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Research Article

Assessment of Vestibular Dysfunction and Risk of Falls amongst Elderly

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Abstract: Elderly population in India is growing due to increased life span and improved medical care. The morbidity in this age group is often associated with increased incidence of falls. It is often related to spells of dizziness and vestibular disorders. Peripheral vestibular disorders often are ignored at the time of evaluation of fall and only realized after the fall. Spells of dizziness affect the functional ability in 'activities of daily living (ADL). One simple test to assess ADL is TUG test. A score of 11.1 seconds or more on TUG test was correlated with 80% chance of a fall in the elderly. Hence a study is undertaken to evaluate peripheral vestibular disorders in elderly along with their performance on TUG (Timed Up and Go) test. Benign Paroxysmal Positional Vertigo (BPPV) has been found to be most common vestibular disorder in the elderly. The most affecting disorder resulting in poor performance on TUG test was 'vestibulopathy'. One out of four elderly with Peripheral vestibular disorder has a risk of 'fall'.
Keywords: Falls, Vestibular disorders, TUG test, VEMP, ENG

INTRODUCTION

There is a growing population of elderly in India. It is estimated that approximately 7.7% of total population are above 65years of age. One of the reasons of ill health at this age is 'Falls'. Those who have two falls in a year are called 'Frequent fallers'. The morbidity associated with a fall often results in disability of movement and dependency on family or society. It is suggested that vestibular disorders with 'spells of dizziness' often lead to a fall. Screening Programmes to identify those at risk of falls comprise an assessment of gait and balance [1, 2]. The assessment of disability in elderly is done with a test popularly known as TUG (Timed UP and GO) test. The original description of the 'get-up and go' test by Mathias and colleagues [3] used a subjective rating scale. This test was later modified by Podsiadlo and Richardson, who developed a scaling system based on the observer's perception of the patient's fall risk [4]. The 'timed up and go version' made the scoring more objective, but the test remained unchanged. A faster time indicates a better functional performance and a score of≥13.5 seconds is used as a cut-point to identify those at increased risk of falls in the community setting [5]. The test is simple to perform and proved to be reliable indicator of health status. In this test, an elder adult is asked to ambulate, rise from a chair, walk 3 meters, then turn around, walk back to the chair and sit comfortably. The entire time taken to perform the task is measured in seconds by an observer. The ageing process affects all reflex mechanisms controlling posture that includes vision, vestibular control, muscle tension, range of movement and central coordination. In a study on elderly adults, a time of 11.1 seconds or more is often associated with risk of fall when associated with vestibular disorder [6].

In our institute of tertiary care, a study has been undertaken with the following objectives:

- To know the TUG test performance in elderly with and without vestibular disorders
- To assess the number of elderly who are at risk of fall in each vestibular disorder.

METHODOLOGY

All the patients of 65years or more age attending Department of ENT at our institute have been included in the study in a period of nine months . The patients with head injury or diminished vision or dementia are excluded from the study. Those who had undergone ear surgeries earlier are included as well as those who used Aminoglycoside ototoxic drugs. The TUG test has been performed in the usual way with an attending Nurse and Audiologist.

The test was carried out in the out-patient department in a long hall. Floor line and end of three meters were marked. A stop-watch is arranged to calculate the time precisely. Two trials were given to assess whether the patient followed instruction clearly or not. Then actual test time was calculated. A bed was placed in close

vicinity in the hall to facilitate patients for lying down, in case of fatigue or spells of dizziness.

The patients with history of dizziness, light-headedness, aural fullness or imbalance are subjected to thorough ENT Clinical examination, Neuro-otological tests (Head shaking test, Head-Thrust test and Spontaneous nystagmus, Dix-Hallpike test). All the patients with history of vertigo underwent investigations of audiometry, ENG, and VEMP (Vestibular evoked Myogenic Potentials). A neurologist opinion sought wherever a central pathology was suspected and relevant investigations (MRI Brain) carried out. ENG recordings were analysed for Hypo function or canal paresis. VEMP recordings were analysed to assess sacular hypo function or paresis.

RESULTS

The total number of subjects in the study was 85. The sex ratio and age distribution were given in the Table 1. 3 patients were referred to Neurology in view of central disorders. The results of ENG and VEMP are shown in Table 2.

In 7 patients there were hypofunction noted both in ENG and VEMP. The VEMP showed hypo function in 3cases of Acute Vestibular Neuritis and in 2 cases of Meniere's disease.

ENG showed hypo function/ canal paresis in 9 cases of Meniere disease, 7 cases of acute vestibular Neuritis and 7 cases of Vestibulopathy. In 6 patients, no abnormality could be detected either on ENG or VEMP. Results of TUG test in Elderly with and without dizziness are given in Table 3. Peripheral Vestibular disorders with positive evidence in causation of dizziness in the elderly have been summarized in Table 4.

The TUG in seconds in each Peripheral vestibular disorder in both age groups were given in table 5.

.Table 1: Number of patients with and without dizziness

Total Number (85)	Male(57)	Female(28)
Without vertigo	22	11
With spells of dizziness	35	19

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Table 2: Number of patients with dizziness with various test results

Dix and Hallpike test positive	22
Hypofunction /canal paresis(ENG)	23
Saccular / Inferior vestibular nerve hypofunction(VEMP)	12

Table 3: Time in seconds during TUG test

Age group	65 -74 years	75 and above
Without dizziness (N:33)	8.4 ± 0.8 seconds(N:26)	9.2 ±1.2seconds(N:7)
With dizziness (N:54)	10.6±2.1seconds (N:45)	11.3±1.6seconds (N:9)

Table 4: Different pathologies of vertigo in elderly

Diagnosis	Number of Patients(48)	Percentage
Benign Paroxysmal Positional vertigo	22	45.8
Meniere disease	9	18.75
Acute vestibular Neuritis	10	20.8
Vestibulopathy	7	14.6

Table 5: Number of patients in each vestibular disorder who performed the test exceeding 11.1 seconds, having risk to fall

BPPV(22)	6	27%
Vestibulopathy(7)	4	57%
Ac.Vestibular Neuritis(10)	0	0
Meniere's disease(9)	2	2.2%

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DISCUSSION

It is claimed that life time prevalence of vestibular vertigo is 7.4%. Of patients presenting to Emergency with falls of unknown aetiology, 80% have vestibular impairment and 40% complain of dizziness [7]. According to Kirstein MT, nine out of ten who sustain hip fracture due to fall are above the age of 65 years, thus highlighting the vulnerable age group [8]. Our study aimed to evaluate the risk of falls, precisely, in the same age group.

The results of 48 patients with positive evidence of pathologies were analysed in terms of Peripheral vestibular disorder and performance on TUG test.

The most common disorder of Peripheral origin, in our study, is 'Benign Paroxysmal Positional Vertigo', affecting 46% of the elderly with spells of dizziness. Bath *et al*. reported a similar incidence in their study [9]. Though commonly reported in middle age groups, acute vestibular neuritis was observed in our study involving 20% of elderly. Though less common, Meniere's disease may still pose problems in similar percentage of elderly.

Vestibulopathy, a term often suggestive of hypo function in both canals (horizontal as well as vertical) as evidenced on ENG and VEMP, does cause a significant problem in the elderly. The problem may cause oscillopsia during locomotion and /or head movements which often causes unsteadiness in the dark [10]. It is suggested that the cause was usage of ototoxic aminoglycosides and meningitis [11]. It is also due to age – related structural deterioration of the vestibular system. In our study, 14% of the elderly were having vestibulopathy, with other workers reporting a higher incidence [12]. This may be due to many cases being not reported or not investigated.

The TUG test results in otherwise normal elderly showed average score of 8.4seconds and 9.2 seconds in two age groups of 65-74 and 75 and above respectively. The scores reported globally were also similar [13]. Though the attacks of dizziness were reported in 54 patients, Central pathology was detected in 3 patients, thus 51 patients were subjected for Investigations and also TUG test performance. In 6 patients no abnormality could bedetected either on ENG or VEMP.

In a study conducted in elderly, Whitney *et al*. found that TUG score of 11.1 or more seconds can be taken as criteria to predict fall. In their study, the sensitivity of the test was found to be 80 % [14]. We have taken these criteria as a cut –off point to predict falls in various peripheral vestibular disorders.

The TUG test results showed a score higher than 11.1 seconds in 57% of cases with Vestibulopathy, which is alarming, because of risk of 'Fall'. Though BPPV is common in elderly (45.8%), the risk of fall is only in 27% of affected people. Overall 12 patients were found to be having 'risk of falling', out of total group of 48 patients. Thus one out of four elderly with peripheral vestibular disorders are prone to fall.

CONCLUSION

TUG test scores suggest 'one out of four patients of BPPV' and every other case of Vestibulopathy are prone to fall. Over all one out of four elderly with spells of dizziness have a risk of fall.

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