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Correlation of MRC Dyspnoea Scale and Forced Expiratory Volume in First Second (FEV_1) In Chronic Obstructive Pulmonary Diseases

Bhanurekha.B[1], Sasisekhar T.V.D[2], Saireddy Y[3], Indrakeela Girish M[4]
[1,3](Assistant Professor, Postgraduate, Department of Pulmonary Medicine, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation, India)
[2,4](Professor, Postgraduate, Department of General Medicine, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation, India)

Abstract : Background*: Chronic obstructive pulmonary disease (COPD) is contributing to the burden of chronic diseases. Current Gold guidelines define the severity of COPD in terms of the % predicted FEV_1 and also uses MRC dyspnea scale for comprehensive assessment. MRC dyspnea scale can easily be applied for quantification of severity of COPD where as spirometry requires standardized testing conditions.*

Materials And Methods*: This is a cross sectional study consisting of 260 COPD patients who attended the chest and internal medicine clinics of Dr.Pinnamaneni Siddhartha Institute of Medical Sciences. Informed consent was taken from all the patients. Personal interview was held to collect data including age, gender and occupation. Dyspnoea was graded by MRC Scale as grades 1-5. Baseline FEV_1 was measured by spirometer . Spirometry was performed as per the general guidelines of American Thoracic Society. Each patient then received two puffs (200mcg) of salbutanol delivered by a metered dose inhaler with spacer. 15 minutes later forced expiratory maneuver was repeated as described in the guidelines of American Thoracic Society and the best FEV_1 was recorded. Those patients who showed reversibility of 12% or more were excluded from the study.*

Results: *The age of the study group ranged from 35-83. Out of the 260 patients studied, most of them had MRC grade 4 (40.38%) and only 15 (5.76%) patients had dyspnoea of grade 5. Strong correlation between MRC dypnea grade and post-bronchodilator % predicted FEV1 was noted[P=0.0001].*

Conclusion: *MRC dyspnoea scale correlated well with FEV1 post spirometric indices. The MRC scale can be used as an effective tool for screening in rural set up and it is also a convenient and comprehensive tool for respiratory therapists in planning the rehabilitation programs.*

Keywords - *COPD, Dyspnoea, MRC scale, Percentage predicted FEV_1(FEV_1%). Spirometry,*

I. INTRODUCTION

The Increasing burden of chronic diseases is a particular risk to countries with developing health systems[1]. Chronic obstructive pulmonary disease (COPD) is contributing to the burden of chronic diseases. The impact of COPD on health systems could also be increasing due to a greater ability and capacity to manage the disease, the frequency of exacerbations, and enhanced survival of the patients[2].

Respiratory symptoms – chronic cough with sputum production, dyspnoea which is persistent and progressive are the key indicators for diagnosing COPD. Dyspnoea is the most debilitating symptom for which most patients with COPD seek medical attention[3].

The Medical Research Council (MRC) dyspnoea scale has been in use for many years for grading the effect of breathlessness on daily activities[3]. The MRC dyspnoea scale is simple to administer as it allows the patients to indicate the extent to which their breathlessness affects their mobility. Current Gold guidelines define the severity of COPD in terms of the % predicted FEV_1 and also uses MRC dyspnea scale for comprehensive assessment[4]. Apart from its prognostic value, functional capacity testing is useful in evaluating the effect of therapeutic interventions and improvement of functional capacity is one of the main treatment goals in the management of COPD. These factors have led to a general consensus on the importance of measuring functional capacity in all patients with COPD[5,6].

For the patient to undergo spirometry, standardized testing conditions like qualified technician and expert to interpret the report are required; whereas, MRC dyspnea scale can be easily applied for quantification of severity of COPD[7,8]. Hence this study is undertaken to compare the relationship between spirometry and MRC dyspnea scale, so that it can be an used as substitute for the measurement of the functional capacity especially in rural set ups involving primary health centers[9,10].

II. MATERIAL AND METHODS

This is a cross sectional study consisting of 260 COPD patients who attended the chest and internal medicine clinics of Dr.Pinnamaneni Siddhartha Institute of Medical Sciences. All the patients were males and active smokers. Participants were informed in detail about the objective of the study.

Personal interview was held to collect data including age, gender, occupation and other demographic details. Dyspnoea was graded by MRC Scale as grades 1-5.

Baseline FEV_1 was measured by spirometer. Spirometry was performed as per the general guidelines of American Thoracic Society[11]. The reference values are those of European Respiratory Society ERS 93 with 20% ethnic correction which is % predicted for age, sex, and height. Three to five forced expiratory maneuvers were obtained[12]. The best curve which produced largest FVC and FEV_1 and which was reproducible within 10 percent on at least two determinations was selected. The patient then received two puffs (200gm) of salbutanol delivered by a metered dose inhaler with spacer. 15 minutes later forced expiratory maneuver was repeated and the best FEV_1 was recorded[13]. Those patients who showed reversibility of 12% or more were excluded from the study. Dyspnoea scale was correlated with FEV_1 post bronchodilator using pearson correlation matrix.

III. RESULTS

The age of the study group ranged from 35-83. Distribution of the age is described in Table-1. Out of 260 patients studied, most patients were in the age group of 50-70(63.4%). Most of the patients were in MRC grade 4 (40.38%) and only 15 (5.76%) patients had dyspnoea of grade 5. Mean MRC dyspnoea grade was 3.15 with SD ±1.0 (table 2)

Post-bronchodilator FEV_1 was in the range of 300ml to2.7 liter and majority had FEV_1 in between 1-2 liter and majority of the patients had post bronchodilator percentage predicted FEV_1 in between 60-90%. The mean post FEV1 was 55% with SD ±2.0 (Table 3). Correlation between MRC dyspnoea scale and FEV1% predicted was statistically significant [P=0.0001].

The stages of COPD as per Gold criteria depending upon the percentage predicted post bronchodilator FEV_1 are described in Table 4. Most Patients were in Stage II (44.23%) and only (13.46%) Patients were in Stage IV.

The average values for the different parameters studied are shown in Table 5. Correlation of MRC dyspnoea scale with percentage predicted post bronchodilator FEV_1as per GOLD criteria was statistically significant [P=0.0001].

IV. DISCUSSION

Even though COPD is a major contributor for DALY [disability adjusted life years] in India, the facilities such as spirometry for the rational of diagnosis and management are almost nonexistent at primary health care set up. Given this bleak picture, simple tools emphasizing the clinical methods are the need of the hour[14].

Very few studies have been done to know the validity of MRC dyspnoea scale in classifying the clinical severity of COPD in Indian patients. For this purpose we compared the MRC dyspnea scale scores with spirometric FEV1 indices.

We studied 260 male smokers of age ranging 35 to 83 and most of the patients were of age group 50-70 years with mean age 60$\pm$10.6 years. Most of the patients studied had grade 4 dysponea with no patients in grade 0. Dyspnoea measured by MRC scale was 3.5+ 1.07. Paula S et al showed that most of the patient have grade 2 dyspnoea with mean of 2.5$\pm$1.7 previously in European population. Our study included all males and smokers in contrast to Paula S etal, who had only 79.3% males in their study. However, in both studies MRC scale correlated well with percentage predicted FEV_1[15] .

JC Bestall et. al., concluded that the FEV1 did not relate to disability as measured using MRC scale. One reason for this lack of variation was that the ranges of differences in FEV1 across the groups were very small in their study. The patients with MRC grade 5 dyspnoea were over 70 years of age whereas patients with grades 3 & 4 were younger. The mean FEV_1 was less than 1 litre in all the groups. Although FEV_1 was lowest with the highest grade, the range of differences in FEV_1 across the groups was small. FEV_1 did not relate to disability as measured using MRC scale[16].

Another comparative study of MRC scale, Oxygen cost diagram and baseline dyspnoea index observed that the MRC scale correlated well with % predicted FEV_1 and FVC ($r=0.41$, $p<0.001$) in 91 COPD subjects[17].

Lonneke M Boera et.al., concluded that MRC dyspnoea scale showed a statistically significant but only moderate association with the actual functional capacity test[12]. They also showed that the change in dyspnoea on the Visual Analog Borg Scale had a significant correlation with 6 minute walk test and treadmill exercise[18].

A cross sectional study of associations between the presence of common respiratory symptoms and the results of spirometry testing among adults with known risk factors for COPD in primary care settings concluded that presence of 3 or more common respiratory symptoms or a score of 4 or 5 on the MRC dyspnea scale was

associated with an increase in the likelihood of having moderate to severe COPD. The presence of 2 or fewer common respiratory symptoms or a score of 1 on the MRC dyspnea scale was associated with a decreased likelihood of having this level of COPD[19].

A study of Sixty two [62] COPD patients with spirometric FEV1 mean of <65%predicted underwent a multi-factorial analysis of the variables of dyspnoea scale, spirometry, plethysmography which proved that they were independent of each other[20].

V. CONCLUSION

MRC dyspnoea scale correlated well with FEV1 post spirometric indices. The MRC dyspnoea scale is simple and technically easy to administer, so it can be used as an effective tool for screening in rural set up where the facilities for spirometric evaluation of COPD are nonexistent. Apart from that MRC scale is a convenient and comprehensive tool for respiratory therapists in planning the rehabilitation programs

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