ISSN 2321 – 7359 EISSN 2321 – 7367

discovery

Medical Science

The International Weekly Journal for Medicine

Postural Instability in Patients with Schizophrenia

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Publication History
Received: 24 December 2013
Accepted: 27 February 2014
Published: 12 March 2014

Citation
Neil K Agarwal, Shashi K Agarwal. Postural Instability in Patients with Schizophrenia. *Medical Science*, 2014, 6(20), 47-50

Keywords: Schizophrenia, imbalance, computerized dynamic posturography, falls

Abbreviations: CDP: Computerized dynamic posturography; DSM: Diagnostic and Statistical Manual of Mental Disorders; NS-EO: normal stability - eyes open; NS-EC: normal stability- eyes closed; PS-EO: perturbed stability - eyes open; PS-EC: perturbed stability - eyes closed.

1. INTRODUCTION

Schizophrenic patients have a high incidence of falls and fractures. (Howard et al., 2007) Schizophrenia is a common and well studied disease (APA, 2000; Sullivan et al., 2003; Woo et al., 2004). Its worldwide prevalence is approximately 1%, (Bhugra 2005) and is responsible for almost 3 percent of the global burden of disability (WHO, 2001). Approximately ten percent America's totally and permanently disabled people suffer from szhizophrenia (Rupp et al., 1993). Patients with schizophrenia have a two to three fold higher mortality rate compared to the general population, (Laursen et al., 2007; Saha et al., 2007; Brown et al., 2010) resulting in shortened life spans (Allebeck, 1989) and a 10-25 year reduction in life expectancy (Laursen et al., 2012). This has been attributed to unhealthy and often violent lifestyles (Wildgust et al., 2010; Foti et al., 2010; Fazel et al., 2009), unwanted effects of anti-psychotic drugs (De et al., 2010), sub-optimal medical care (Mitchell et al., 2010), and psychiatric (Buckley et al., 2009), and medical co-morbidities (Goldman, 1999; Lambert et al., 2003). One of the medical co-morbidies is frequent falls and an increased propensity for fractures. The latter has been attributed to a decreased bone mineral density (Abraham et al., 2003), particularly in patients with high prolactin levels as a side effect of psychotropic medications (O'Keane et al., 2005; Liu-Seifert et al., 2004). We have also reported an increased prevalence of vitamin D deficiency in these patients (Agarwal, 2013). Although osteopenia and osteoporosis may be contributory to the increased risk of fractures seen in this population (Agarwal et al., 2010), the inciting event is usually a fall. Postural instability resulting in an increased propensity for falls has not been well studied in this population (Koreki et al., 2011). We evaluated this phenomenon in schizophrenic patients using computerized static and dynamic posturography.

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SCHIZOPHRENIA

Schizophrenia is a worldwide disease, with a prevalence of approximately 1%.

Patients with schizophrenia have a two to three fold higher mortality rate compared to the general population.
Patients with schizophrenia have more frequent falls and fractures, than the general population.
When tested by computerized dynamic posturography, the vast majority of schizophrenia patients suffer from posture and balance abnormalities.

2. METHODS

We retrospectively evaluated CDP studies on 54 consecutive schizophrenic patients. All patients had been diagnosed to be suffering from schizophrenia by psychiatrists according to the criteria established by the revised fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR). All patients met the three diagnostic criteria: A. *Characteristic symptoms:* Two (or more) of the following, each present for a significant portion of time during a 1-month period (or less if successfully treated): (1) delusions (2) hallucinations (3) disorganized speech (e.g., frequent derailment or incoherence) (4) grossly disorganized or catatonic behavior(5) negative symptoms, i.e., affective flattening, alogia, or avolition. B. *Social/occupational dysfunction:* For a significant portion of the time since the onset of the disturbance, one or more major areas of functioning such as work, interpersonal relations, or self-care are markedly below the level achieved prior to the onset (or when the onset is in childhood or adolescence, failure to achieve expected level of interpersonal, academic, or occupational achievement). C. *Duration:* Continuous signs of the disturbance persist for at least six months. This 6-month period must include at least one month of symptoms (or less if successfully treated) that meet Criterion A (i.e. active-phase symptoms) and may include periods of prodromal or residual symptoms. During these prodromal or residual periods, the signs of the disturbance may be manifested by only negative symptoms or two or more symptoms listed in Criterion A present in an attenuated form (e.g., odd beliefs, unusual perceptual experiences). (DSM-IV, 2000) Computerized dynamic posturography, (CDP) is a noninvasive quantitative method for assessing upright posture and balance under a variety of conditions that simulate conditions encountered in daily life (Nashner, 2001). It is commonly utilized in diagnosing patients with dizziness, vertigo, and postural imbalances (Mirka et al., 1990) and in physical therapy and postural re-education (Hakim et al., 2012). CDP was done using FallTrak(R). Patients performed normal stability - eyes open (NS-EO), normal stability- eyes closed (NS-EC), perturbed stability - eyes open (PS-EO), and perturbed stability - eyes closed (PS-EC) for 30 seconds each. Findings were classified as normal or abnormal based on age-matched normative data.

Alogia
Inability to speak.

Avolition
Lack of drive.

3. RESULTS

The ages ranged from 31 to 77 years. There were 34 (63.0%) males and 20 (37.0%) females. Of the total 54 patients, 48 (88.9%) exhibited abnormalities on CDP testing. NS-EO was abnormal in 29 (53.7%), NS-EC was abnormal in 37 (68.5%); both NS-EO and NS-EC were abnormal in 25 (46.3%); PS-EO was abnormal in 27 (50.0%) and PS-EC was abnormal in 20 (37.0%). Both PS-EO and PS-EC were abnormal in 14 (25.9%). Both PS and NS were abnormal in 26 (48.1%). NS was normal in 13 (24.1%) and PS was normal in 21 (38.9%). Both NS and PS were normal in 6 (11.1%) patients.

4. DISCUSSION

Balance is complex sensorimotor control function. It involves sensory inputs from vision (retina), proprioception (cutaneous receptors, muscle spindle-type I and II, Golgi tendon organ, joint receptors), and the vestibular system located in the inner ear (semicircular canals, otholiths, maculaes) ; integration of these signals in the central nervous system; and motor outputs to the eye and body muscles. Both anticipatory and compensatory postural adjustments result in a properly maintained balance. These interlacing feedback mechanisms can be disrupted by disease, injury or the aging process (Macherson et al., 2009; Horak et al., 1996; Alexander, 1994). Balance control is essential both for postural stability and mobility-related activities during daily life (Pollock et al., 2000). Disturbances of balance are common in the schizophrenia population, and the pathogenesis is probably multifactorial. The disequilibrium in these patients is aggravated by obesity, (Hirano et al., 2011) aging (Finkelstein et al., 2007) and antipsychotic medications (Vestergaard et al., 2006). Besides producing deficits in cognition and extra-pyramidal symptoms, these drugs can also cause postural hypotension (Gregory et al., 1994). The role of postural and gait rehabilitation in this population, to our knowledge, has not been studied.

Cognitive function
It refers to the mental ability involving all aspects of perception, thinking, learning, reasoning and remembering.

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5. CONCLUSION

Most schizophrenic patients show abnormalities in both normal and perturbed stability when tested using static and dynamic posturography. Balance was normal in only 11.1 % of the patients. Further studies are needed to evaluate the clinical significance of these findings. Balance training has been helpful in preventing falls in patients with postural instability (Tofthagen et al., 2012). Its role in preventing falls and fractures in patients with schizophrenia needs to be evaluated.

SUMMARY OF RESEARCH

Considerable experimental, epidemiological and clinical evidence has documented a marked presence of both psychiatric and medical comorbidities in patients with schizophrenia. One major comorbidity is frequent falls and fractures. These have been generally attributed to osteopenia and osteoporosis. However, most fractures result as a consequence of falls. Our research shows that only 11.1% of our institutionalized patients with schizophrenia were normal on measured posture and balance testing, both static and dynamic. The causes appear to be multifactorial. The clinical significance and especially the therapeutic implications of this finding are unclear.

DISCLOSURES

The authors have no conflicts of interest to disclose.

ACKNOWLEDGEMENT

This data was presented as a poster during the scientific meetings of the 19th European Congress of Psychiatry, Vienna, Austria, March 15, 2011.

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Medical Science

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