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A Study on Computerized Spirometry Relevance with and Without Nose Clip

Dr. S.Raghu[1], Dr. G.Peter Paul[2] Dr.N.Gopichand [3] Dr.M.Venkat Rao[4]dr.K.Vijay Kissinger[5]Dr.M.Siva Durga Prasad Nayak[6]

[1](Associate Professor, Department of Pulmonary Medicine, RIMS, Ongole)
[2](Assistant Professor, Department of Physiology, RIMS, Ongole)
[3](Professor & H.O.D, Department of Pulmonary Medicine, RIMS, Ongole)
[4] (Associate Professor, Department of Pulmonary Medicine, RIMS, Ongole)
[5](Assistant Professor, Department of Pulmonary Medicine, RIMS, Ongole)
[6](Tutor, Department of Community Medicine, RIMS, Ongole)
Corresponding Author:Dr. G.Peter Paul

Abstract:
Context: Spirometry is one of the procedures for determining lung function. The utility of spirometry is for both physiological and clinical investigative purposes. *Aim: The aim of the present study is to assess the effectiveness of subject/patient's performance on Spirograph with and without the application of Nose clip. Settings and Design. It is a hospital based observational study conducted at RIMS,Ongole, during the period from December 2017 to January 2018. Methodology: A total of 138 Adult male and female subjects are selected for study. In the subjects tested, static and dynamic lung volumes are taken with and without the aid of nose clip and student t test (paired) performedandP values generated using IBM SPSS software. Results:It was observed that there is no Statistical significance for the static and dynamic lung volumes in spirometry subjects while using nose clip and without nose clip.Allsubjects performed two sets of measurements (with and without nose clips). Measurements obtained with and without the use of nose clips (n=138) were similar, FEV_1 (Correlation 0.995, P Value 0), FVC (Correlation 0.991, P Value 0), FEV_1/FVC (Correlation 0.01, P Value 0.909), PEFR (Correlation 0.991, P Value 0), $FEF_{25-75\%}$ (Correlation 0.994, P Value 0). (all P> 0.05). Conclusions: usage of nose clip is physically cumbersome and its application in determining spirometric values has not proven worthy of its utility in our present study. Still further studies are needed to the present scenario.*

Keywords: *spirometry, nose clip, lung volumes, student t test, P value.*

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I. Introduction

Respiratory Illnesses are among the most common illnesses for which a patient seeks medical attention. The Incidence of Respiratory illnesses is on the rise all over the world including India. The risk factors for Respiratory Illnesses are Genetic Factors, Personal Habits, Environmental factors (Air Pollution, Occupational Exposure).

Chronic respiratory diseases namely COPD, Asthma, Tuberculosis and Allergic Rhinitis, are the most common reasons for a doctor visit by patients with respiratory diseases [1]. In all these Respiratory Illness, the widely observed pathophysiological parameter is diminished lung function on an acute or chronic level lasting till the last breath.The diminished lung function in respiratory illnesses is assessed by Pulmonary Function Tests. Presently, the most widely done bedside and outpatient investigation performed is computerised spirometry to determine the obstructive or restrictive pattern of the respiratory illness understudy, to enable treatment outcome. The parameters assessed in Computerised. Spirometry are Forced Expiratory Volume in 1st Second (FEV_1), FVC, FEV_1/ FVC,PEFRand$FEF_{25\%-75\%}$. The determination of lung function by spirometry involvessubjects under study with the aid of nose clip during the procedure. Our study involves determination of lung function by spirometry in the subjects under study with two different procedural modifications both with the nose clip and without nose clip.

Recent observations on forced expiratory manoeuvres with voluntary Oro-nasal obstructions resulted in Barotrauma upper and lower Respiratory tract, surrounding tissues and may involve distant systemic sites. In these circumstances it is advisable not to permit voluntary closure of nasal airways during forced expiratory manoeuvre such as spirometry testing with the nose clip. Based on this background the aim of the present study is to compare the PFT Parameters done on C.Spirometryin COPD and Asthmatic subjects with and without nose clip and its impact on patients performance.

II. Methodology

The present study is a hospital based observational study conducted at the Department of Pulmonary Medicine, Rajiv Gandhi Institute of Medical Sciences (RIMS), ongole, prakasam district during the period from December 2017 to January2018. The target population of known apparently healthy adult male and female COPD and Asthmatic patients between 17 to 80 years visiting OPD, dept of pulmonary medicine are considered for the study. The target group of COPD and Asthmatic patients who have other co-morbid conditions involving cardiac, neurological, gastrointestinal, renal systems are excluded from the present study. prior permission taken from the ethical committee,the principal, rims, ongole and medical superintendent to conduct the spirometry procedure. Spirometry procedure with and without nose clip is an outpatient non-invasive procedure. Due care has been taken before, During and after the spirometry procedure educating about the spirometry procedure to minimize any discomfort or inconvenience to the subjects. Spirometry testing was done in the sitting position after 30 minutes of rest after attending OPD using Computerised Spirometer, Minispir S/N T03045.

A total of 138 adult male and female patients are tested over a period of 2 months after prior informed consent. All the test patients are included in the study. Information about age, gender, PFT Values are collected. Student 't' Test performed and P Values are calculated for the PFT Values using IBM SPSS softwareand Microsoft Excel is used for data storage and graphical analysis. The parameters compared are Forced Expiratory Volume in 1st Second (FEV_1), FVC, FEV_1/ FVC, PEFR, $FEF_{25\%-75\%}$ with and without nose clip.

III. Results

Figureno.1 Gender wise distribution of Study population

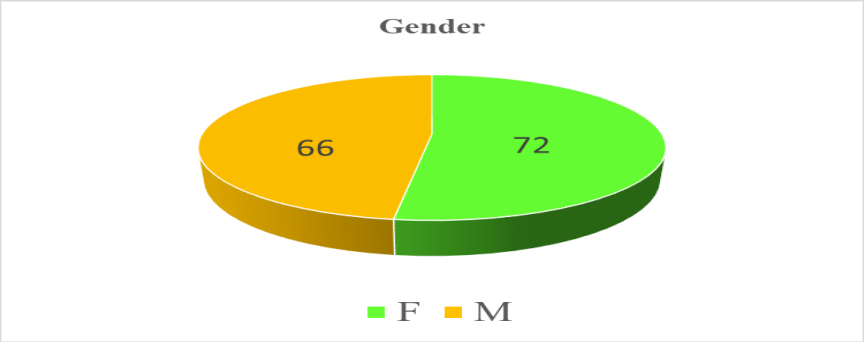

Table No.1: Descriptive statistics of studypopulation

	Minimum	Maximum	Mean	Std. Deviation
Age in years	17	80	43.57	19.160
Height in cm	145	179	161.15	8.183
Weight in Kg	28	105	62.72	15.507
BMI	12.78	39.52	24.0854	5.40927
FEV1 (L) without Nose clip	.47	4.30	1.7470	.87322
FEV1 (L) with Nose clip	.47	4.30	1.7611	.87247
FVC (L) Without Nose clip	.52	4.59	1.9278	.92140
FVC (L) With Nose clip	.52	4.59	1.9591	.92510
FEV1/FVC (%) without Nose clip	58.8	100.0	90.033	8.3913
FEV1/FVC (%) with Nose clip	62.5	932.0	107.857	123.6313
PEF (L/s) Without Nose clip	.95	8.55	3.9052	1.99163
PEF (L/s) With Nose clip	.95	8.55	3.9502	1.98683
FEF25-75 (%) Without Nose clip	.54	4.71	2.2678	1.16821
FEF25-75 (%) With Nose clip	.54	4.71	2.2457	1.18774

Table No.2: T-test statistics for Paired Correlations n=138

		Mean	Std. Deviation	Std. Error Mean	Correlation	P value
Pair 1	FEV1 (L) without Nose clip	1.747	0.87322	0.07433	0.995	0
	FEV1 (L) with Nose clip	1.7611	0.87247	0.07427		
Pair 2	FVC (L) Without Nose clip	1.9278	0.9214	0.07843	0.991	0
	FVC (L) With Nose clip	1.9591	0.9251	0.07875		
Pair 3	FEV1/FVC (%) without Nose clip	90.033	8.3913	0.7143	0.01	0.909
	FEV1/FVC (%) with	107.857	123.6313	10.5242		

	Nose clip					
Pair 4	PEF (L/s) Without Nose clip	3.9052	1.99163	0.16954	0.991	0
	PEF (L/s) With Nose clip	3.9502	1.98683	0.16913		
Pair 5	FEF25-75 (%) Without Nose clip	2.2678	1.16821	0.10054	0.994	0
	FEF25-75 (%) With Nose clip	2.2678	1.19148	0.10255		

IV. Discussion

The study population had almost equal proportion of both male and females. Mean age of study population was 43.57 years. Average body mass index of study population was 24. i.e in the normal range. Pared T test was done to test the difference between means of different recordings with spirometer, with and without nose clip. All the pairs showed no significant difference with and without nose clip.

TheFEV_1 and the FVC findings in our study are FEV_1Correlation 0.995 with P value 0 and FVC Correlation 0.991 and P Value 0 are consistent with the results of Newall.C al. study[2]. The PEF in our study, Correlation 0.991 with P value 0 and The $FEF_{25-75\ (\%)}$ correlation 0.994 and P value 0 are consistent with the findings of Gupta.DA et al[3].The FEV_1/FVC in our study, Correlation 0.01 with P value 0.909 with no significant difference.In the present study the practical application of voluntary clipping of nose with a mechanical aid has no significance in the PFT values measured with the spirometry before and after its usage.The disadvantages of nose clip application are 1. Acts as mechanical inconvenience 2. Physical Injury such as microtraumalocally 3. Precipitates an attack of asthma in apprehensive anxious patients. 4. Dislodging and Spread of Infection through contact. 5. May Precipitate stroke 6. Laryngeal fracture[4]7.Rupture ear (Barotrauma) 8. Rupture throat[5] (Barotrauma). 9. Propensecardiac arrest due to vagal stimulation.

V. Conclusion

The Present study found that the overzealous practice of spirometry with the usage of nose clip has no significant advantage over not using the nose clip, but mechanical inconvenience[6]. Further studies are ongoing at our department to prove and disapprove the myths and truths of applying nose clip during spirometry.

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