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Original Research Article

Which is better among FEV1/FVC and FEV1/SVC in obstructive airway disease?

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ABSTRACT

Background: Forced expiratory volume in 1 second (FEV1) to forced vital capacity ratio (FVC) is being used to diagnose the obstructive lung diseases. Forced manoeuvre (FVC) or relaxed/slow manoeuvre (SVC) can be used to determine vital capacity (VC). In healthy individuals the difference between SVC and FVC (SVC-FVC) is minimal whereas in the presence of airway obstruction this difference will become significant. The present study was done with the objective to detect and compare the airway obstruction by determining the FEV1/FVC and FEV1/ SVC ratios.
Methods: This was a prospective cross-sectional study done at OPD, Government Thiruvoteeswarar hospital of thoracic medicine/Kilpauk medical college during the period from September 2016 to February 2017among the patients presenting with symptoms of obstructive airway disease. The sample comprised of 353 patients who underwent spirometry according to standard of ATS/ERS guidelines. As per the criteria, the patients are classified into four groups, by spirometry.
Results: The analysis of FEV1/FVC revealed the presence of airway obstruction in 131 (37%) individuals compared to 165 (46%) individuals by the analysis of Fev1/SVC ratio. In the obstruction and mixed groups, the difference in vital capacity SVC – FVC is statistically superior ($p<0.05$) when compared to normal and restriction groups.
Conclusions: The FEV1/SVC ratio detected the presence of airway obstruction in more individuals than did FEV1/FVC ratio and hence FEV1/SVC considered as more reliable factor in the detection of obstructive airway diseases.

Keywords: FEV1/FVC, FEV1/SVC, Obstructive air way disease, SVC-FVC

INTRODUCTION

Obstructive airway disease is diagnosed by the forced expiratory volume in 1 second (FEV1) to forced vital capacity ratio (FVC).[1,2] Normal values are approximately 80% and in obstructive lung diseases the ratio was reduced to less than 80% of predicted.[3] A forced manoeuvre (FVC) or relaxed/slow manoeuvre (SVC) can be used to determine vital capacity (VC). When a FVC manoeuvre is performed, there will be dynamic airway compression and airway collapse leading to air-trapping and reduction in the amount of air expelled out by forced manoeuvre, whereas in SVC manoeuvre there will be less intra thoracic pressure hence large volume of air can be mobilised.[4] So, FVC volume will be less due to the dynamic compression and SVC volume will be more for the same patient when we perform slow manoeuvre. As a result more persons with obstructive airway disease can be diagnosed with SVC manoeuvre.

In healthy individuals the difference between SVC and FVC (SVC-FVC) is minimal or practically zero; whereas

in the presence of airway obstruction this difference will become significant. Thus, the analysis of airway obstruction by FEV1/FVC which is being commonly used may result in under diagnosis of airway obstruction.[5]

The objective of the present study was to detect and compare the presence of airway obstruction as determined by FEV1/FVC and FEV1/SVC ratio.

METHODS

This was a prospective cross-sectional study done at Government Thiruvoteeswarar hospital of Thoracic Medicine/Kilpauk Medical College among the patients attending OPD during the period from September 2016 to February 2017.

Inclusion criteria were patients with age above or equal to 18 years with symptoms of obstructive airway disease like wheeze, shortness of breath, breathlessness, and cough. Exclusion criteria were patients suffering from structural lung disease, cardiac illness and those who were already on medications, who had contraindications for performing spirometry.

The study sample consisted of 400 patients. All of them were made to perform spirometry according to ATS/ERS guidelines. First, they were made to perform slow vital capacity followed by forced vital capacity. Among them, 47 were not able to perform spirometry according to quality criteria hence excluded from the study. Thus, the final study sample was 353. The pulmonary function test results were interpreted in accordance with the criteria proposed by the ATS/ERS.[6] On the basis of the results, patients were classified into four groups:

- Normal,
- Restriction,
- Obstruction and
- Mixed groups.

The difference between SVC and FVC (SVC-FVC) was calculated in each group and compared with the other group. All the obtained data were analysed by one way ANOVA method. For statistical analysis, the level of significance was set at 0.05.

RESULTS

Table 1 presents the demographic characteristics of the study participants in four groups. Female preponderance was seen in the normal group whereas males predominated in obstruction and mixed groups. In restriction group both sexes were equal in number. The mean age group and BMI were ranged between 46.0 to 61.4 and 20.9 to 26.4 respectively.

Table 1: Demographic characteristics of study population.

Groups	Male	Female	Age	BMI
Normal (N=158)	70	88	48.0±14	24.8±5.2
Obstruction (N=131)	80	51	58.9±7.5	20.9±4.3
Restriction (N=41)	21	20	46.0±9.0	26.4±7.0
Mixed (N=23)	15	8	61.4±11	24.1±5.0

Table 2: Pulmonary function characteristics of the study participants.

Parameters	Normal	Obstruction	Restriction	Mixed
FEV1(L)	2.05±0.48	1.39±0.54	1.49±0.436	0.67±0.11
FVC (L)	2.60±0.55	2.66±0.74	1.85±0.45	1.4±0.32
SVC (L)	2.64±0.53	2.89±1.05	1.82±0.48	1.60±0.37
FEV1/FVC (%)	0.77±0.054	0.58±0.17	0.84±0.079	0.48±0.09
FEV1/SVC (%)	0.80±0.059	0.53±0.16	0.84±0.65	0.42±0.06
SVC-FVC (ml)	13±114	206.07±111	12±93	178±102

Table 3: Comparison of the means of the differences between svc and FVC among the pulmonary function groups under study.

Groups	Normal	Obstruction	Restriction	Mixed
Normal	N/A	P <0.05	N/S	P<0.05
Obstruction	P<0.05	N/A	P<0.05	N/S
Restriction	N/S	P<0.05	N/A	P<0.05
Mixed	P<0.05	N/S	P<0.05	N/A

N/A: Not applicable; N/S: Not significant

Table 2 presents the pulmonary function parameters in the four groups. The difference between SVC and FVC was analysed in each group and found to be greater in obstruction (206.07±111ml) and mixed groups (178±102ml). In obstruction and mixed pattern groups the SVC-FVC parameter was found to be statistically superior to that in normal and restrictive group ($p<0.05$). The analysis of FEV1/FVC ratio diagnosed the presence of airway obstruction in 131 (37%) individuals while FEV1/SVC ratio diagnosed airway obstruction in 165 (46%) individuals. Thus, there is discrepancy of 9%.

To determine the relation of SVC−FVC parameter, to the type of respiratory pattern, Kruskal-Wallis test was used to reveal the existence of statistical differences ($p<0.05$) in at least one of the pulmonary function groups. For this multiple comparisons of the means for independent samples was used as shown in Table 3. In the obstruction and mixed groups, the SVC-FVC parameter, was statistically significant in normal and restricted groups ($p<0.05$). In normal and restriction groups, SVC-FVC parameter, was statistically significant ($p<0.05$) in obstruction and mixed groups (Table 3).

DISCUSSION

A forced manoeuvre (FVC) or relaxed/slow manoeuvre (SVC) can be used to determine vital capacity (VC). When a FVC manoeuvre is performed, there will be dynamic airway compression and airway collapse leading to air-trapping and reduction in the amount of air expelled out by forced manoeuvre, whereas in SVC manoeuvre there will be less intra thoracic pressure hence large volume of air can be mobilised.[2] So, FVC volume will be less due to the dynamic compression and SVC volume will be more for the same patient when we perform slow manoeuvre.

In the present study, the analysis of FEV1/FVC ratio diagnosed the presence of airway obstruction in 131 (37%) individuals while FEV1/SVC ratio diagnosed airway obstruction in 165 (46%) individuals. Thus, there is discrepancy of 9%. This was in agreement with the findings of Barroset al.[7] In his study, the discrepancy was found to be 8.4% between the two rations. In another study by Rasheed et al, the discrepancy between the two ratios of the total sample (asthma and COPD groups) was 17%.[8]

In this study, we measured the difference between SVC and FVC based on the respiratory patterns. The findings of the present study showed that the difference between SVC and FVC (SVC-FVC) was greater in obstruction and mixed group. This difference describes why the FEV1/FVC ratios were higher than the FEV1/SVC ratios in the present study. This was due to the lower FVC value than SVC which has greater airway obstruction detection capability. These observations are in consistent with the findings of Chan et al.[4]

In this study, statistically significant differences were observed between SVC and FVC, signifying the volumes obtained by unforced manoeuvres being greater than those obtained by forced manoeuvres. Similar findings were also observed by Barros et al.[7]

CONCLUSION

The findings of the present study reveals that FEV1/SVC ratio detected the presence of airway obstruction in more individuals than did FEV1/FVC ratio; signifying FEV1/SVC ratio is more reliable and sensitive pulmonary function test for detection of obstructive airway disease such as asthma and COPD.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Swanney MP, Ruppel G, Enright PL, Pedersen OF, Crapo RO, Miller MR, et al. Using the lower limit of normal for the FEV1/FVC ratio reduces the misclassification of airway obstruction. Thorax. 2008;63(12):1046-51.
2. Sahebjami H, Gartside PS. Pulmonary function in obese subjects with a normal FEV1/FVC ratio. Chest. 1996;110(6):1425-9.
3. Chronic obstructive pulmonary disease: Management of chronic obstructive pulmonary disease in adults in primary and secondary care (partial update). Available at: http://www.nice.org.uk/guidance/CG101. Accessed on 10 February 2016.
4. Chan ED, Irvin CG. The detection of collapsible airways contributing to airflow limitation. Chest. 1995;107(3):856–9.
5. Constán EG, Medina JP, Silvestre AH, Alvarez II, Olivas RB. Difference between the slow vital capacity and forced vital capacity: predictor of hyperinflation in patients with airflow obstruction. Internet J Pulmonary Med. 2005;4(2):1-1.
6. Pellegrino R, Viegi G, Brusasco V, Crapo RO, Burgos F, Casaburi R, et al. Interpretative strategies for lung function tests. Eur Res J. 2005;26(5):948-68.
7. Barros AR, Pires MB, Raposo NM. Importance of slow vital capacity in the detection of airway obstruction. J Bras Pneumol. 2013;39(3):317-22.
8. Rasheed A, Vasudevan V, Shahzad S, Arjomand DM, Reminick S. Underdiagnosis of obstructive disease by spirometry. Chest. 2011;140(4):691.

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