

## **Spirometry for Euthyroid Subjects**

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**Abstract:** *Expiratory spirogram & ratio of certain parameter helpful in identifying unnoticed inspiratory obstruction in euthyroids with dyspnoea & intermittent choking which gets relieved by BD, so that mild dose to be included in drug regime along with eltroxin tabs*

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### **I. Introduction**

Assessment of lung function is of value to the physician both for diagnostic and treatment thereby securing the confidence of the patient. Although it is recognized that an enlarged thyroid may cause tracheal compression, incidence of upper airway obstruction in Euthyroid goiter is unknown. On determination of Expiratory Spirogram before & after BD for female patients with euthyroid goiter with the frequent problem of Dyspnoea, Breathlessness & choking on exertion, though the FEV1% is not significantly increased after BD therapy, the patient becomes comfortable with the course of oral BD along with Eltroxin. But ratios like FEV1/PEFR, & PEFR/FEFR25-75% determined along with FEVC, FEV1 & FEV1% for these patients showed significant improvement with BD suggesting Upper Airway obstruction. These ratios are helpful in assessing the unsuspected extra thoracic airway obstruction (upper airway obstruction) as this is slow in onset and left unnoticed in these subjects.

### **II. Study**

11 married, female patients with mean age of 40-50, with average height varies from 150 cm – 155cm with weight vary from 58-64kgs, with no problem of diabetes or hypertension, having clinical diagnosis of non-toxic goiter were included for the study as these patients have the clinical history of Dyspnoea and recurrent problem of shortness of breath, choking sensation on moderate exertion. Apart from clinical examination all were examined roentgenographically, haematologically with estimation of HB, TLC, and ESR. Biochemically with estimation of Blood Sugar, Serum Cholesterol. Forced Expiratory Spirogram were performed for all these patients using computerized spirometer and values for the best of the three efforts were taken for consideration.

### **III. Results And Observation.**

Though Expiratory Spirogram showed no significant reduction in PEFR, FEFR25-75% & FFEV1 and its % before and after BD, their problem got reversed with short course of BD. But the assessment of the ratios between FEV1/PEFR and PEFR/FEFR25-75% before and after BD is significantly increased indicating the upper airway obstruction, suggesting course of BD along with Eltroxin to prevent the recurrent attack of shortness of breath & dyspnoea.

### **IV. Discussion**

Tracheal compression by enlarged thyroid gland as a cause of mechanical airway obstruction has been well established. (Torres et al 1983, Karbowitz et al 1985.) Acute respiratory failure from large benign goiter has been described in numerous reports (Segal 1968; Shambaugh et al 1973; Canham and Sahn 1982). Goiter has been found to be producing fixed obstruction as it is located near thoracic outlet and the upper airway obstruction is constant during inspiration and expiration (Shim et al 1972).

The present study suggests a high incident of upper airway obstruction in euthyroid goiter but this was frequently unsuspected and undiagnosed because of mild and non-specific symptoms. In majority of patients the onset is insidious and the compression causes only mild reduction in the lumen of the trachea and therefore the patients may have no or nonspecific symptom and they are with no X-ray abnormalities by soft tissue roentgenogram of the neck (Williams 1974).

FEV1 and its % reduced before BD (though they have difficulty in breathing) got relieved with BD though the rise in these parameters with BD is not statistically significant. But the ratios derived between FEV1/PEFR and PEFR/FEFR25-75 showed significant change with BD, suggesting larger/central airways obstruction.

PEFR reflects the status of large central airways and FEFR25-75 signifies peripheral airway disease (Meenakshi S 1984a & 1984b) and the ratio between the two has been suggested by (Bhella et al 1979) as the most effective parameter in separating upper airway obstruction from peripheral airway obstruction.

Empey D.w.1972 showed FEV1/PEFR as a satisfactory indirect method of assessing upper airway obstruction as the advantage of this procedure is , the ease with which the expiratory maneuver required to measure FEV1 and PEFR can be performed. In addition the equipment is standard in most hospitals.

The presence of inspiratory obstruction shown in the present study in euthyroid goiter is asymptomatic as the mean weight of the gland on palpation was less than 50 gm and does not appear to be mechanical as it does not cause pressure symptoms such as coughing, wheezing and dysphagia.

However, the presence of inspiratory obstruction documented by spirographic tracings lead to the following speculations that inspiratory obstruction in thyroid goiter appears to be due to hormonal influence of thyroid hormone on catecholamine and CAMP levels, as thyroid hormone could affect the response of catecholamine over adrenergic receptor sites or phosphodiesterase activity(Spaulding and Noth1975). Also thyroid gland synthesizes and secretes prostaglandins and certain prostaglandins of E series activate adenylyl cyclase which is presumed to be CAMP mediated(Friedman et al 1975;Spauldingand Burrow1975).and CAMP levels and B-adrenergic receptors play a part in airway obstruction(Spaulding and Noth loc , cit; Pisarev et al1979). But the changes fluctuating the goiter size and hormonal level are impossible to document due to irregular shape and position of the gland and also the insensitivity of the available assay methods to distinguish normal level from slightly levels (Felig et al 1981)

### V. Summary And Conclusion

Spiro metric study of 11 married female patients with non-toxic, simple, euthyroid goiter with no clinical and radiological evidence of pressure effect over trachea were demonstrated to be having unsuspected upper airway obstruction which was slow in onset usually and therefore, left unnoticed by the patient. The cause for this upper airway obstruction appeared to be hormonal.

To conclude the high incidence of inspiratory obstruction in euthyroid goiter suggests that the this complication is frequent and along with determination of FVC,FEV1and FEV1% the ratios between FEV1/PEFR, PEFR/FEFR25-75 also to be calculated for assessment of upper airway obstruction which is a simple noninvasive sensitive method to be included in routine test and it is suggested from the study that a minimal dose of BD also may be administered along with Eltroxin to prevent respiratory distress for these patients.

#### Spirographic Values Before Broncho Dilator Therapy

NO	FVC(ml)	FEV1(ml)	FEV1%	PEFR(lit/mt)	FEFR25-75lit/sec
1	1002.5	799	79.7	190	1.25
2	2015	1693	84	280	1.82
3	2697	2414	89.5	300	4.39
4	1608	1254	78	180	1.35
5	1168	899	77	160	1.32
6	2982	2445	82	195	2.7
7	2041	1756	86	220	3.34
8	2927	2195	75	185	2.5
9	1923	1500	78	340	1.88
10	2380	1880	79	310	3.1
11	2751	2201	80	320	2.8

#### SPIROGRAPHIC VALUES AFTER BRONCHO DILATOR Therapy

FVC	FEV1	FEV1%	PEFR	FEFR25-75
<b>1125</b>	900	80	300	3.75
<b>2222</b>	1800	81	420	4.4
<b>3187</b>	2614	82	600	4.89
<b>1862</b>	1490	80	290	3.55
<b>1518</b>	1200	79	270	3.32
<b>3670</b>	3010	82	300	3.90
<b>3035</b>	2550	84	310	4.44
<b>3734</b>	2950	79	290	3.73
<b>2592</b>	2100	81	500	2.18
<b>3390</b>	2780	82	410	4.80
<b>3614</b>	3000	83	480	4.70

**Ratios Of Spirographic Parameters Before Bd**

NO	FEV1/PEFR	PEFR/FEFR25-75
1	799/120=4.21	190/1.25=2.5
2	1693/280=6.04	280/1.82=2.6
3	2414/300=8.05	300/3.39=1.5
4	1254/180=7.00	180/1.35=2.2
5	899/160=5.6	160/1.32=2.00
6	2445/195=12.5	195/2.7=1.20
7	1756/220=8.0	220/3.34=1.1
8	2195/185=11.9	185/2.5=1.23
9	1500/340=4.4	340/1.88=3.0
10	1880/310=6.1	310/3.1=1.7
11	2201/320=6.9	320/2.8=1.90

**Ratios Of Spirographic Parameters After Bd Therapy**

NO	FEV1/PEFR	PEFR/FEFR25.75
1	900/300=0.3	300/3.75=1.3
2	1800/420=0.43	420/4.42=1.58
3	2614/600 =0.43	600/4.89=2.04
4	1490/290=0.52	290/3.55=1.36
5	1200/270=0.44	270/3.32=1.36
6	3010/300=1.00	300/3.90=1.28
7	2550/310=0.83	310/4.4=1.17
8	2950/290=0.6	290/3.73=1.3
9	2100/500=0.42	500/2.18=3.8
10	2780/410=0.68	410/4.80=1.4 2
11	3000/480=0.06	480/4.70=1.70

**% OF RESPONSE OF BD THERAPY**

NO	FEV1/PEFR	PEFR/FEFR25-75
	<0.1	<0.1
1	12.6	51
2	6.3	50
3	8.2	100
4	18. 9	61
5	12.2	81
6	23	54
7	45	40
8	34	57
9	40	47
10	48	32
11	36	50

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