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Benign paroxysmal positional vertigo and concomitant otolithic dysfunction

Abstract

Objectives: This prospective study is designed to clarify the association of Otolithic dysfunction (dysfunction of Utricle) in our outpatient service which is secondary referral otology and neurotology clinic. The parallel usage of OVEMP with ENG and VHIT is an asset to study site of lesion within vestibular system.

According to our findings in 152 patients complaining of vertigo compatible with BPPV, we could expect that recurrent canalolithiasis is originated from some dysfunction in Utricle. It may be due to dysfunction of Macula in maintaining the balance of calcium carbonate crystals (Statoconia) in the utricles. As a matter of fact, dysfunction of Utricle ignites the canalolithisis resulting BPPV symptoms.

We studied all of our patients with true positional vertigo lasting for seconds and we confirmed BPPV with Hallpike's maneuver. We carried out Epley's maneuver for all patients and visited the patients regularly for assessment of treatment and possible recurrence.

We also checked all patients with oVEMP (ocular Vestibular Evoked Myogenic Potential), cVEMP (Cervical Vestibular Evoked Myogenic Potential) and ENG (Electro nystagmography). We found OVEMP abnormality without ENG abnormality that it specifically shows dysfunction of utricle. All patients are divided based on their age and recurrence and we evaluate the abnormality of OVEMP again.

Rate of OVEMP abnormality is much higher in patients with recurrent BPPV and it is very high in younger age group when we compare it with age more than 50 and the first attacks. We can logically conclude that canalolithiasis is not an accidental flow of calcium carbonate in the semicircular canals but it can happen when the balance of these particles impaired in utricle. This impairment can be associated with other structural abnormalities in the hydrodynamic characteristics of semi -circular canals making recurrent or reluctant BPPV.

Keywords: benign paroxysmal positional vertigo, utricle, macula, statoconia, ovemp, cvemp, eng

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Abbreviations: BPPV, benign paroxysmal positional vertigo; oVEMP, ocular vestibular evoked myogenic potential; cVEMP, cervical vestibular evoked myogenic potential; ENG, electro nystagmography; SVV, subjective visual vertical

Introduction

Mammary analogue secretory carcinoma (MASC) was first described by Skálová et al.,[1] in 2010 as a unique entity of the salivary glands. Its pathological features are consistent with the secretory carcinomas of the breast.[1,2] MASC has a distribution across all age groups with a mean of 46years of age and predominance in young male patients. The parotid gland is the most common site of occurrence in 70% of cases. However, non-parotid sites consisting of serous acini including the submandibular, palatine, and labial glands have also been reported. MASC displays overlapping features of both mammary secretory carcinoma and acinic cell carcinoma (AciCC) and is composed of microcystic, cribiform, tubular, papillary, follicular solid or glandular growth patterns.[3–6] Immunocytochemistry of MASC is positive for mammoglobin and S100. Diagnosis of MASC is confirmed with the detection of chromosomal translocation (12;15) (p13;q25) leading to the fusion gene ETV6-NTRK3.[4,6–8] As a result of this translocation, the tyrosine kinase is constitutively active. Additionally, the Ras-MAP kinase mitogenic and the PI-3 kinase-AKT pathways are likely activated as well.[8] These pathways have been implicated in cancer and induce anti-apoptotic signals, thereby promoting tumor survival.[9]

Immunohistochemistry demonstrates positivity for S-100, mammaglobin, GCDFP-15, MUC1, GATA-binding protein 3, adipophilin, α-amylase, DOG-1, SOX-10 and p63.[1,5,10] Clinically, MASC usually portends a good prognosis; however, in some cases, high-grade transformation has been reported and poor outcomes have been demonstrated.[6]

Material and method

A prospective case study was performed at a private otology & neurotology clinic. We did the study with patients' consent and they were aware of investigation for research purposes. We had 150 patients with BPPV in different ages, sexes. 90 patients were female and 60 were male. They were in two category of recurrent and the first attack. Mean age was 58.2 (11-85 y/o). The youngest was 15 and the oldest was 85years old. We followed up the patients for three to twelve months after the first visit. We checked all patients with Hallpick's maneuver and diagnosed for unilateral BPPV in post semicircular Canal.

We carried out the Epley`s maneuver[15] for them and we checked OVEMP for all of the patients. We excluded the patient with underlying vestibular diseases such as Meniere disease, Migraine, Recurrent vestibulopathy, Vestibular Neuritis and central causes. All of our patients have normal ENGs that it shows superior vestibular nerve are normal and abnormal OVEMPs just showing abnormal utricular function.

We analysed data with SPSS 19 and all results approve our studies. We would like to look at the difference between BPVs in different ages, then we divided the patient to three different age group 10-30, 30-50 and older than 50. We also like to find the difference of BPVs in recurrent and non- recurrent BPPVs, so we looked at the patients in two groups of recurrent and the 1st attack.

We researched about relation (searched for the relations) of abnormal OVEMP in the patients with BPPV and correlation between age, sex and recurrence with abnormal OVEMP (Table 1).

Table 1 Result of vestibular investigations in different age groups

Age10-30	1st attack with Abnormal oVEMP	Recurrent with Abnormal oVEMP
14	3	7 (50%)
Age 30-50	1st attack with Abnormal oVEMP	Recurrent with Abnormal oVEMP
32	9	12 (37%)
Older than 50	1st attack with Abnormal oVEMP	Recurrent with Abnormal oVEMP
106	23	28 (26%)

Results

There was no significant relation between oVEMP and sexes (gender) in our study and almost both sexes had abnormal oVEMP (shouldn't this word be capital all the time?) if they had BPPV. We had 14 patients in the age group one (10-30). oVEMP was abnormal in 10 patients out of 14. Two patients had bilateral abnormal oVEMP and oVEMP was abnormal in 6 out of 14 patients in the same ear of BPPV (Table 2). We also had 32 patients in the second age group (30-50). oVEMP was abnormal in 22 out of 32.

Table 2 The first age group (investigations and site of lesion)

Age(10-30)	14 (1.5%)
Bilateral Abnormal oVEMP	2
Unilateral Abnormal oVEMP same side	8 (57%)
Unilateral Abnormal oVEMP Opposite side	0

Three patients had bilateral abnormal oVEMP and 18 had unilateral abnormal oVEMP in the same site of BPPV. One patient had abnormal oVEMP on the opposite side (Table 3). In the third group (older than 50), we had 106 patients 51 to 83 of age. oVEMP was abnormal in 34 patients (Table 4).

Table 3 The second age group (investigations and site of lesion)

Age (30-50)	32 (22%)
Bilateral Abnormal oVEMP	3
Unilateral & same side Abnormal oVEMP	18 (56%)
Unilateral & Opposite side Abnormal oVEMP	1

Table 4 The third age group (investigations and site of lesion)

Age older than 50	106 (70%)
Bilateral Abnormal oVEMP	15
Unilateral & same side Abnormal oVEMP	34 (32%)
Unilateral & Opposite side Abnormal oVEMP	2

We also look at the recurrent patients in the different age groups and its relationship with abnormal oVEMP. 70 patients out of 150 had a positive history of previous attack of the BPPV in the same or opposite side. oVEMP was abnormal in 50 patients. Recurrent patients were in different age groups. It significantly shows that in the youth and recurrent BPPV, we have more dysfunction in the utricle (Tables 5-8).

Table 5 Statistical analysis

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	Cases Used	Statistics for each pair of variables are based on all the cases with valid data for that pair.
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Correlations

Table 6 statistical analysis

		Age	Recurrent	ovemp
Age	Pearson Correlation	1	-0.123	-.187(*)
	Sig. (2-tailed)		0.131	0.021
	N	152	152	152
Recurrent	Pearson Correlation	-0.123	1	-.327(**)
	Sig. (2-tailed)	0.131		0
	N	152	152	152
ovemp	Pearson Correlation	-.187(*)	-.327(**)	1
	Sig. (2-tailed)	0.021	0	
	N	152	152	152

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

[DataSet1] Correlations

Table 7 Statistical analysis

Output Created		#########
Comments		
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	Split File	group
	N of Rows in Working Data File	152
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each pair of variables are based on all the cases with valid data for that pair.
Syntax		CORRELATIONS /VARIABLES=Age recurrent ovemp /PRINT=TWOTAIL NOSIG /MISSING=PAIRWISE.
Resources	Elapsed Time	00:00.0

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Table 8a Correlations (a), group=1

		Age	Recurrent	ovemp
Age	Pearson Correlation	1	-0.433	-0.094
	Sig. (2-tailed)		0.122	0.748
	N	14	14	14
Recurrent	Pearson Correlation	-0.433	1	-0.452
	Sig. (2-tailed)	0.122		0.104
	N	14	14	14
ovemp	Pearson Correlation	-0.094	-0.452	1
	Sig. (2-tailed)	0.748	0.104	
	N	14	14	14

Table 8b Correlations (a), group=2

		Age	Recurrent	ovemp
Age	Pearson Correlation	1	0.128	0.239
	Sig. (2-tailed)		0.486	0.188
	N	32	32	32
Recurrent	Pearson Correlation	0.128	1	-.509(**)
	Sig. (2-tailed)	0.486		0.003
	N	32	32	32
ovemp	Pearson Correlation	0.239	-.509(**)	1
	Sig. (2-tailed)	0.188	0.003	
	N	32	32	32

**Correlation is significant at the 0.01 level (2-tailed)

Table 8c Correlations (a), group=3

		Age	Recurrent	ovemp
Age	Pearson Correlation	1	-.208(*)	-0.128
	Sig. (2-tailed)		0.032	0.191
	N	106	106	106
Recurrent	Pearson Correlation	-.208(*)	1	-.266(**)
	Sig. (2-tailed)	0.032		0.006
	N	106	106	106
ovemp	Pearson Correlation	-0.128	-.266(**)	1
	Sig. (2-tailed)	0.191	0.006	
	N	106	106	106

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

Conclusion

This study can help to explain and understand why calcium carbonate is separated from macula. When there is no balance in the calcium carbonate in the Statoconia and calcium carbonate suspension the utricle. BPPV can happen due to release of calcium carbonate in the Semi-Circular Canals. Macula can release it due to senile changes and even otoconial morphology change with aging[16] but in the youth and patients with recurrent BPPV, we have more pathologies in the Macula because oVEMP shows abnormality in the function of Utricles. We may use oVEMP for prediction of recurrence in the young BPPV patients. The otolith damage also was shown in horizontal canal BPPV using static subjective visual vertical (SVV) test[17] or in saccule using cervical VEMP.[18]

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Conflicts of interest

Author declares there are no cionflicts of interest.

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