

## EFFECT OF ADENOTONSILLITIS ON PEAK EXPLORATORY FLOW RATE IN CHILDREN

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### ABSTRACT

Peak Exploratory Flow Rate (PEFR) is a simple, economical, reproducible, non-invasive test, which can be quickly performed with ease. PEFR was assessed in 36 children with adenotonsillar enlargement with mean age 10.75 years and equal number of age and sex matched normal children who acted as controls. PEFR was found to be  $250.61 \pm 66.92$  lt/min in controls and  $216.85 \pm 59.76$  lt/min in children with adenotonsillar enlargement signifying impairment of PEFR in children in the second group.

*Key Words: PEER, Children, Adenoides, Tonsillitis, Hypertrophy.*

### INTRODUCTION

Peak expiratory flow rate (PEFR) is a simple index of pulmonary function and is often used in clinical and epidemiological studies for assessing ventilatory capacity. It is effort dependent and reflects the status of large airways. Thus it is insensitive to early obstructive changes, which are known to occur in small airways.<sup>1</sup> Pulmonary function is known to vary with age, sex, height, weight, race, geographic locations, muscle strength, airway resistance, lung recoil and body fat content.<sup>2-4</sup>

Today, it is important to realize that in children, nasal obstruction from whatever cause, anatomic or infections, causes measurable increase of airway resistance and can be considered as a possible cause of chronic obstructive lung disease in adult life.<sup>5</sup> With the help of pulmonary function tests in children with adenotonsillar enlargement, the obstructive phenomenon that is not evident clinically can be identified and can be used

as a useful tool in decision making for adenotonsillectomy in children. Despite abnormal pulmonary function, most children with nasal obstruction initially lack symptoms or signs pertaining to lungs. They usually seek medical consultation because of recurrent upper respiratory tract infections or because there is objective evidence of adenotonsillar enlargement.

The studies of lung functions during adenotonsillar enlargement in children are very few. Moreover, these are in concern with evaluation of standard lung volumes and capacities. Very little information is available on PEFR in adenotonsillar enlargement in children, even if this is simple and fairly reproducible test of lung function.<sup>6,7</sup>

Thus assessment of lung function in children with adenotonsillar enlargement is important for studies of pulmonary effect of prolonged upper airway obstruction leading to chronic obstructive lung disease, chronic bronchitis and asthma.<sup>8</sup>

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*Received Date : 4<sup>th</sup> Jan, 2005*

*Accepted Date : 9<sup>th</sup> Nov, 2005*

This preliminary study was under taken to know the effect of adenotonsillar enlargement on pulmonary function tests (PFT). However, it may not be possible to carry out detailed PFT in large number of cases, so a simple and quick PEFR was chosen as an indicator of PFT impairment.

## MATERIAL AND METHODS

This study was conducted in thirty-six normal healthy children (group I) and equal number of children of either sex with adenotonsillar enlargement (group II), referred from department of otolaryngology at a medical college in Delhi who were being investigated and awaiting surgery. Only those children with more than 2+ hypertrophy of tonsils<sup>9</sup> and with moderate to severe hypertrophy of adenoids which was confirmed on x-ray soft tissue nasopharynx lateral view<sup>10</sup> were included in the study. Usually the adenoids attain maximum size by 7 years of age and then start slowly regressing and stay up to puberty i.e. 14 years and sometimes even late in presence of allergy and infection. These patients were selected randomly using a periodic random number. Sample size was not predetermined, however it was ensured that not less than 30 patients would be taken for proper statistical analysis.

The age of patients appear to be slightly on higher side as the younger children with adenotonsillar were not able to perform the test properly.

Children suffering from the disease other than adenotonsillar enlargement, which are known to affect pulmonary function like obstructive airway disease and cardiac disease and other ENT disease like nasal polyps, DNS etc were excluded from the study. The recording was done on vitalograph (Unissi India Pvt. Ltd., New Delhi) after taking the consent of parents. All subjects were trained to perform PEFR test after clipping the nose by short forceful single exhalation into mouthpiece of vitalograph and the test was repeated thrice. The average of three efforts was taken as peak expiratory flow rate. Statistical analysis was performed using "Z" test.

## RESULTS

Mean age in group I (control group) was 10.12 years (range 7 to 12 years). There were 20 males and 16 females whereas the mean age of group II (study group) was 10.75 years (range 6.5 to 12 years). There were 21 males and 15 females. The age was comparable in both the groups. Mean height of group I

and II was 131.70 and 132 cms respectively, there being no significant difference between the two groups. Weight of two groups was also comparable i.e. 34.61 kg and 35.02 kg. Peak expiratory flow rate was  $250.61 \pm 66.92$  lt/min in group I and  $216.85 \pm 59.27$  lt/min in group II. The difference between the two groups was statistically significant ( $P < 0.05$ , Table I).

## DISCUSSION

Adenotonsillar enlargement is very common cause of upper airway obstruction in children in 4 to 14 years age group. This hypertrophy present with obstructive symptoms like mouth breathing, snoring and even sleep apnoea.<sup>11,12</sup> If it remains untreated it affects the lower respiratory tract which can be assed with pulmonary function tests, PEFR being the quickest.

PEFR is a simple and reliable method to assess the degree of airway obstruction. PEFR is significantly affected by adenotonsillar enlargement as observed by Maurizi and his colleagues who found that 52% of children with adenotonsillar hypertrophy had findings of obstructive pulmonary disease.<sup>13</sup> Kavukcu et al also showed a significant decline in PEFR in 60% children with adenotonsillar enlargement. They concluded that PEFR is reduced even when there is no evidence of radiological obstruction.<sup>14</sup>

Reduction in PEFR denotes expiratory obstruction. In our study, the PEFR value in normal healthy children was  $250.61 \pm 66.92$  (Mean  $\pm$  SD) lt/min while  $216.85 \pm 59.27$  (Mean  $\pm$  SD) lt/min in children with adenotonsillar enlargement. This decline in PEFR seen in adenotonsillar enlargement was found to be significant with Z value 2.44 ( $P < 0.05$ ). The reduction in PEFR is known with various respiratory diseases like asthma and chronic bronchitis. PEFR provides a good objective index to confirm diagnosis, control medication and monitor response to treatment.<sup>15</sup>

Massive adenotonsillar enlargement leads to obstruction of respiratory passage leading to decline in PEFR. If these children are left untreated, they may develop cardiopulmonary failure.<sup>5</sup> Ideally detailed pulmonary function test should be carried out i.e respiratory flow loop study. However, the test is cumbersome, requires lot of time and calculations. So this preliminary study was done to know the role of PEFR in adenotonsillar enlargement: five patients underwent adenotonsillectomy and PEFR was carried out 1 month after surgery showed a significant improvement. However adenotonsillectomy patients number being too small, was not considered for statistical analysis.

**Table I : Peak Expiratory Flow Rate in controls and patients with Adenotonsillar Enlargement**

Group	Mean Age in Years	Male	Female	Total	PEFR Lt/min (Mean $\pm$ SD)	P Value
I	10.12	20	16	36	250.61 $\pm$ 66.92	-
II	10.75	21	15	36	216.85 $\pm$ 59.27	<0.05 significant

This simple and quick test can be employed to weed out those children who do not need detailed pulmonary function test. Children with adenotonsillar hypertrophy and impaired PEFr can be taken for flow loop study. This way the crowding of pulmonary labs will be avoided which is a common phenomenon in South Asia. Further, parents of children with impaired PEFr can be counseled that their children are likely candidate of cardiopulmonary complication if do not undergo surgery. Kavukcu et al also observed that peak exploratory flow could reveal the obstructive effect of adenotonsillar hypertrophy with no clinical or radiological obstructive findings and could be useful in surgical indication in adenotonsillar hypertrophy.<sup>14</sup>

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