

UNILATERAL PERIPHERAL VESTIBULAR DISORDERS IN THE EMERGENCY ROOM OF THE ENT DEPARTMENT OF CLUJ-NAPOCA, ROMANIA

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Abstract

Objective. To assess the management of unilateral peripheral vestibular disorders in the emergency room of the ENT Department of Cluj-Napoca, Romania.

Material and method. The study was prospective, non-randomized, and included the patients presented for dizziness or balance disorders at the emergency room of the ENT Department between March 2012 and March 2013. Demographic characteristics, specific clinical history, the onset of peripheral vestibular disorders, and co-morbidities were recorded. The patients charts included the type of onset and the treatment (medical, surgical, and rehabilitation) performed in the emergency room or, in case of hospital admission, the relieving measures for the vestibular symptoms with or without hearing recovery.

Results. One hundred and fifty-two subjects were included in our study, 97 with pure peripheral vestibular dysfunction (VD), 34 with cochlear-vestibular dysfunction (CVD), and 21 with Ménière's disease (MD). No significant differences were identified when the proportion of patients with a certain onset (acute, subacute or chronic) were compared. Hypertension was the most frequent co-morbidity in all investigated groups. No significant difference was observed when the relief of vertigo or hearing recovery were compared between all groups.

Conclusion. This first Romanian report on the management of unilateral peripheral vestibular disorders showed that early corticosteroids treatment associated with electrolytes, antiemetic, and vasodilation drugs led to the recovery of the vestibular function without any differences between the types of peripheral vestibular dysfunction. In addition, we obtained the complete recovery of the vestibular and acoustic dysfunction in the cases treated with methylprednisolone intratympanic injection.

Keywords: peripheral vestibular disorders, ENT emergency room, algorithm, vertigo, dizziness.

Background and aims

Dizziness may be problematic when presented to the emergency department, both from a diagnostic and a management viewpoint [1]. It is important to establish a difference between the central and the peripheral disorders

and this task may sometimes be difficult. There are clinical characteristics that could orientate the diagnosis but there also specific investigations needed [2].

Vertigo and dizziness are most often caused by different vestibular disorders, such as benign paroxysmal positional vertigo (BPPV), Ménière's disease (MD), and other vertigo of peripheral vestibular origin [3]. Causes of vertigo are multi-faceted and can be due to a dysfunction of

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the peripheral or central vestibular system [4], but may also be psychogenic. Internal causes are unlikely in pure rotatory vertigo and are usually overrated; postural vertigo may result from orthostatic disturbances or from adverse effects of medications such as antihypertensive or anticonvulsive drugs [2]. The last years have offered new strategies for the diagnosis and treatment of peripheral vestibular disorders: pharmacological [5,6] and surgical interventions [7] that offer limited improvement, and vestibular rehabilitation for the treatment or management of patients with vestibular dysfunction [8,9].

The aim of our study was to assess the management of unilateral peripheral vestibular disorders in the emergency room of the ENT Department of Cluj-Napoca, Romania.

Material and methods

A prospective, non-randomized study was conducted between March 2012 and March 2013 to accomplish our goals. The patients who presented for dizziness or balance disorders to the emergency room of the ENT Department, Emergency County Hospital, Cluj-Napoca, Romania, were included in this study.

All the patients accepted both the participation and the follow-up schedule. We included in this study patients which were initially examined in the emergency room; the first revision of symptoms was performed at 24 hours and then every two days until the relief of symptoms. The patients also signed an informed consent form, which contained a comprehensive description of the procedures (such as pharmacotherapy, intratympanic injections, surgery, and/or vestibular rehabilitation), the expected outcomes, and the possible side effects. For patients younger than eighteen years old a verbal consent was taken. The informed consent form was signed by their parents. No penalties were applied for discontinued participation in the study. The patients with symptoms of central, neurological degenerative or cerebellar disorders were excluded from the study.

Demographic characteristics, such as age and gender, were collected from all of the patients included in the study. A specific clinical history centered on the beginning of the crisis, the duration and other associated symptoms, as well as a complete vestibular examination were performed. An algorithm for diagnosis and therapy was used (Fig. 1).

The onset of peripheral vestibular disorders, vestibular and audiologic signs, and co-morbidities were also recorded. The unilateral injury of peripheral vestibular structures produces specific symptoms which consist of severe vertigo, nausea and vomiting, spontaneous nystagmus, and postural instability and based on these we included the patients in the vestibular dysfunction group (VD). The severity of the vestibular crisis was one criterion for admission to our department. When the vestibular peripheral dysfunction was associated with acute hearing

loss, the patients were included in the group of cochlear-vestibular dysfunction (CVD). The Ménière's disease (MD) group included subjects with acute episodic vertigo, or sudden hearing loss, or increasing of tinnitus. The patients in each group were further divided by the severity of the symptoms and the time between the beginning of the crisis and the presentation to the ENT room in acute (lasting from 2 weeks), subacute (between 2 and 4 weeks), and chronic status (more than 4 weeks).

The patient's charts included the type of onset (acute, subacute or chronic disease) and the treatment (medical, surgical, and rehabilitation) performed in the emergency room or in case of patient's admission. The charts were reviewed 24 hours after diagnosis and included the types of treatment for the relief of the vestibular symptoms with or without hearing recovery, in cases of cochlear-vestibular dysfunction or Ménière disease. The possible strategies for restoring the body vestibular sense, visual function and co-ordination are: medication, physical and surgical procedures. The acute phases of vestibular or cochlear-vestibular dysfunction were treated with infusion with corticosteroids (progressive decreasing doses of hydrocortisone hemisuccinate), electrolytes substitution, antiemetic, and vasodilation medication. Antivertiginous treatment (betahistine) was used for subacute or chronic conditions. Benign paroxysmal vertigo was diagnosed by Dix Hallpike maneuver for the three semicircular canals and the treatment was the liberating manoeuvres (Epley and Semont). The surgical treatment which involved intratympanic application of medication (methylprednisolone (0.2 ml), dexamethasone, and gentamicin) was used for the CVD and MD treatment. The inclusion criteria were the symptoms and hearing loss severity for the CVD and increasing numbers of acute crisis under chronic medication with Betahistine for MD. Vestibular rehabilitation therapy (VRT) was used in acute and chronic status of all the groups for improving the vestibular or balance dysfunctions. Cholesteatoma surgery or sacotomy were performed only in a few cases with prior hypoacusia complicated by CVD or MD.

The study was approved by the Ethics Committee of Iuliu Hațieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania.

Statistical analysis

Quantitative variables are presented as means and standard deviations whenever the data proved normally distributed; otherwise, median and interquartile range are reported. Qualitative variables are presented as absolute and/or relative frequencies associated with 95% confidence intervals for proportions [10]. The Z-test was applied to test the differences between two proportions. Kruskal-Wallis ANOVA was used to compare quantitative variables between groups whenever data proved not to follow a normal distribution.

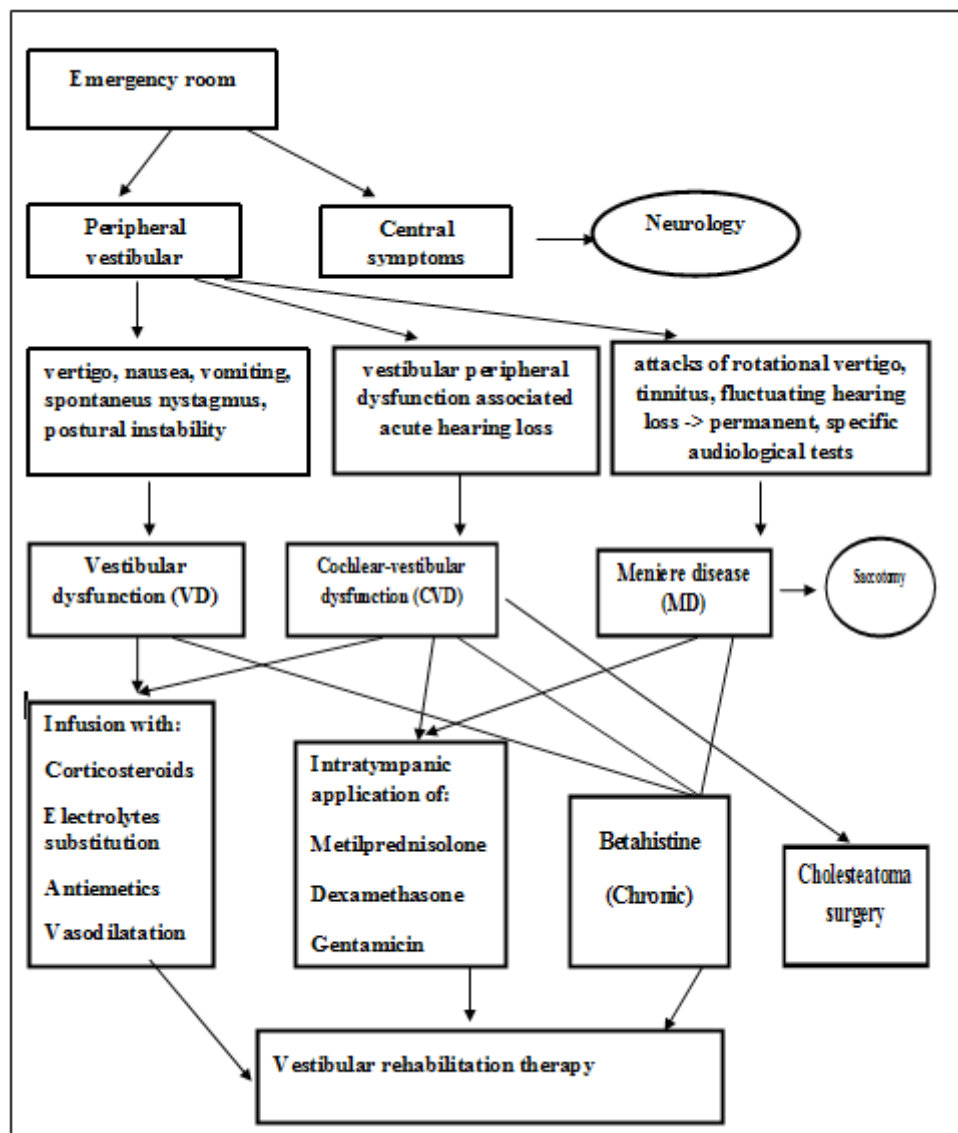


Figure 1. Algorithm for the diagnosis and treatment of the vestibular disorders.

The Statistica software (StatSoft. Inc., Tulsa, OK), version 8.0, was used for the statistical analysis. A significance level of 5% was applied whenever two groups were compared; for comparison between three groups the differences were considered significant when p-values were smaller than 0.0167.

Results

One hundred and fifty-two subjects were included in our study, 97 with pure peripheral vestibular dysfunction (VD), 34 with cochlear-vestibular dysfunction (CVD), and 21 with Ménière disease (MD). Four patients with cholesteatoma complicated with an perilymphatic fistula presenting acute symptoms of CVD in the emergency ENT room and all cases with acute VD with prior hypoacusia (i.e. tympanic membrane's perforation, tympanosclerosis, prior ear surgery) were included. The age of subjects ranged

between 14 and 80 years with no significant differences within investigated groups (Kruskal-Wallis ANOVA: statistics=1.2628, p-value=0.5318). The demographic characteristics of subjects included in the study according to the disease are presented in **Table I**.

Three significant differences were observed between the investigated groups regarding the demographic characteristics:

- a significant proportion of subjects from urban area had VD compared to CVD ($p=0.0131$);
- a significant lower proportion of subject from urban area had CVD compared to those with MD ($p=0.0158$).

The first filtering of our patients in the emergency room excluded the obvious clinical signs of a more serious cause for dizziness: confusion or impaired mental state, sudden head or neck pain, neurological or cardiovascular symptoms, and abdominal vital sign. The clinical assessment

Table I. Demographic characteristics and clinical profiles of patients included in the study.

Parameter	VD (n=97)	CVD (n=34)	MD (n=21)
Age (years) ^a	52 (36; 60)	52 (39.75; 63)	43 (37; 59)
Gender ^b			
M	25 (25.77 [17.54; 36.07])	15 (44.12 [26.56; 61.68])	7 (33.33 [14.51; 56.92])
F	72 (74.23 [63.93; 82.46])	19 (55.88 [38.32; 73.44])	14 (66.67 [43.08; 85.49])
Living background			
Urban	69 (71.13 [60.84; 80.40])	16 (47.06 [29.50; 64.62])	17 (80.95 [57.37; 95.01])
Rural	28 (28.87 [19.59; 39.16])	18 (52.94 [35.38; 70.50])	4 (19.05 [4.99; 42.63])
Onset			
Acute	56 (57.73 [47.43; 68.03])	18 (52.94 [35.38; 70.50])	11 (52.38 [28.8; 75.96])
Subacute	26 (26.80 [18.57; 37.10])	15 (44.12 [26.56; 61.68])	8 (38.10 [19.27; 61.68])
Chronic	15 (15.46 [9.29; 23.70])	1 (2.94 [0.09; 14.62])	2 (9.52 [0.23; 28.34])

VD = vestibular dysfunction (peripheral and non-systematized);

CVD = cochleo-vestibular dysfunction; MD = Ménière's disease;

^a median (Q1; Q3), where Q1 = 25th percentile; Q3 = 75th percentile

^b n (% [95%CI]), where 95%CI = 95% confidence interval

of the type of vertigo or dizziness was performed according to the duration of vertigo (seconds, hours, days or weeks), a clear history of dizziness triggers (e.g. changes in head position and, when possible, the Dix-Hallpike maneuver to reproduce the symptoms), and a focused neurological exam to exclude the presence of three dangerous oculomotor signs in patients presenting with acute vestibular syndrome at high risk for stroke: normal vestibulo-ocular reflex responses, vertical and direction-changing nystagmus. The head thrust test allows a direct assessment of the vestibulo-ocular reflex and an abnormal result is highly suggestive of a lesion of the vestibular nerve.

No significant differences were identified when the comparing the types of onset (acute, subacute or chronic) between the investigated groups ($p \geq 0.0524$, the lowest p-value being obtained when acute CVD was compared to acute MD).

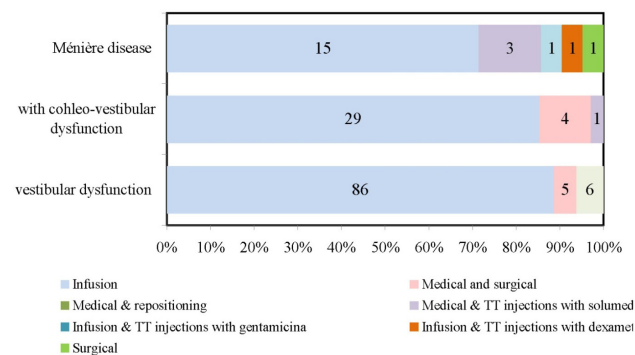
We considered an unidirectional spontaneous horizontal nystagmus as highly suggestive for a lesion of the vestibular nerve. The affected side was the side opposite the direction of the fast phase of nystagmus. A central lesion was presumed whenever a pattern other than unidirectional spontaneous horizontal nystagmus was observed. The most common central patterns of nystagmus were direction changing nystagmus and spontaneous down-beating nystagmus. In benign paroxysmal positional vertigo (BPPV), the nystagmus can change direction with changes in head position, and a principally vertical nystagmus is the characteristic pattern of the most common BPPV variant, posterior canal lesion.

Subjects with vestibular dysfunction had most frequently more than one associated co-morbidity (36.08% [26.82; 46.38]). The same was also observed in the group of patients with cochlear-vestibular dysfunction (41.18% [23.62; 58.74]) as well as in the group of patients with Ménière's disease (28.57% [9.75; 52.15]). No significant differences were identified when these percentages were compared ($p > 0.05$). In both vestibular dysfunction group

and Ménière disease group the patients had no associated co-morbidities (34.02% [24.75; 44.32], and 47.62% [24.04; 71.20], respectively). Hypertension was the most frequent co-morbidity in all investigated groups followed by diabetes in the cochlear-vestibular dysfunction and Ménière disease groups. Cervical spondylosis was diagnosed more frequently in the vestibular dysfunction group compared to cochlear-vestibular dysfunction ($Z=2.5758$, $p=0.01$). No other significant differences were identified ($p > 0.05$).

All patients with acute phase of disease were admitted to the ENT wards for treatment: minimum 3 days in case of intratympanic administration of methylprednisolone, and a maximum of 12 days in cases with infusion and surgical treatment. Most of the patients received infusion treatment with no significant differences between groups ($p \geq 0.1034$): 88.66% [80.42; 93.80] for the vestibular dysfunction group, 85.29% [67.73; 94.03] for the cochlear-vestibular dysfunction group, and 71.43% [47.85; 90.25] respectively, for the group of subjects with Ménière's disease. The distribution of treatment per group of subjects included in the study is presented in Figure 2.

No significant difference was been observed when


Figure 2. Distribution of treatment used in the selected groups.

the relief of vertigo was compared between subjects with Ménière's disease and those with cochlear-vestibular

dysfunction ($Z = 0.4612$, $p = 0.6447$), and vestibular dysfunction subjects and Ménière's disease ($Z = -2.1905$, $p = 0.0285$) respectively. The recovery of hearing was evidenced in three subjects (3.09% [1.04; 8.24]) with vestibular dysfunction (Fig. 3), in ten subjects with cochlear-vestibular dysfunction (29.41% [14.79; 46.97], Fig. 4), and in five patients with Ménière's disease (23.81% [9.75; 47.39], Fig. 5).

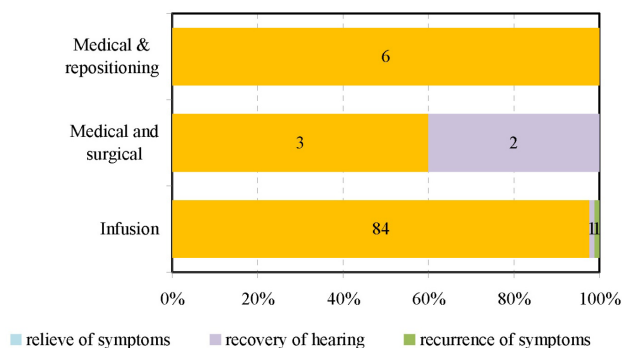


Figure 3. Relief of symptoms in the vestibular dysfunction group.

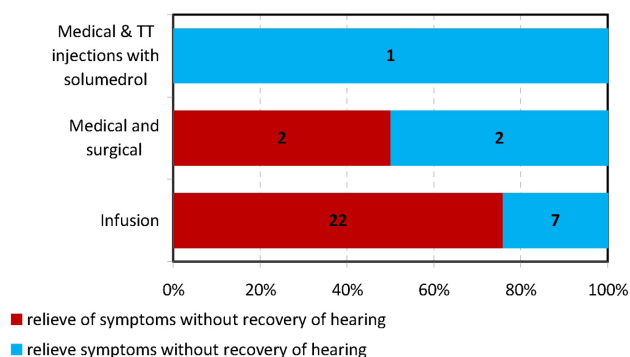


Figure 4. Relief of symptoms in the cochlear-vestibular dysfunction group (TT = transtympanic).

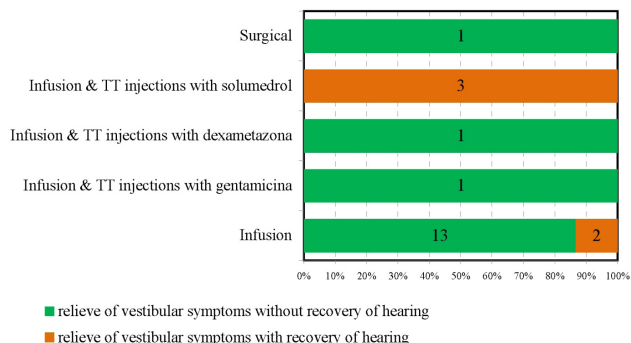


Figure 5. Relief of symptoms in the Ménière disease group (TT=transtympanic).

In the few cases that underwent intratympanic metilprednisolone the hearing was recovered. Significant differences were obtained when the recovery of hearing was compared between in cases with vestibular dysfunction with prior hypoacusia (i.e. tympanic membrane's

perforation, tympanosclerosis, prior ear surgery) and cochlear-vestibular dysfunction ($Z = -3.2853$, $p = 0.001$).

Discussion

Vertigo is one of the most common conditions with which patients present to the physician and its incidence increases with age [4,11]. Despite a lifetime prevalence of dizziness and vertigo estimated at 20–30% and 1-year prevalence estimate for vertigo of 4.9%, the healthcare burden of vertigo is still relatively under-reported due to the unpredictability of attacks and the nature of the disease [12].

This is the first Romanian report of the management of unilateral peripheral vestibular disorders in the ENT Emergency Department. There was a significant predominance of the urban area patients and the female group. The goal in the emergency room was to identify treatable disorders and to stabilize the acute symptoms.

Our patients presenting with vertigo and dizziness in the emergency department fall into one of the following three categories: acute severe dizziness, recurrent attacks of dizziness, or recurrent positional dizziness.

The rate of recovery of peripheral vestibular function ranges from 40% to 63% depending on early treatment with corticosteroids [5]. In our study, the acute symptoms of vertigo, nausea, and vomiting were ameliorated by means of infusions with corticosteroids, electrolytes, peripheral vasodilatation medication, and antivertigo drugs with no statistically difference between the three groups of vestibular disorders. A prospective, randomized, placebo-controlled trial in 141 patients showed that recovery of peripheral vestibular function was significantly improved by monotherapy with methylprednisolone [5].

Transtympanic administration of glucocorticoids is increasing, although so far only one methodologically impeccable study has demonstrated an effect [13]. Furthermore, a prospective randomized controlled trial showed that the frequency of vertigo attacks in refractory Ménière's disease was reduced much more by the transtympanic administration of low doses of gentamicin than by intratympanic dexamethasone (93% vs 61%) [14]. We used intratympanic injections with gentamicin or dexamethasone only in two cases of this study, both with Ménière's disease. A very acute vertigo after injection was described in both cases. However, in a few cases we performed transtympanic administration of methylprednisolone with excellent effects for both vertigo and hearing, but further prospective randomized controlled trials are necessary for strong conclusions.

Surgery was performed in five cases, four with of cholesteatoma complicated with a perilymphatic fistula and one sacotomy for Ménière's disease. In all cases we performed postoperative infusions with corticosteroids and antibiotics with complete symptoms' remission.

Subacute or chronic unilateral peripheral vestibular

pathology was treated with á la long betahistine with good results.

There has been increasing interest in the use of vestibular rehabilitation for the treatment or management of patients with vestibular dysfunction [9,15]. Vestibular rehabilitation is an exercise-based group of approaches initiated with the aim of maximizing central nervous system compensation for vestibular pathology [15]. Specific components have been defined in the vestibular rehabilitation [16], each having differing physiological or behavioural rationales: compensatory responses (for positional or motion-provoked symptoms), based on the inherent plasticity of the central nervous system and using motion to habituate or reduce responsiveness to repetitive stimuli and to rebalance tonic activity within the vestibular nuclei [17]; adaptation for visual-vestibular interaction and possibly eye/hand coordination, using repetitive and provocative movements of the head and/or eyes to reduce error and restore vestibulo-ocular reflex gain; postural control exercises, falls prevention, relaxation training.

The vestibular rehabilitation with specific repositioning maneuvers was performed for particular diagnostic groups of vestibular dysfunction (BPPV). BPPV was not only readily identifiable at the time of the clinical presentation, but the posterior-canal BPPV was effectively treated with the Epley maneuver. Canalith repositioning maneuvers (Epley's, Semont and liberating) were performed on the patient (rather than the patient performing exercises) and were based on a mechanical rationale to shift vestibular debris [18]. If the features were atypical for BPPV or the patient did not respond to repositioning maneuvers, then central disorders was taken into consideration.

Our socio-economic burden makes the neuroimaging studies not generally available in the acute setting; the sensitivity of CT scans for identifying stroke is a dismal 26% [19]; MRI is much more sensitive but takes more time, and is much more expensive. In our study, the indication for radiological imaging depended on the results of the audiological tests for cochlear or retrocochlear disease. Therefore in 18 cases of vestibular disorders we performed MRI for cerebello-pontin angle with a single case of a small acoustic neurinoma, and in other 25 cases of VD we used contrast CT scan to diagnose 2 cases of temporal meningiomas. In the group of cochlear-vestibular dysfunction we diagnosed only one case of meningioma from 17 CT scan examinations performed.

Conclusion

This first Romanian report on the management of unilateral peripheral vestibular disorders showed that early corticosteroids treatment associated with electrolytes, antiemetic, and vasodilatation drugs produces recovery of vestibular function without any difference between types of peripheral vestibular dysfunction. In addition, the complete recovery of the vestibular and acoustic dysfunction in

the cases treated with methylprednisolone intratympanic injection requires more studies in a higher number of patients.

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References

1. Kerber KA. Vertigo presentation in the emergency department. *Semin Neurol.* 2009;29:482-490.
2. Neuhauser H. Epidemiology of vertigo. *Curr Opin Neurol.* 2007;20:40-46.
3. Skøien AK, Wilhemsen K, Gjesdal S. Occupational disability caused by dizziness and vertigo: a register-based prospective study. *Br J Gen Pract.* 2008;58:619-623.
4. Yardley L, Owen N, Nazareth I, Luxon L. Prevalence and presentation of dizziness in a general practice community sample of working age people. *Br J Gen Pract.* 1998;48:1131-1135.
5. Strupp M, Kremmyda O, Brandt T. Pharmacotherapy of vestibular disorders and nystagmus. *Semin Neurol.* 2013;33:286-296.
6. Toyota H, Shimogori H, Sugahara K, Yamashita H. A novel treatment for vestibular disorder with FGLM-NH₂ plus SSSR. *Neurosci Lett.* 2012;526:128-132.
7. Garduno-Anaya MA, Couthino De Toledo H., Hinojosa-Gonzalez R, Pane-Pianese C, Rios-Castaneda LC. Dexamethasone inner ear perfusion by intratympanic injection in unilateral Meniere's disease: a two year prospective, placebo-controlled, double-blind, randomized trial. *Otolaryngol Head Neck Surg.* 2005;133:285-294.
8. Smith-Wheelock M, Shepard NT, Telian SA. Physical therapy program for vestibular rehabilitation. *Am J Otol.* 1991;12:218-225.
9. Chang WC, Yang YR, Hsu LC, Chern CM, Wang RY. Balance improvement in patients with benign paroxysmal positional vertigo. *Clin Rehab.* 2008;22:338-347.
10. Jäntschi L, Bolboacă SD. Exact probabilities and confidence limits for binomial samples: applied to the difference between two proportions. *ScientificWorldJournal.* 2010;10:865-878.
11. Strupp M, Brandt T. Diagnosis and treatment of vertigo and dizziness. *Dtsch Arztebl Int.* 2008;105:173-180.
12. Benecke H, Agus S, Kuessner D, Goodall G, Strupp M. The Burden and impact of Vertigo: Findings from the REVERT Patient Registry. *Frontiers Neurol.* 2013;4:136-143.
13. Strupp M, Dieterich M, Brandt T. The treatment and natural course of peripheral and central vertigo. *Dtsch Arztebl Int.* 2013;110:505-516.
14. Casani AP, Piaggi P, Cerchiai N, Seccia V, Franceschini SS, Dallan I. Intratympanic treatment of intractable unilateral Meniere disease: gentamicin or dexamethasone? A randomized controlled trial. *Otolaryngol Head Neck Surg.* 2012;146:430-437.
15. Giray M, Kirazli Y, Karapolat H, Celebisoy N, Bilgen C, Kirazli T. Short-term effects of vestibular rehabilitation in patients with chronic unilateral vestibular dysfunction: a randomised controlled study. *Arch Phys Med Rehabil.* 2009;90:1325-1331.
16. Herdman SJ, Schubert MC, Das VE, Tusa RJ. Recovery of dynamic visual acuity in unilateral vestibular hypofunction. *Arch Otolaryngol Head Neck Surg.* 2003;129:819-824.

17. Gans RE. Vestibular rehabilitation: critical decision analysis. *Semin Hear.* 2002;23:149–159.
18. Bronstein AM. Benign paroxysmal positional vertigo: some recent advances. *Current Opin Neurol.* 2003; 16:1–3.
19. Chalela JA, Kidwell CS, Nentwich Luby M, Butman JA, Demchuk AM et al. Magnetic resonance imaging and computed tomography in emergency assessment of patients with suspected acute stroke: a prospective comparison. *Lancet.* 2007; 369:293–298.

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