannenbaum, 2004; Cohen, 2004; Topuz, 2004; Bittar, 2002; Murray, 2001). Patients who experience anxiety or depression along with the vestibular symptoms may see improvement in their emotional state with vestibular rehabilitation (Meli, 2007).

Many patients, particularly older ones, have additional medical problems that contribute to the vestibular symptoms. Treatment of these other problems significantly affects their response to rehabilitation therapy (Moreira, 2007).

Children with peripheral vestibular disorders probably benefit from rehabilitation (Medeiros, 2005), although clinical trials with children are rare.

Specific Interventions

At this writing, only BPPV has specific rehabilitation interventions. This material is abstracted from our BPPV page.

How is BPPV Treated?

- Office Treatment
- Home Treatment (Brandt-Daroff Exercises)

Office Treatment of BPPV: The Epley and Semont Maneuvers

There are two treatments of BPPV that are usually performed in the doctor's office. Both treatments are very effective, with roughly an 80% cure rate, according to a study by

Herdman and others (1993). If your doctor is unfamiliar with these treatments, you can find a list of knowledgeable doctors from the Vestibular Disorders Association (VEDA) (http://www.vestibular.org/).

The maneuvers, named after their inventors, are both intended to move debris or "ear rocks" out of the sensitive part of the ear (posterior canal) to a less sensitive location. Each maneuver takes about 15 minutes to complete. The Semont maneuver (also called the liberatory maneuver) involves a procedure whereby the patient is rapidly moved from lying on one side to lying on the other. It is a brisk maneuver that is not currently favored in the United States.

The Epley maneuver is also called the particle repositioning, canalith repositioning procedure, and the modified liberatory maneuver. It involves sequential movement of the head into four positions, staying in each position for roughly 30 seconds. The recurrence rate for BPPV after these maneuvers is about 30% at one year, and in some instances a second treatment may be necessary. While some authors advocate use of vibration in the Epley maneuver, we have not found this useful in a study of our patients.

After either of these maneuvers, you should be prepared to follow the instructions below, which are aimed at reducing the chance that debris might fall back into the sensitive back part of the ear.

Instructions For Patients After Office Treatment (Epley or Semont Maneuvers)

1. Wait for 10 minutes after the maneuver is performed before going home. This is to avoid "quick spins," or brief bursts of vertigo as debris repositions itself immediately after the maneuver. Don't drive yourself home.

2. Sleep semi-recumbent for the next two nights. This means sleep with your head halfway between being flat and upright (a 45-degree angle). This is most easily done by using a recliner chair or by using pillows arranged on a couch. During the day, try to keep your head vertical. You must not go to the hairdresser or dentist, or engage in exercise that requires head movement. When men shave under their chins, they should bend their bodies forward in order to keep their head vertical. If eye drops are required, try to put them in without tilting the head back. Shampoo only under the shower.

3. For at least one week, avoid provoking head positions that might bring BPPV on again:

Use two pillows when you sleep

Avoid sleeping on the “bad” side

Don’t turn your head far up or far down

Be careful to avoid head-extended position, in which you are lying on your back, especially with your head turned towards the affected side. This means that you should be cautious at the beauty parlor, dentist’s office, and while undergoing minor surgery. Try to stay as upright as possible. Exercises for low-back pain should be stopped for a week. No sit-ups should be done for at least one week and no “crawl” swimming. (Breast stroke is all right.) Also avoid far head-forward positions such as might occur in certain exercises (for example, touching the toes). Do not start doing the Brandt-Daroff exercises immediately or two days after the Epley or Semont maneuver, unless specifically instructed otherwise by your doctor.

4. At one week after treatment, put yourself in the position that usually makes you dizzy. Position yourself cautiously and under conditions in which you can’t fall or hurt yourself. Let your doctor know how you did.

Massoud and Ireland (1996) stated that post-treatment instructions were not necessary. While we respect these authors, at this writing (2002), we still feel it best to follow the procedure recommended by Epley.

What if One Has Bilateral BPPV?

There is some concern in this situation that treating one side followed by treating the other might “undo” the positive effects of the first. Therefore, a common approach is to treat one side, and move on to the other a week later. Nevertheless, some physicians treat both sides in the same session, with good results. In either case, a follow-up visit is usually needed at roughly a week from the initial attempt.

What if the Maneuvers Don’t Work?

These maneuvers are effective in about 80% of patients with BPPV (Herdman et al, 1993). If you are among the other 20%, your doctor may wish you to proceed with the Brandt-Daroff exercises, as described below. If a maneuver works but symptoms recur or the response is only partial (about 40% of the time according to Smouha, 1997),

another trial of the maneuver might be advised. When all maneuvers have been tried and symptoms are still intolerable, then surgical management (posterior canal plugging) may be offered.

BPPV often recurs. About 33% of patients have a recurrence in the first year after treatment, and by five years, about half of all patients have a recurrence (Hain et al, 2000; Nunez et al; 2000). If BPPV recurs in our practice, we usually retreat with one of the maneuvers above, and then follow this with a once a day set of the Brandt-Daroff exercises.

In some persons, the positional vertigo can be eliminated, but imbalance persists. In these persons it may be reasonable to undertake a course of generic vestibular rehabilitation, as they may still need to accommodate to a changed utricular mass or a component of persistent vertigo caused by cupulolithiasis. Fujino et al (1994) reported conventional rehabilitation has some efficacy, even without specific maneuvers.

Home Treatment Of BPPV: Brandt-Daroff Exercises

The Brandt-Daroff Exercises are a method of treating BPPV, usually used when the office treatment fails. They succeed in 95% of cases but are more arduous than the office treatments. These exercises are performed in three sets per day for two weeks. In each set, one performs the maneuver as shown five times.

1 repetition = maneuver done to each side in turn (takes 2 minutes)

Suggested Schedule for Brandt-Daroff Excercises:

Morning

- Exercise: 5 repetitions
- Duration: 10 minutes

Noon

- Exercise: 5 repetitions
- Duration: 10 minutes

Evening

Exercise: 5 repetitions

Duration: 10 minutes

Start sitting upright. Then move into the side-lying position, with the head angled upward about halfway. An easy way to remember this is to imagine someone standing about 6 feet in front of you, and just keep looking at their head at all times. Stay in the side-lying position for 30 seconds, or until the dizziness subsides; if this is longer, then go back to the sitting position. Stay there for 30 seconds, and then go to the opposite side and follow the same routine.

These exercises should be performed for two weeks, three times per day, or for three weeks, twice per day. This adds up to 52 sets in total. In most persons, complete relief from symptoms is obtained after 30 sets, or about 10 days. In approximately 30% of patients, BPPV will recur within one year. If BPPV recurs, you may wish to add one 10-minute exercise to your daily routine (Amin et al, 1999). The Brandt-Daroff exercises, as well as the Semont and Epley maneuvers, are compared in an article by Brandt (1994), listed in the reference section.

General Interventions

Cawthorne Cooksey Exercises

One of the first general interventions for vestibular problems were the Cawthorne-Cooksey exercises, as described below. These are a one page handout of activities that progress from simple head movement to complex activities such as throwing a ball. The major advantage of the Cawthorne-Cooksey exercises is that they are very low cost and often effective. When combined with an accurate diagnosis and use of BPPV maneuvers instead of these exercises, if appropriate, this approach is can be very effective. We also like the idea of having the patient see a physical therapist on an occasional basis to act as a “coach,” since not all individuals are able to move though the exercises without help.

These exercises are adapted from Dix and Hood, 1984 and Herdman, 1994; 2000.

1. In bed or sitting
    1. Eye movements — at first slow, then quick
        1. up and down
        2. from side to side

3. focusing on finger moving from 3 feet to 1 foot away from face

2. Head movements at first slow, then quick, later with eyes closed
    1. bending forward and backward
    2. turning from side to side
3. Sitting
    1. Eye movements and head movements as above
    2. Shoulder shrugging and circling
    3. Bending forward and picking up objects from the ground

2. Standing
    1. Eye, head and shoulder movements as before
    2. Changing form sitting to standing position with eyes open and shut
    3. Throwing a small ball from hand to hand (above eye level)
    4. Throwing a ball from hand to hand under knee
    5. Changing from sitting to standing and turning around in between
3. Moving about (in class)
    1. Circle around center person who will throw a large ball and to whom it will be returned
    2. Walk across room with eyes open and then closed
    3. Walk up and down slope with eyes open and then closed
    4. Walk up and down steps with eyes open and then closed
    5. Any game involving stooping and stretching and aiming such as bowling and basketball

Diligence and perseverance are required but the earlier and more regularly the exercise regimen is carried out, the faster and more complete will be the return to normal activity. Ideally, these activities should be done with a supervised group. Individual patients should be accompanied by a friend or relative who also learns the exercises.

Individualized Physical Therapy

In the 1990s an effort was begun, led by several academic physical therapists, to advocate exercises customized to individual problems (for example, Horak et al, 1992). Therapists performed an evaluation (physical examination), which allowed them to

adjust their treatment program. For example, for BPPV, in most cases it might seem irrational to treat with anything other than specific interventions such as the Epley maneuver (although general exercises seem to help too — Fujino et al, 1994). This was an important development as prior to this time; therapists often treated all dizzy patients with the same protocol (for example, the Cawthorne-Cooksey). The major advantage is greater efficiency. Reliable controlled studies showing that anything fancier than separating out the BPPV patients for special handling is significantly better than, for example, the Cawthorne-Cooksey exercises (see above) are presently hard to come by, although there have been some attempts (Smith-Wheelock et al, 1991). There is also evidence for a considerable positive effect of rehabilitation for chronic neurological disorders (Solari et al, 1999), suggesting that the general idea is worthwhile.

The disadvantage of individualized physical therapy is the higher cost compared to the Cawthorne-Cooksey or other "do it yourself" regimes. Usually four to eight sessions of therapy are prescribed (Gans, 1998), but sometimes as many as 16 sessions or ongoing treatment is recommended. This approach can, perhaps, be compared to working out with a personal trainer. The trainer is likely to be helpful, but the experience will cost you a bit more than doing it yourself.

This genre of exercises has its own nomenclature, for example:

Gaze stabilization exercises — activities where one attempts to read while moving the head

Museum walking — walking around while looking back and forth

Gait or balance (re)training — practicing walking, with the head still or moving

Posturography training — use of a machine similar to a ski video-game for 30 minutes per week for training.

Liberatory maneuver or Canalith Repositioning — these are alternative names for the BPPV maneuvers previously discussed.

It is not unusual for therapists to propose creative treatment maneuvers with uncertain rationale. For example, therapists might have patients smear their glasses with Vaseline. The rationale is to reduce "visual dependency." Bouncing on Swiss balls or mini-tramps may be advocated to build up the otolith-ocular reflex. Patients may be urged to track objects that are moving in counterphase to their heads (there is no natural situation that this exercise might help them with). These therapists also often rely on an unusual physical examination that uses the "foam and dome" to destabilize individuals, as well

as more conventional devices such as Frenzel goggles (for BPPV).

Devices of uncertain utility, such as posturography, are also often found in physical therapy settings (posturography has not been shown so far to be of diagnostic value, except for malingering). As in hamburger merchandising, franchises of “balance centers” exist throughout the country. Some vestibular rehabilitation courses also offer a certification procedure for vestibular rehabilitation therapists.

Little outcome information is available about posturography training. This procedure involves a moving platform coupled to a computer monitor. Patients are asked to keep their center of pressure within a box on the screen or to track a target. Typically two sessions are given per week over several weeks. There are several commercial vendors including Neurocom and Kat. On the face of it, this procedure seems unlikely to promote neuroplasticity or adaptation, but it might assist individuals in forming internal models of their body and the outside world. Two recent studies suggested that there is no benefit from this procedure over conventional physical therapy for acute stroke balance rehabilitation (Walker et al, 2000; Geiger et al, 2001). In this situation, it would seem to us that any benefit of the training might be obscured by much more important and fundamental neural processes involved in stroke recovery. Additional studies are needed to determine the utility of these devices in other contexts than acute stroke. Particularly interesting might be to see whether these devices have utility in more static situations.

Our take on this is that individualized vestibular rehab is often the best way to do it, but it is somewhat expensive compared to the alternatives. Vestibular rehabilitation is clearly worthwhile for disabling and refractory problems such as bilateral vestibular loss and easy to deal with problems such as BPPV. Home programs such as the Cawthorne-Cooksey exercises are usually adequate for unilateral vestibular loss situations, such as vestibular neuritis.

A new approach that has been investigated is the use of virtual reality. This involves individualized therapy with visual, vestibular and somatosensory input designed to challenge the vestibular system and train it to adapt to environmental stimuli. Small studies found improvement on posturography testing and vestibular symptoms (Suarez, 2006; Pavlou, 2005).

Alternative and Occupational Approaches

An alternative way of obtaining the goal of balance rehabilitation is to make use

occupational or avocational activities. T'ai Chi, a Chinese exercise routine similar to ballet is one such method. Sports activities such as golf, bowling, or recreational walking can also be used for rehabilitation. These activities are intrinsically lower in cost than individualized therapy, but their efficacy has not been compared in a head-on fashion to individualized therapy. They are probably most appropriate for those who have "graduated" from individual physical therapy.

The combination of psychological counseling, such as cognitive behavioral therapy, with vestibular rehabilitation may be helpful in patients who have a significant emotional disorder that aggravates their vestibular problems (Andersson, 2006; Holmberg, 2006).

Empirical Treatment

Anywhere between 15 and 50% of patients evaluated by tertiary care "dizziness" clinics go undiagnosed. In this situation, rather than giving up all hope, it is often useful to have an organized approach to try out all reasonable interventions. In the author's practice, this includes both medications as well as a one- or two-month enrollment in a balance/vestibular rehabilitation program, for patients who have chronic symptoms. Recent studies have suggested that vestibular rehabilitation reduces severity of agoraphobia in persons with agoraphobia and vestibular dysfunction (Jacob et al, 2001).

Similarly, patients with central vestibular problems (for example, a cerebellar cerebrovascular accident) are highly unlikely to benefit from medication or therapy. Nevertheless, these patients are usually so impaired that it seems ill advised not to try out all possible modalities.

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