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Reduced one-second forced expiratory volume (FEV1) in patients with Schizophrenia

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General Note
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ABSTRACT

Schizophrenia is a severe, persistent and debilitating psychiatric disorder. Patients with schizophrenia have lower rates of employment and marriage. They also have unhealthy lifestyles. These include poor diet, lack of exercise, excessive smoking and increased alcohol intake. Patients with schizophrenia suffer from significant co-morbidities and have a two to three fold higher mortality rate compared to the general population. They also have a higher rate of suicide, accidents and substance abuse. They are more likely to be homeless, institutionalized or incarcerated due to crimes. Overall, patients with schizophrenia suffer from a 10-25

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year reduction in life expectancy. Although the high rates of smoking have been reported before, there is limited data on pulmonary function tests on these patients. Our data show that a significant percentage of these patients have reduced FEV1, a pulmonary function parameter that has been consistently linked with abnormal lung function and increased morbidity and mortality.

Key words: Schizophrenia, COPD, FEV1, Restrictive Lung Disease, Lung function, smoking

Abbreviations: FVC: Forced vital capacity, the total volume of air that can be exhaled during a maximal forced expiration effort.FEV_1: Forced expiratory volume in one second, the volume of air exhaled in the first second under force after a maximal inhalation. FEV_1/FVC ratio: The percentage of the FVC expired in one second. FRC: Functional residual capacity, the volume of air in the lungs at resting end-expiration. TLC: Total lung capacity, the volume of air in the lungs at maximal inflation. RV: Residual volume. COPD: Chronic Obstructive Lung Disease

1. INTRODUCTION

Schizophrenia is a worldwide disease, with a prevalence of approximately 1% (Bhugra D. 2005). It is the third leading cause of global disability in persons aged 15-44 years. It is responsible for 2.8 percent of the global burden of disability (WHO, 2001). The clinical features and management of schizophrenia has been well studied (APA, 2000, Sullivan et al, 2003, Woo et al, 2004) 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). Patients with schizophrenia have a higher rate of suicide and accidents (Palmer et al, 2005, Dervaux et al, 2003, Wing et al, 2012, Jones et al, 2011). They also have unhealthy lifestyles. These include poor diet, lack of exercise and excessive smoking and alcohol intake (Wildgust et al, 2010, Linde-Feucht, 2007). They commonly have associated substance abuse problems (Foti et al, 2010). Schizophrenic patients also are more likely to be homeless or incarcerated, due to crimes, contributing to a further suboptimal lifestyle (Fazel et al, 2009). Anti-psychotics may play a role in the excess mortality due to adverse effects (De et al, 2010). People with schizophrenia also suffer from high rates of physical co-morbidity (Jeste et al, 1996). These include pulmonary, cardiovascular and endocrine diseases (Casey et al, 2011, Goff et al, 2005, Copeland et al, 2007). It is estimated that these abnormal behaviors and co-morbidities contribute significantly to the premature deaths seen in this population (Brown, 1997) Detection and management of these co-morbidities is often poor in this population (WFMH, 2010) And finally, they appear to receive sub-optimal medical care (Mitchell et al, 2010) Overall, patients with schizophrenia suffer from a 10-25 year reduction in life expectancy. They also account for approximately ten percent of America's totally and permanently disabled population (Rupp et al, 1993).

Schizophrenia: Schizophrenia is a severe and chronic psychiatric illness characterized by impairments in perception and cognition. It is also associated with disturbed social and occupational functioning.

2. METHODS

We retrospectively reviewed the pulmonary function tests of all schizophrenia patients seen in our office during a period of one year. All patients were 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 6 months. This 6-month period must include at least 1 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

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Spirometry:
Spirometry is a common pulmonary function tests used to measure lung function, specifically the lung volumes and speed of air flow during inhalation and exhalation. It helps in the diagnosis, assessment of severity and response to treatment of many lung diseases.

perceptual experiences) (DSM-IV-TR. 4th ed.) Spirometry is designed to identify and quantify functional abnormalities of the respiratory system (Petty, 2001, Ferguson et al, 2000). All patients were smokers and none had any contraindications to spirometry. Spirometry was done using commercially available portable office equipment. The patients were explained the procedure in detail. Following a full inhalation, a forced expiration was done and continued for as long as possible or until a plateau in exhaled volume was reached. These efforts are recorded and graphed. The following parameters were measured and interpreted according to the established normal values: FEV: normal 80%-120%, FVC: normal 80%-120%, FEV1/FVC ratio" within 5% of the predicted ratio, TLC: normal 80%-120%, FRC: normal 75% to 120% and RV: normal 75% to 120% (Salzman, 1999). Restrictive lung disease was diagnosed if the FEV1 and FVC were decreased and the FEV1/FVC ratio was normal or increased and the TLC, FRC and RV were reduced Ob.

3. RESULTS

Of the 75 patients with schizophrenia studies, there were 52 m structive lung disease was diagnosed if the FEV1 and FEV1/FVC ratio was decreased (Colp, 1979). Males and 23 females - Their ages ranged from 23 to 74 years. Of the 75 patients, 18 patients (24%) had normal FEV1 and 57 patients (76%) had reduced FEV1. Of these 57 patients with reduced FEV1, 36 (63%) had restrictive lung disease (FEV1 low, FVC low, FEV1/FVC normal or increased and TLC reduced) while 21 (37%) had obstructive lung disease (18 M, 3 F) (FEV1 low, FVC normal and FEV1/FVC low).

4. DISCUSSION

4.1. Abnormal lung function in schizoprenics

Abnormal lung function has been poorly studied in patients with schizophrenia. Impairment of the lung function was found to be higher in people with schizophrenia when compared to a national sample in the United Kingdom (Filik et al, 2006). These patients also have more frequent chronic respiratory problems (Chafetz et al, 2005) Patients with associated tardive dyskinesia often have dysfunctional breathing (Wilcox et al, 1994). There are also reported increased frequencies of choking deaths in patients with schizophrenia due to tardive dyskinesia, tachyphagia, and abnormal swallowing (Ruschena et al, 2003). Our study clearly shows that abnormalities in lung function are extremely common in this population. Reduced FEV1 values are present in nearly 20% of the adult population and declines with age. However, it was present in 76% of our patients with schizophrenia. Reduced FEV1 is associated with an increased risk of morbidity and mortality (Gillissen et al, 2009) from ischemic heart disease, stroke, arrhythmias, respiratory failure and cachexia.

4.2. Smoking related decreased FEV1

COPD:
Chronic obstructive lung disease – a lung condition associated with gradual narrowing of the airways with progressive decreased reversibility and the eventual development of emphysema. Smoking is the main culprit in most patients.

The most common cause of reduced FEV1 is smoking (Wise, 2006) Almost 44% to 46% of cigarettes sold in the United States are smoked by individuals with mental illness (Lasser et al, 2000). Smoking rates are high in patients with major depression (44.7%), bipolar disorder (60.6%), panic disorder (42.6%), and posttraumatic stress disorder (44.6%), (Lasser et al, 2000), in comparison to the 25% rate seen in the general US population (MMWR, 1999). However, these estimates are even higher in patients with schizophrenia and range from 49% to as high as 90% (George et al, 2001, Poirier et al, 2002). Cognitive dysfunction reducing properties of nicotine may play a role in the development of addiction and 'self-medication' with cigarettes in this population. There are also associated brain reward pathways and common genetic and environmental factors that are independently associated with both smoking and schizophrenia (Fowler et al, 1996). The excessive smoking is a major risk factor for the development of COPD (reduced FEV1) and its deleterious consequences in this population (Carney et al, 2006).

4.3. Other causes of reduced FEV1

Reduced FEV1 may be caused by subclinical viral infections, (Omenaas et al, 1996) and allergy to house dust-mites (Omenaas et al, 1995) in these patients. Recurrent bronchitis (Kanner et al, 2001) and certain environmental and genetic factors may also contribute

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to the reduced FEV1 seen in these patients (Koyama et al, 1998, Sandford et al, 2001). A patho-physiological causal association with schizophrenia is also possible.

4.4. Treatment

The treatment of COPD is well established. Smoking cessation is critical in treating these patients. Smoking cessation usually restores the normal or near-normal rate of FEV1 decline. Since the etiology of restrictive lung parameters in these patients are elusive at this time, appropriate management is unclear. Obviously, obesity needs to be addressed as it may cause lung restriction. Breathing exercises should help improve the lung function. And finally, appropriate management of tardive dyskinesia, if present, is indicated.

4.5. Spirometry errors

Basic spirometry equipment is relatively inexpensive. The test is easy to perform and can provide adequate assessment of pulmonary function and help in clinical management. However, proper testing requires considerable patient effort and cooperation. Therefore, results must be assessed for validity before they can be interpreted (Allen et al, 2008). Inadequate patient effort can lead to misdiagnosis and inappropriate treatment, (Colp, 1979, Crapo, 1994) especially in a schizophrenia population.

5. CONCLUSION

Reduced FEV1 is extremely common in patients suffering from schizophrenia. Reduced FEV1 is associated with increased morbidity and premature death from both respiratory and non-respiratory causes. It increases need for more health care services and raises health care costs. Smoking remains a major factor although other etiologies may also play a role. Spirometry should be done routinely in these patients. Strategies to preserve and improve lung function in schizophrenics, needs to be aggressively pursued.

SUMMARY OF RESEARCH

Schizophrenia patients experience poor lifestyles. They have higher rates of smoking, alcoholism, malnutrition and lack of exercise. They suffer from high rates of physical co-morbidity. These include hypertension, diabetes, lung disease and many others common ailments. As a result, they experience premature mortality. Smoking rates are extremely high in patients with schizophrenia. This contributes to the high prevalence of COPD seen in these patients. Our patient population also exhibited a surprisingly high incidence of restrictive lung disease during spirometry testing. The etiology of this remains unclear. Reduced FEV1 was very common in our schizophrenia population – FEV1 is a strong diagnostic and prognostic marker that predicts future morbidity and mortality.

FUTURE ISSUES

Subclinical pulmonary abnormalities in patients with schizophrenia are common. Lung function in this population is poorly studied. Besides excessive smoking, other factors may play a role in reducing the FEV1 seen in this population. Smoking cessation remains critical. Other strategies to preserve and improve lung function in patients with schizophrenia need to be aggressively pursued.

DISCLOSURE STATEMENT

The author has no conflicts of interest to disclose.

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