"A STUDY OF CHANGE OF POSTURE ON THE PULMONARY FUNCTION TESTS : CAN IT HELP COPD PATIENTS ?"

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ABSTRACT :

Objectives :

1. To know the pulmonary function tests in sitting, supine and standing postures in North Indian population

2. Is there any change in PFTs due to change in posture

***Settings**: Department of Physiology, **G.S.V.M. Medical College,** Kanpur and **Escorts Heart Centre,** Kanpur*

***Participants** : 50 male and 30 female healthy, non-smoker volunteers comprising of 50 students of first year MBBS and 30 volunteers at Escorts Heart Centre, Kanpur*

***Measurements** : PFTs, FEV1, FVC, FER, PEFR and TV*

***Statistical analysis** : Students 't' test*

***Results**: The FEV1, FVC and PEFR increased significantly from supine to sitting to standing posture in both males and females. The FER significantly increased only when moving from supine to sitting in both males and females. The TV increased significantly by moving from supine to sitting and also from supine to standing postures in both males and females.*

***Keywords**: PFTs, Posture*

***Abbreviations :** FEV1 - forced expiratory volume in 1st second, FVC-Forced expiratory ratio, PEFR - Peak expiratory flow rate, TV - Tidal volume, PFT - Pulmonary function tests, COPD - Chronic obstructive pulmonary disease.*

Introduction :

The pulmonary function tests (PFTs) depend on factors like lung volumes, diameter of airways, the compliance of lungs and chest wall, movement of the diaphragm and the strength of the respiratory muscles. There are various studies on PFTs in sitting and supine postures[1] and a few in standing postures[2], which are from western countries. The present work, thus, had been planned to evaluate the effect of change of posture on PFTs in normal healthy volunteers in north Indian population which would provide the data for reference values of Indian subjects.

Material & methods :

The present study was done on 80 healthy volunteers comprising of 50 young healthy first year MBBS students of **G.S.V.M. Medical College, Kanpur** and 30 healthy volunteers at **Escorts Heart Centre, Kanpur.** There were 50 males and 30 females. All were non smokers, healthy, between 18 - 24 years of age and were not having any complaints related to cardiopulmonary diseases.

The FEV1 (Forced Expiratory Volume in

1st second in L/1st sec),FVC (Forced Vital capacity in L), FER (Forced expiratory ratio of FEV1/FVC as %), Peak expiratory flow rate (PEFR as L/min) and TV (Tidal volume in ml were measured by spirometer. The readings were taken in standing, sitting and supine postures. The statistical analysis was done by students 't' test and $p < 0.05$ was taken as significant.

Observation and Results :

The physical parameters were according to the table 1.

TABLE - 1

Parameters	Male (n=50)	Female (n=30)
Mean age (years)	21.27 ± 1.46	19.56 ± 1.27
Height (cms)	171.2 ± 5.44	158.2 ± 4.13
Weight (Kgs)	61.07 ± 8.95	51 ± 5.28
Suface area (m^2)	1.71 ± 0.13	1.58 ± 0.08

The readings of various PFTs were according to table 2.

TABLE-2

Parameters	Sex	Standing	Sitting	Supine
FEV1	Male	3.39 + 0.42**	3.34 + 0.4*	3.08 + 0.39
(L in 1st sec)	Female	2.53 + 0.39**	2.5 + 0.4*	2.28 + 0.37
FVC (L)	Male	4.07 + 0.51**	3.99 + 0.52*	3.73 + 0.48
	Female	2.89 + 0.41**	2.83 + 0.42	2.64 + 0.39
FER (%)	Male	83.13 + 3.63	83.3 + 3.84*	82.20 + 3.84
	Female	87.35 + 4.92	87.9 + 4.82	86.15 + 4.63
PEFR	Male	533.6 + 77.9**	520.4 + 77.5*	479.2 + 76.7
(L/min)	Female	350.45+66.35**	332.6 + 69.99*	305.9 + 62.03
TV (ml)	Male	499.33 + 49.68**	4494.0 + 54.11*	459.33 + 52.39
	Female	376 + 22.1**	371 + 23.8	346+28.3

*Significant increase from supine to sitting posture
**Significant increase from supine to standing posture

Discussion :

Our results are consistent with those recorded earlier[2,3,4]. An increase in FEV1 and FVC when moving from supine to standing in both sexes were also reported[5,6,7]. The same increase in PEFR values as of our study were also reported earlier[6]. The increase in TV as in our study was also reported by other researchers[8,9]. Various theories have been put forward by

different authors for changes noted by changing the posture. The diaphragm is at its lowest position in the thorax when the subject is erect and at its highest when the subject is supine explaining the changes of PFTs in different postures[10]. The ventilation in the supine posture is more uneven than in the erect posture. In the seated posture, effective muscle action was being applied to move the rib cage which was not applied in the supine posture and leads to smaller negative intrathoracic pressure in supine posture explaining the higher values of FEV1 in the sitting posture[11]. The increased FER from supine to sitting posture stresses the need of change of posture from supine to sitting in patients of obstructive respiratiory disease (COPD).

Conclusions :

1. All the mean values of FEV^1, FVC, PEFR and TV in the three postures were higher in males as compared to females.
2. The FEV^1, FVC and PEFR increased significantly from supine to sitting to standing postures in both males and females.
3. The FER significantly increased only when moving from supine to sitting in both males and females. **This stresses the need of change of posture from supine to sitting in patients of COPD.**
4. The TV increased significantly by moving from supine to sitting and also from supine to standing posture in both males and females.

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