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Multiple-canals Benign Paroxysmal Positional Vertigo - A Single Case Study

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Abstract: ***Vast number of individuals with BPPV frequently visits Primary health centers, Otorhinolaryngology and Neurology clinical centers. Amongst vestibular disorders, Benign Paroxysmal Positional Vertigo (BPPV) is the most common and non-life threatening vertigo (1). Multiple-canals BPPV has been particularly examined, as the chief basis of various atypical forms of disease. This case report presents a type of nystagmusevoked during the investigative maneuvers of BPPV. A 66 years old male with a complaint of vertigo was subjected to vestibular assessment. During the assessment, strong beating geotropic horizontal nystagmus on right side in conjunction with up beating tortional component of posterior canal origin was observed thereby, labeling the individual with multiple Semicircular canal (SCC) BPPV.Barbeque 360° Maneuver and Semont's maneuver were performed for canalith repositioning of two involved SCCs on the right side. This mixed component of nystagmus, if not observed carefully during assessment can lead to wrong diagnosis of the patient. Therefore, it is essential to carefully observe the nystagmus changes during the assessment to perform accurate canalith repositioning.***

Keywords: Vertigo, Multiple-canal, BPPV, Nystagmus

1. Introduction

Amongst vestibular disorders, Benign Paroxysmal Positional Vertigo (BPPV) is the most common and non-life threatening vertigo [1].It is a specific label, requiring most easy form of treatment excluding need for medical or surgical intervention [2].Each word signifies the condition, i.e. "benign": not life-threatening, "paroxysmal": sudden, short spells of vertigo, "positional": triggered vertigo from head movements or head positions and "vertigo": spinning sensation [1].

Vast numbers of individuals with BPPV frequently visit primary health centers, Otorhinolaryngology and Neurology clinical centres. Ibekweand Rogers [3], cite the categorization of BPPV based upon anatomical location of dislodged otoconia in semi-circular canal (SCC). This peripheral vestibular disorder is coupled with distinguishing paroxysmal positional nystagmus which can be elicited with unambiguous investigative positional maneuvers, such as Dix-Hallpike test and Supine roll test [4].

Multiple-canal BPPV has been particularlyexamined, as the chiefbasis of various atypical forms of disease, which until now were resistant to management with standard canalith repositioning techniques [5]; [6]. Multiple-canal BPPV incorporates either participation of same canal on both sides or simultaneous participation of different canals on the same or on both sides. One should predominantly think of and search for multiple-canal BPPV versus single canal BPPV when the patient has suffered head trauma. Doubtlessly, the most important factor in labeling the type of BPPV is noticing the provoked nystagmus, during the diagnostic positional maneuvers.

The rationale of this paper is to present the case report regarding the various types of nystagmus produced during the investigative maneuvers of BPPV, which in concurrence with patient's case history and symptoms will help in concluding towards accurate labeling and appropriate management.

2. Need for the Study

BPPV is reported to be the most common vestibular disorder with a prevalence of 2.4% in a lifetime. A calculated incidence and prevalence of BPPV per year accounted to 1.6% and 0.6% respectively. Individuals older than 60 years are reported to experience BPPV almost seven times in comparison to individuals younger than 50 years with a prevalence of 3.4% per year. Along with, a lifetime incidence of 10% is quoted by 80 years of age [7].

Most frequently, posterior SCC demonstrates its involvement in BPPV pathogenic mechanism, which is followed by seldom involvement of horizontal SCC canal and anterior SCC. Korres, Balatsouras, Kaberos, Economou, Kandiloros and Ferekidis [8] identified incidence of 90% for posterior SCC BPPV, 8% for horizontal SCC BPPV and 2% for anterior SCC BPPV. However, Tomaz, et. Al [5] added Multiple-canal BPPV as an atypical form of vestibular disease which is resistant to standard canalith repositioning maneuvers. Contribution of multiple canals has been accounted in 6.8%–20% of BPPV cases [9], [10] and is often unnoticed and under diagnosed. In clinical practice the most common multiple canal presentations are bilateral posterior canalithiasis and ipsilateral posterior and horizontal canalithiasis [6].

Latest clinical research is focused on identifying and treating different types of BPPV, based on implicated pathogenic mechanism and involvement of respective SCC [4].Even after long standing canalith repositioning practices, clinicians report positive outcome in few patients while rest do not recover [6].Clinical evidence on best practices for Multiple-canal BPPV is scanty. In addition, with an

increased number of individuals with Multiple-canal BPPV; a detailed vestibular evaluation is warranted. However, this aspect is most commonly neglected worldwide and hence the present study was undertaken.

Aim of the study

To file a comprehensive report on vestibular status in individuals with multiple canal BPPV. The study also focuses on highlighting rehabilitation and recovery of multi-canal BPPV.

3. Case Report

The present study incorporated explanatory clinical design with the approval of institutional ethical committee. A verbal consent from the individual and Institutional Ethical Committee clearance was taken prior to reporting the case findings. A male individual named "X" visited our Audiology department for audiology and vestibular evaluation. The 66 years old retired businessman complained of episodic vertigo since one year, associated with idiopathicsudden 4 year old hearing impairment.

An exhaustive case history revealed episodic vertigo with change in position of head associated with nausea lasting for short duration of few seconds. The presence of vertigo had indirectly affected the individual's quality of life. Similarly, the individual was presented with hearing impairment and associated tinnitus in both the ears (more loudly on right side).

Detailed audiological and vestibular evaluation was performed by an experienced Audiologist. In the audiological investigation, hearing thresholds between 250 Hz to 8KHz were estimated using Modified Hughson and Westlake procedure [11] in an acoustically sound treated room. Middle ear status and acoustic stapedial reflex was examined using GSI Tymp-Star Pro. In addition, Speech Audiometry was administered using a standardized Kannada spondee and PB word list test material to obtain speech recognition threshold and speech discrimination scores. Outer hair cell function was also assessed using the University of Florida protocol available in I-LOV 6.

Furthermore, vestibular assessment was credited with detailed case history and subjective vestibular tests such as Romberg's test [12],Fukuda test [13], Head shake test [14], Head impulse test [15].This was further accompanied with Dix-Hallpike test [16] and Supine head roll test [17]; [18] to identify BPPV.

4. Results & Discussion

A detailed vestibular profile revealed episodes of vertigo lasting for few seconds; disappeared with no head movement mostly in the morning associated with nausea. This inturn had severe effects on quality of life. Subjective vestibular evaluation ruled out central pathology with negative scoring. The subjective vestibular evaluation included Fukuda test, Romberg's test, Head shake test, Head impulse test, Dix Hallpike test and Supine head roll test. All the above mentioned tests evoked a negative response; however, Dix-Hallpike test and Supine head roll test obtained stronger beating geotropic horizontal nystagmus on right side in conjunction with up beating tortional component of posterior canal origin. Therefore, the individual was labeled to have multiple SCC BPPV.

Barbeque 360° Maneuver [19] was performed to treat the right horizontal SCC involvement leading to BPPV. For Barbeque 360°, individual underwent a stepwise 90° turns starting from affected ear-down, followed by quick rotations to complete 360°. Each step and position was held for 30 to 60 seconds until the induced nystagmus dissoluted. Finally, individual was brought back to sitting position. Total two sessions were administered on the same day with intersession gap of 15 minutes to avoid fatigability of nystagmus. Further, on a check for success rate in treating individual completely, Dix-Hallpike test and supine head roll test was repeated. This elicited tortional up-beating nystagmusonly on right sidein Dix-Hallpike test. Hence, Semontmaneuver[20] was performed to treat BPPV. Post upholding the Brandt and Daroff position [21]for approximately 2 minutes, individual was rapidly taken back to contralateral nose down position. On repeat testing no nystagmus and vertigo was observed. Post-maneuver limitations quoted by Toupet, Ferrary and Grayeli [22] were verbally explained and were accompanied by written memo to the individual.

Multiple-canal BPPV includes either involvement of same canal on both sides or simultaneous involvement of different canals on same or on both sides [23]. The obtained findings in case study are in concordance with the literature findings. Kim, Han, Kim and Park[24] reported canal switch from horizontal SCC BPPV to posterior SCC BPPV for 45.5% of the cases, followed by posterior SCC BPPV to horizontal SCC BPPV for 27.3% of the cases and a overall multiple canal involvement was accounted for up to 6.0% in 1000 given cases.

BPPV is most commonly idiopathic in older individuals than in younger individuals. Theliterature accounts aging to contribute towards the fragmentation of otoconia, which leads to displacement of the same into the semicircular canals. This in turn produces spinning sensations with head movement. BPPV in older individuals can present atypically, and has more-protracted course and higher risk of recurrence. Thus, remains for a longer duration of time with tremendous effects on quality of life. These findings are in favor of the labeled individual with multi canal BPPV in our study and also explains the long lasting vertigo.

Hearing status of the male individual was right ear with severe high frequency sloping sensori-neural hearing loss and left ear with mild sensori-neural hearing loss. Immittance audiometry revealed bilateral "A" type tympanogram with absent ipsilateral and contralateral acoustic reflexes. Speech recognition threshold in right ear and left ear were 90dBHL and 35dBHL respectively, with severe poor speech discrimination scores of 48% in right ear and 84% in left ear. Outer hair cell function test showed bilateral dysfunction. In accordance with the audiological findings, individual was subjected for hearing aid trial in right ear. Tinnitus matching and Loudness matching could not be performed to carry out Residual inhibition as patient

did not want to undergo the testing and accepted to ignore the tinnitus post counseling.Further, Hearing Aid Trail was carried out. Microtech thrive 1050 hearing aid yielded aided audiogram within Speech Spectrum and 6/6 score for Ling sound test [25] at 3feet, 6feet and 9feet with only auditory cues. Thus, the above hearing aid was prescribed for the individual.

The hearing status of the individual suggests sudden idiopathic sensorineural hearing impairment in the right ear. The exact reason is unknown as prior tracing of hearing thresholds or search for the cause was not carried out 4 years ago. Similarly, the left ear hearing impairment can be attributed to Presbycusis. The literature supportsthe findings in the study by quoting the presence of BPPV in 8.6-12.7% of patients with idiopathic sudden sensorineural hearing impairment [26]. The authors also found multi canal and horizontal SCC involvement in 11 out of 13 patients with idiopathic sudden sensorineural hearing impairment of profound degree. To add on, simultaneous BPPV inidiopathic sudden sensorineural hearing impairment proposes combined damage to the utricle and may also indicate widespread labyrinthine damage.However, the exact role of BPPV in hearing recovery remains controversial.

To add on, the individual was recommended to undergo Brain and CP angle MRI to rule out any central cause. This recommendation proved positive towards our labelling of the individual with normal MRI findings. These findings were further discussed with ENT specialist for confirmation.

5. Conclusion & Future Scope

The present study was focused on highlighting the vestibular status in multiple-canal BPPV. While performing comprehensive evaluation, we observed a switch in the canal resulting in multiple-canal BPPV. This necessitates caution among medical and allied health professionals to deliver customized and timely services that aides in recovery and promote quality of life. The study also contributes on compulsorily performing detailed audiology and vestibular test battery to predict the recovery of BPPV.

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