

Association between COPD Assessment Test (CAT) and Disease Severity Based on Reduction of Respiratory Volumes in Chemical Warfare Victims

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Background: This study aimed to find an association between the short validated patient-completed questionnaire, the COPD Assessment Test (CAT) and disease severity according to spirometric findings in chemical warfare victims.

Materials and Methods: A total of 55 patients referred to Sasan Hospital (special complex for chemical warfare victims) were included in this survey. They completed CAT questionnaire and then spirometry was performed. According to GOLD criteria, the subjects were divided into four severity groups. All candidates were non-smoker males. They all had $FEV_1/FVC < 70\%$.

Results: CAT scores varied from 5 to 39, with a mean score of 22.25. FEV_1 varied from 17.5% to 89% with a mean of 53.14, and FVC ranged from 22.9% to 100% with a mean of 61.12. Data analysis revealed a significant relationship between CAT and FEV_1 ($P=0.01$). There was also a significant relationship between CAT and FVC ($P=0.05$).

Conclusion: Our findings show a significant association between CAT and disease severity obtained by lung function in chemical warfare victims.

Key words: COPD Assessment Test (CAT), Chemical warfare victim, Spirometry, Respiratory status, COPD

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a slowly progressive disease that usually leads to irreversible airway obstruction (1,2). COPD is characterized by breathlessness, cough and sputum production (2,3). As the disease progresses, patients with COPD will be more unwilling to attend social and physical activities. Iraq-Iran war chemical victims suffer from many organ dysfunctions especially pulmonary impairment. During the war, sulfur mustard

gas as an alkylating agent was used against Iranian soldiers very often. This compound can cause serious defects in the eyes, lower and upper respiratory tract and etc. Exposure to sulfur mustard gas may lead to involvement of small airways and bronchiolitis (4). Delayed effects of exposure include asthma, chronic bronchitis, bronchiectasis and emphysema (4-6). Recent studies showed that small airways are the main location of involvement in COPD (3). Considering the above

mentioned findings, COPD assessment test (CAT) can be helpful in patients with exposure to sulfur mustard gas. Subjects who have been exposed to this agent for a long time, show the signs of obstructive pulmonary disease like chronic coughs, breathlessness and sometimes hemoptysis (7). In COPD patients, measurement of health-related quality of life is a descriptive tool to measure prognosis of the disease (8). Complete recovery from COPD is nearly impossible and the main aim of treatment is to promote the quality of life (8). In the last decade many studies were done to evaluate the efficacy of questionnaires designed to assess the COPD patients' quality of life. St. George's respiratory questionnaire, chronic respiratory disease questionnaire (CRQ) and COPD clinical questionnaire (CCQ) are the examples of tools for quality of life assessment, but they are long and have a complex scoring system that is not routinely applicable (6,9,10). COPD assessment test (CAT) is a new questionnaire that is designed for subjects with COPD to measure the effects of the disease on their quality of lives. CAT can specify progressive decline of the quality of life over the time. It is an easy and applicable test which can be helpful for physicians to treat COPD (11,12). CAT questionnaire was designed by comparing many clinical studies about COPD patients. The test is about cough, phlegm, chest tightness, dyspnea, activity limitation, confidence, sleep and energy (11).

This study aimed to find an association between the short validated patient-completed questionnaire, the COPD Assessment Test (CAT) and disease severity according to spirometric findings in chemical warfare victims.

MATERIALS AND METHODS

This was a descriptive cross sectional study. Subjects were chemical warfare victims of Iraq-Iran war referred to the lung clinic of Sasan Hospital. They showed considerable air trapping on HRCT. The inclusion criterion was forced expiratory volume in one second

over forced volume capacity (FEV_1/FVC ratio) $< 70\%$. Patients with history of smoking, heart diseases and hospitalization during the last two months due to exacerbation of their respiratory diseases were excluded from the study. The study sample is shown in Table 1. Based on the "Global Initiative for Chronic Lung diseases" (GOLD) guidelines, disease severity was categorized into mild, moderate, severe and very severe categories. The local ethics committee approved the study, and all subjects gave written informed consent.

After history taking, spirometry test was performed before and after the inhalation of four puffs of salbutamol. A brief instruction was given to all subjects. They were asked to complete COPD Assessment Test (CAT) questionnaire unaided. CAT questionnaire is composed of eight questions. Table 1 shows this questionnaire. Subjects scored questions from 1-5 according to their own feelings about the disease. Total scores of the questions were measured. The correlation between CAT total score with FEV_1 and FVC and FEV_1/FVC was calculated, and then any possible significant association between each one of eight questions with FEV_1 and FVC was measured.

Analysis

Data were analyzed using SPSS version 13 software. Bivariate correlation was measured for data, and then we used linear regression analysis.

Table 1. CAT questionnaire

I never cough	1-2-3-4-5	I cough all the time
I have no mucus in my chest at all	1-2-3-4-5	My chest is completely full of mucus
My chest doesn't feel tight at all	1-2-3-4-5	My chest feels very tight
When I walk up a hill or one flight of stairs I am not breathless	1-2-3-4-5	When I walk up a hill or one flight of stairs I am very breathless
I am not limited doing any activities at home	1-2-3-4-5	I am very limited doing activities at home
I am confident leaving my home despite my lung condition	1-2-3-4-5	I am not at all confident leaving my home because of my lung condition
I sleep soundly	1-2-3-4-5	I don't sleep soundly because of my lung condition
I have lots of energy	1-2-3-4-5	I have no energy at all

RESULTS

Understudy subjects were 55 males with a mean age of 49±9.1 yrs (range 36-80 yrs).

Table 2 shows the spirometric findings. Maximum FEV₁ was %89 and minimum was 17.5% with a mean of 53.14±18.27. Maximum FVC was %100 and minimum was 22.9% with a mean of 61.12 ±20.4.

Table 2. Spirometric findings

Parameters	Max (%)	Min (%)	Mean	SD
FEV ₁	89	17.5	53.14	18.27
FVC	100	22.9	61.12	20.4
FEV ₁ /FVC	69	36.77	64.74	8.85

SD: Standard Deviation

Then we studied any possible association between CAT total score and spirometric findings. As it is shown in Table 3, there is a significant correlation between CAT total scores with both FEV₁ and FVC but no significant correlation was observed between CAT total scores and FEV₁/FVC. Figure 1 and Figure 2 show an inverse association between these parameters. It means that by increase of CAT total score, FEV₁ and FVC decrease and vice versa. After finding this association, we decided to study any possible association between each one of questions presented in CAT questionnaire with FEV₁ and FVC. We found that questions No. 6, 7 and 8 had significant association with FEV₁ and among them the 8th question had the most significant association. We also understood that questions no.1, 6, 7 and 8 had significant association with FVC and the 8th question had the most significant correlation.

Table 3. Association between CAT total scores and spirometry

		CAT	FEV1	FEV1/FVC	FVC
CAT	Pearson correlation	1	-0.332*	-0.72	-0.327*
FEV1	Pearson correlation	-0.332*	1	0.399**	0.890**
FEV1/FVC	Pearson correlation	-0.72	0.399**	1	0.44
FVC	Pearson correlation	-0.327*	0.890**	0.44	1

*. Correlation is significant at the 0.05 level

** . Correlation is significant at the 0.01 level

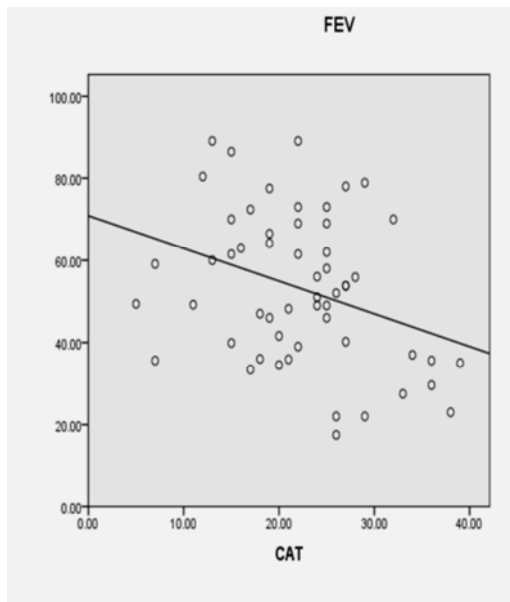


Figure1. Correlation between CAT scores and FEV1

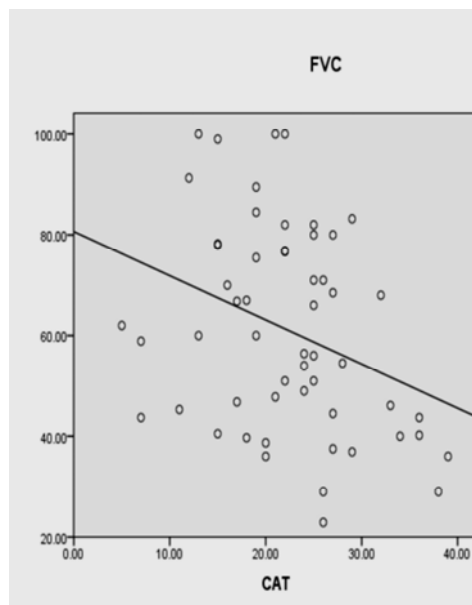


Figure2. Correlation between CAT scores and FVC

DISCUSSION

Former Iraqi regime used sulfur mustard gas against Iranian army many times. This compound causes serious defects in the eyes, skin, upper and lower respiratory tract and sometimes gastrointestinal tract. Delayed chronic bronchitis is among the best known effects of this agent (1). Currently there is no documented study about the quality of life of such patients. In order to carry out this study we used CAT

questionnaire which is really simple and practical in comparison to other questionnaires like St George's respiratory questionnaire. CAT is based on St. George's Questionnaire (13). CAT questions are designed to encourage physicians to use it more often in COPD patients. Although spirometric findings have a direct relation with respiratory functions and severity of signs, any increase in spirometric findings does not necessarily indicate a possible increment in the patients' quality of life. For instance, FEV₁ is a useful indicator for air flow obstruction but worthless for evaluation of dynamic hyperinflation (5). The first step to treat patients with COPD is to alleviate breathlessness, cough and sputum production. Drugs may have no effect on spirometric findings but can relieve above symptoms and cause an increase in the quality of life (14,15). Consequently measurement of quality of life with spirometric findings can be useful for treatment of patients with COPD (10,16). But it may be deceitful in some patients with improvement in symptoms without significant effect on spirometric findings. This study showed that there is a significant relationship between CAT total scores and FEV₁ and FVC. Increase of CAT total score causes decrease of FEV₁ and FVC. Some questions of CAT have more significant association with FEV₁ and FVC.

Engström and colleagues (8) revealed that although spirometric findings are important, their association with quality of life changes with three tests: six minutes walking distance, dyspnea related limitation and depression score. Except psychological states, all other aspects of the quality of life are questioned in CAT. Most current guidelines emphasize on spirometry to specify the severity of disease yet it is unable to clarify all effects of the disease on subjects' health status. Therefore, using CAT questionnaire can be really helpful to figure out the patients' health status in general. The CAT survey can set a vivid overview about the course of the disease; on the other hand, this test can be used in places without a spirometer to follow up the therapeutic results. The most important feature of this test is simplicity and conciseness in

comparison to other tests. Because of CAT questionnaire's ability to evaluate the therapies and patient's response to treatments, application of this questionnaire with spirometry in chemical warfare victims is valuable, especially when used at regular intervals.

CONCLUSION

Serial application of CAT questionnaire as a practical test in specific time intervals with spirometry is helpful to assess the severity of the disease and treatment response in chemical warfare victims. It also can be used as an alternative in places without spirometry. Also, we concluded there is a weaker association between FEV₁ and severity of cough, volume of sputum production and severity of chest tightness. Also, there is a stronger association between FEV₁ and loss of energy in COPD patients.

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