Our Experience on Tug Test as Diagnostic Marker in Peripheral Vestibular Diseases

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Abstract

Background: Vestibular dysfunction in elderly screened with Timed Up and Go (TUG) test, is fast, simple way to assess fall risk, lower limb mobility, and function in clinical settings. This study was initiated to assess improvement of patient symptoms and postural control after performing Epley's maneuver using the Timed Up and test. Incorporation of the TUG test in this study provided a comprehensive evaluation of the effects of Epley's maneuver on both symptom relief and functional mobility. It allowed for objective measurements and quantifiable data to assess the effectiveness of the intervention, providing valuable insights for clinical decision-making and patient management.

Methods: Prospective observational study was carried out on 100 patients aged 65 years and above suffering with peripheral vertigo were performed with "timed up and go" (TUG) test. We Propose Cutoff point of 13.5 seconds proposed as standard for identifying at risk of falling after particle repositioning maneuver. This decision was based on several factors and considerations specific to our study population and objectives. By setting a cut-off value of 13.7 seconds, we tried to achieve better balance between sensitivity and specificity, ensuring a more accurate identification of the target parameter in our study population.

Results: In our study we observed from the results that the mean age of the patients in study was 69.6 years. A study population of 62 (62.0%) males and a number of 38(38.0%) females were considered for the study. Clinical findings of the study revealed that for patients suffering with dizziness it was observed that 29(29.0%) of patients had dizziness of less than 6 months, 24(24.0%) of the patients had dizziness for 6-12 months, 23(23.0%) patients had dizziness for >2 years, and 22(22.0%) of patients had dizziness for 1-2 years. Based on frequency of dizziness attacks it was observed that 53(53.0%) of study population had dizziness every day and 47(47.0%) had dizziness every week. Based on the duration of dizziness in the study population 29(6.0%6) of them had dizziness for few seconds only, 25(25.0%) of them had dizziness lasting for few minutes to hours, and 23(23.0%) of study population had continuous dizziness. In the study population 28(28.0%) had dizziness on lying down, 24(24.0%) had dizziness on turning, and 22(22.0%) had dizziness on lying down and turning. Also 84(84.0%) of these population had body instability, 73(73.0%) had vomiting during dizziness, 71(71.0%) had anxiety related to dizziness, 67(67.0%) had associated symptoms of nausea during attacks, 65(65.0%) of study population had associated tinnitus, 61(61.0%) among the study population had disordered sleep. Also it was observed that 59(59.0%) had headache,

56(56.0%) had sensation of fainting, 39(39.0%) had pallor & hearing loss, 38(38.0%) had sensation of pressure, and 29(29.0%) had sweating as associated clinical symptoms during the attacks of dizziness. Re-assessment after Epley's maneuver reveals reduction in majority clinical findings. TUG test findings show mean initial assessment score of 15.3 + 3.02, after Epley's maneuver was 12.3 + 3.34 with mean difference of 3.01 with p-value (<0.001).

Discussion and Conclusion: Epley's maneuver is useful to reduce clinical symptoms with peripheral vestibular disorders as assessed by TUG test in elderly.

Keywords: Rehabilitation; Vestibular Functions; TUG Test; Geriatric Population

Abbreviations: TUG: Timed Up and Go

Introduction

Vestibular diseases are usually reported to significantly disrupt body balance, limit independence during daily tasks, and cause severe discomfort. Numerous regimens for treating vestibular problems, known as vestibular rehabilitation, emphasize habits like habituation, adaptation, substitution, and compensation exercises [1]. Vestibular dysfunction was present in 18.5% of adults aged 40 to 49 years, 49.4% of older people aged 60 to 69 years, and up to 84.8% of older people aged 80 years and older [2].

Peripheral vertigo is known to cause significant morbidity and functional imbalance in elders, which leads to a considerable burden in physical, economic, and family life. Falls among the elderly are an essential concern to healthcare providers to detect the fall risk [3]. These falls are mainly due to vestibular diseases, and they present with dizziness, visual disturbances, and balance impairment [4]. BPPV has been noted in about 64/100,000 individuals, and rates of predominance in the elderly are significantly greater [5]. BPPV is thought to be present in 25.0% of dizzy people aged 70 and older. Most people usually tolerate it for more than a year passed before seeking help [6].

Numerous regimens for treating vestibular problems, known as vestibular rehabilitation, emphasize habits like habituation, adaptation, substitution, and compensation exercises [1]. The vestibular dysfunction was present in 18.5% of adults aged 40 to 49 years, 49.4% of older people aged 60 to 69 years, and up to 84.8% of older people aged 80 years and older [2].

There are various tests to screen risks among older people, and one among them is the Timed Up and Go (TUG) test [7]. TUG test is a simple test that is quickly performed and doesn't need any specific equipment. "Timed up and go" (TUG) test is a fast, simple way to assess fall risk, lower limb mobility, and function in clinical settings [8]. The TUG was used in several studies as an outcome measure and has shown sensitivity to various therapeutic strategies. Because of its simple structure, association with fall risk, and sensitivity [9]. This study was initiated to assess the improvement of patient symptoms and postural control after performing Epley's maneuver using the Timed Up and test.

Methods

A prospective observational research at hospitals was carried out across a total of 100 male and female patients aged 65 years and above suffering with peripheral vertigo for 18 months duration from 1st February' 2021 to 30th August' 2022 in the Department of Otorhinolaryngology.

All the patients with giddiness were subjected to Dix-Hallpike test. Those who had test positive result for Dix-Hallpike test were considered for "timed up and go" (TUG) test before particle repositioning Epley's maneuver. Patients with clinical indications of peripheral vertigo as suggested by Dix-Hallpike test were taken into consideration for the study. Neurological examination was performed to check the gait and balance and patients having favorable results were excluded. Also Patients with cognitive disorders with decreased visual or auditory activity even with lenses or hearing aids fitted having locomotive defects and unable to walk independently were excluded from the study. An informed consent was obtained from patients in vernacular language prior to data collection.

A systematic random sampling method was used to consider the patients who were in accordance with inclusion criteria. The sample size was determined using the formula n = 4pq/d2. Data was collected regarding the personal details of the patients, anthropometric findings, and previous medical history. All the patients had undergone otoscopic examination to visualize the tympanic membrane and hearing assessment was performed.

We tried to observe by performing Timed Up and Go test in peripheral vertigo patients and assess the functional body balance and assess the improvement in functional body balance after Epley's maneuver by using Timed Up and

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Go (TUG) test. Later particle repositioning maneuver was performed. A cutoff point of 13.5 seconds has been proposed as a standard for identifying those who are more at risk of falling [10] after particle repositioning maneuver TUG test was repeated. All the data was recorded.

The TUG test is performed with a standard chair with a seat height between 44 and 47 cm. Subjects are instructed to get out of the chair, walk 3 m marked on the floor at a comfortable speed, turn around, and return to the chair. Subjects are instructed not to stand up using their arms and are allowed to utilize conventional walking aids. Physical help is not provided. Using a stopwatch, the task's completion time is calculated. Timing begins with the word "go" and ends when the subject is seated and leaning back against the back of the chair. The work is often carried out twice. Better performance is shown by shorter times [11].

The details of TUG Test in Geriatric Population were measured using Statistical analysis with descriptive statistics using mean, standard deviation and percentiles to summarize and describe the characteristics of TUG Test data. Other relevant statistical methods like Paired t- test were used as and where required to analyze the data.

Results

The patients' mean age in the study was 69.6 years. Distributions of the patients based on gender revealed that majority 62 (62.0%) were males and 38(38.0%) were females. Distribution of the patients based on dizziness presence, about 29(29.0%) of the patients had dizziness of <6 months, followed by 24(24.0%) of the patients had dizziness for 6-12 months, 23(23.0%) of the patients had dizziness for >2 years, and 22(22.0%) of the patients had dizziness for 1-2 years. Distribution of the patients based on dizziness frequency, about 53(53.0%) of the patients had dizziness every day and 47(47.0%) of the patients had dizziness every week. These results were mentioned in the (Table 1) below.

Dizziness since		N	(%)
<6 months	Present	29	29.00%
	Absent	71	71.00%
6-12months	Present	24	24.00%
	Absent	76	76.00%
1-2years	Present	22	22.00%
	Absent	78	78.00%
>2years	Present	23	23.00%
	Absent	77	77.00%

Table 1: Distribution of Patients Based on Dizziness Since.

Distribution of the patients based on duration of dizziness, majority 29(6.0%6) of them had dizziness for seconds, while 25(25.0%) of them had dizziness for minutes & hours each, and 23(23.0%) had continuous dizziness. These results were mentioned in the (Table 2) below.

Duration of dizziness		N	(%)
Seconds	Present	29	29.00%
	Absent	71	71.00%
Minutes	Present	25	25.00%
	Absent	75	75.00%
Hours	Present	25	25.00%
	Absent	75	75.00%
Continuous	Present	23	23.00%
	Absent	77	77.00%

Table 2: Distribution of Patients Based on Duration of Dizziness.

Distribution of the patients based on posture during dizziness, about 28(28.0%) of the patients had dizziness on lying down, 24(24.0%) had dizziness on turning, and 22(22.0%) of the patients had both. These results were mentioned in the (Table 3) below.

Dizziness in posture		N	(%)
Lying down	Present	28	28.00%
	Absent	72	72.00%
When turning	Present	24	24.00%
	Absent	76	76.00%
Both	Present	22	22.00%
	Absent	78	78.00%

Table 3: Distribution of Patients Based on Posture during Dizziness.

Table 4 shows distribution of the patients based on initial findings where Distribution of the patients based on initial assessment of clinical findings, majority 84(84.0%) of the patients had body instability followed by 73(73.0%) of the patients with vomiting, 71(71.0%) of the patients with anxiety, 67(67.0%) of the patients with nausea, 65(65.0%) of the patients with tinnitus, 61(61.0%) of the patients with disordered sleep, 59(59.0%) of the patients with headache, 56(56.0%) of the patients with sensation of fainting, 39(39.0%) of the patients with pallor & hearing loss each, 38(38.0%) of the patients with sensation of pressure, and 29(29.0%) of the patients with sweating. Re-assessment of clinical findings after Epley's maneuver reveals that there was a reduction in majority of clinical findings as observed from (Table 4) below.

	Initial assessment			Re-assessment after Epley's maneuver		
		N	(%)		N	(%)
Headache	Present	59	59.00%	Present	34	34.00%
	Absent	41	41.00%	Absent	66	66.00%
Sensation of fainting	Present	56	56.00%	Present	21	21.00%
	Absent	44	44.00%	Absent	79	79.00%
Body instability	Present	84	84.00%	Present	49	49.00%
	Absent	16	16.00%	Absent	51	51.00%
Anxiety	Present	71	71.00%	Present	71	71.00%
	Absent	29	29.00%	Absent	29	29.00%
Nausea	Present	67	67.00%	Present	37	37.00%
	Absent	33	33.00%	Absent	63	63.00%
Vomiting	Present	73	73.00%	Present	24	24.00%
	Absent	27	27.00%	Absent	76	76.00%
Disordered sleep	Present	61	61.00%	Present	38	38.00%
	Absent	39	39.00%	Absent	62	62.00%
Tinnitus	Present	65	65.00%	Present	22	22.00%
	Absent	35	35.00%	Absent	78	78.00%
Hearing loss	Present	39	39.00%	Present	28	28.00%
	Absent	61	61.00%	Absent	72	72.00%
Sensation of pressure	Present	38	38.00%	Present	27	27.00%
	Absent	62	62.00%	Absent	73	73.00%
Sweating	Present	29	29.00%	Present	29	29.00%
	Absent	71	71.00%	Absent	71	71.00%

Table 4: Distribution of Patients Based on Initial Assessment and Re Assessment Findings.

Table 5 shows the TUG test findings, the mean initial assessment score of TUG test was 15.3 + 3.02 while after the Epley's maneuver the re-assessment score of TUG test was 12.3 + 3.34, there was a mean difference was 3.01, a statistically significant difference existed between the TUG test assessment scores with p-value (<0.001).

TUG test	N	Mean	S.D	Mean difference	p-value
Initial assessment	100	15.3	3	3.01	0.0001
Re-assessment	100	12.3	3.3		

Table 5: Initial Assessment & Re-Assessment Findings of Tug Test Relation.

Discussion

The TUG test is an important assessment tool in peripheral vertigo to know the condition of patients after Epley's maneuver. In the present study, the mean initial assessment score of TUG test was 15.3 + 3.02 while after the Epley's maneuver the re-assessment score of TUG test was 12.3 + 3.34, there was a mean difference of 3.01, there was statistically significant difference between the TUG test assessment scores with p-value (<0.001).

In our study those with vestibular disorders took over 13.5 seconds to complete TUG. A modified version of the test has been used in several studies where participants are instructed to walk as quickly as possible while staying safe [12]. Recorded evidence suggests that Tug Test is directly related to risk of fall and a positive test patient had a 3.7-fold increased risk of developing clinical symptoms [13].

While some researchers assert that a 15-second threshold increases sensitivity while yielding insufficient specificity, a slightly lower cutoff value of 12 seconds has been used to detect normal mobility in community-dwelling older people and to distinguish fallers from non-fallers [14]. The TUG also has high test-retest reliability, although only moderate test-retest reliability was observed in a large research study of older people.

In the present study, majority 84.0 percent of the patients had body instability followed by 73.0 percent of the patients with vomiting, 71.0 percent of the patients with anxiety, 67.0 percent of the patients with nausea, 65.0 percent of the patients with tinnitus, 61.0 percent of the patients with disordered sleep, 59.0 percent of the patients with headache, 56.0 percent of the patients with sensation of fainting, 39.0 percent of the patients with hearing loss, 38.0 percent of the patients with sensation of pressure, and 29.0 percent of the patients with sweating. The most frequent symptoms are dizziness imbalance postural instability and falls complaints of a BPPV in older people. These symptoms may also be accompanied by sensitivity to sounds, memory issues and irregular sleep patterns as observed from our study.

The modified Epley's maneuver has been characterized in the literature as an efficient and simple repositioning technique and patients who had therapy with it experienced very minor discomfort from the induction of symptoms. In the present study, majority 71.0 percent of the patients had anxiety followed by 51.0 percent of the patients with memory disorder, 49.0 percent of the patients with body instability, 38.0 percent of the patients with disordered sleep, 37.0 percent of the patients with nausea, 34.0 percent of the patients with headache, 29.0 percent of the patients with sweating, 28.0 percent of the patients with hearing loss, 27.0 percent of the patients with sensation of pressure, 24.0 percent of the patients with vomiting, 22.0 percent of the patients with tinnitus, and 21.0 percent of the patients with sensation of fainting. The elimination of symptoms, the reduction of body instability and the risk of falls , and the prompt return of patients to performing activities of daily living are the goals of Epley's maneuver to reposition statoconia.

Conclusion

TUG test is an important assessment tool in peripheral vertigo to know the condition of patients after Epley's maneuver. Epley's maneuver is useful to reduce clinical symptoms of vertigo in elderly with peripheral vestibular disorders. As a single test or when subjects completed another test at the same time, TUG was able to distinguish fallers and non-fallers with increased precision.

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