

PEAK EXPIRATORY FLOW RATE AND HEMODYNAMIC CHANGES BEFORE AND AFTER COMPLETE THORACOCENTESIS: A BED SIDE EVALUATION

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ABSTRACT: OBJECTIVE: Pleural effusion is the most common manifestation of the diseases of pleura. Alteration in physiological state following Thoracocentesis is well established. We aim to evaluate at the bed side the effect of Thoracocentesis in pleural effusion by assessing PEFR and Hemodynamic changes (Blood Pressure). **MATERIAL AND METHOD:** The study comprised 44 patients admitted in SCB medical college and hospital Cuttack, Orissa in the department of Tuberculosis and chest diseases. Pleural effusion was diagnosed clinically and by CXR. PEFR was measured using Wright's peak flow meter and blood pressure was measured in all the cases before and after Thoracocentesis. 'P' value was calculated using 'z' table. **RESULTS AND CONCLUSIONS:** PEFR value shows significant improvement following Thoracocentesis. Changes in the blood pressure shows improvement more so in cases of massive effusion than mild or moderate type of effusion.

KEYWORDS: Pleural effusion, PEFR, Blood pressure.

INTRODUCTION: The pleural space is non – existent (i.e. it is a potential space) occupied by only a small amount of lubricating pleural fluid.¹ Pleural effusion is said to exist when ever excess amount of fluid gets accumulated in pleural cavity. Lung function changes associated with pleural effusion includes restrictive lung volume & decrease lung compliance.² Studies have shown definite improvement in the lung function but little Hemodynamic changes following Thoracocentesis.

AIMS AND OBJECTIVE: (1) Clinical and radiological studies of pleural effusion. (2) Peak expiratory flow and blood pressure measurements before and after complete Thoracocentesis. (3) Correlation between clinico-radiological and pulmonary function status.

MATERIAL AND METHOD: The study comprised 44 patients admitted in SCB medical college and associated hospital Cuttack, Orissa in department of Tuberculosis & chest Disease. Inclusion criteria- (1) Patients aged 15yrs and above of both sexes with unilateral or Bilateral pleural effusion of recent onset. Exclusion criteria- Pleural effusion with parenchymal disease. (2) Encysted pleural effusion. (3) Pleural effusion with pneumothorax and hydropneumothorax. (4) Patient of bronchial asthma and COPD. (5) Systemic diseases leading to pleural effusion like cardiovascular, renal, hepatic. (6) Patients known to have blood pressure or taking anti-hypertensive `medications. Patients were clinically examined and routine of blood examination and sputum for AFB was done. Based on X-ray chest, patients were classified as minimal, moderate and massive type.

Patients with pleural effusion level up to lower border of fourth rib anteriorly were classified as minimal effusion, up to lower border of second rib as moderate effusion and above second rib as massive pleural effusion. Peak expiratory flow rate were carried out after gaining confidence of the patients and making them learn the correct procedure. Each patient was advised to sit over a stool for

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5 minutes and blow in the Wright's Peak flow meter 3 times and best efforts were considered. Similarly blood pressure measured both before and after Thoracocentesis. Finally values were arranged in two groups before and after Thoracocentesis. Lung volumes were corrected to body temperature and pressure standard (BTPS). PEFR values were compared with predicted corresponding Indian values. Finally values were arranged in 2 groups and 'P' value was calculated using 'z' table.

OBSERVATION: Total 44 cases were taken and the result of the study is as follows:-

Age Group in years	Males	Females	Total	Percentage
15-25	2	4	6	13.64%
26-35	8	4	12	27.27%
36-50	13	7	20	45.45%
>50	6	0	6	13.64%
Total	29	15	44	100.00%

TABLE 1: Age & Sex Distribution

From the above table it is evident that out of 44 total cases, 20(45.45%) were in 36-50 years, age group. Next common group was in 26-35 years, (27.27%) between age group 26-50 years, there were almost 72% of cases.

Male predominance were there among all age group of patient.

Age Group in years	No. of. Cases	Percentage
Right	23	52.28%
Left	20	45.45%
Bilateral	1	2.27%
Total	44	100.00%

TABLE 2: Distribution according to side of lesion of pleural effusion

Right side was predominately affected as shown in the present table. More than 50% (52.73%) of the cases have seen right sided involvement and only one case had Bilateral pleural effusion.

Amount of Effusion	Males	Females	Total	Percentage
Minimal	6	4	10	22.73%
Moderate	16	10	26	59.09%
Massive	7	1	8	18.18%
Total	29	15	44	100.00%

TABLE 3: Total percentage distribution of the patients according to the amount of effusion

About 60% (59.09%) of the patients were having moderate pleural effusion. Next common is minimal effusion with 22.73% and only 8 people (18.18%) had massive pleural effusion as evident by this table.

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Amount of Effusion	Total	Males	Females	Age	Height (cms.)
All	44	29	15	38.90 (9.30)	156.39 (11.06)
Minimal effusion	10	6	4	38.50 (9.09)	156.10 (13.10)
Moderate effusion	26	16	10	38.91 (9.63)	156.64 (10.81)
Massive Effusion	8	7	1	39.74 (9.53)	157.19 (10.86)

TABLE 4: Age, Height and Sex Distribution of Patients according to category of pleural effusion

From the above table it is evident that the average age distribution of all the patients were around 40 years. (38.90 ± 9.30) and height were around 156.39 cms.

No. of cases	PEFR before Thoracentesis in Ltre.	PEFR after Thoracentesis in Ltre.	Predicted PEFR in Ltre	Percentage of Predicted
1	200	300	400	75.00%
2	400	420	540	77.77%
3	150	210	340	61.76%
4	150	250	340	73.52%
5	300	320	460	69.56%
6	200	300	380	78.94%
7	400	410	440	93.18%
8	420	470	520	90.38%
9	150	210	340	90.38%
10	270	300	510	61.76%
11	250	300	340	58.82%
12	150	310	370	88.38%
13	200	320	3809	78.33%
14	250	400	440	84.21%
15	200	330	340	90.90%
16	150	210	270	97.00%
17	250	300-	280	77.77%
18	240	300	430	62.50%
19	270	380	420	69.70%
20	200	320	335	90.47%
21	250	300	310	95.52%

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22	250	380	400	96.77%
23	240	300	440	95.00%
24	200	350	380	68.18%
25	250	400	440	92.10%
26	200	320	440	90.90%
27	250	350	350	72.72%
28	270	300	360	94.28%
29	290	300	380	83.33%
30	150	210	220	78.94%
31	420	410	440	97.91%
32	400	470	480	93.18%
33	210	350	350	100.00%
34	250	400	440	90.90%
35	200	380	430	88.37%
36	300	420	480	87.00%
37	400	420	480	87.50%
38	250	310	340	91.17%
39	250	350	400	87.50%
40	300	320	400	80.00%
41	200	300	320	93.75%
42	420	470	490	95.90%
43	310	460	590	77.96%
44	150	240	320	75.00%
Total = 44 Cases				
Mean	238.60	338.60	404.18	82.80%
S.D.	±79.37	± 85.71	± 72.06	± 68.77%

TABLE 5: PEFR of all patients before and after complete thoracentesis

The above table shows the PEFR of all patients before and after complete thoracentesis. The mean value observed before aspiration was found 238.60 Litres/min (S.D. = ±79.37) and after aspiration the mean value was 328.60 Litres/min (S.D. = ±85.71). The predicted value was found out to be 404.18 Litres/min (S.D. = ±72.06).

Types of PFT	All patients		Minimal Effusion		Moderate Effusion		Massive Effusion	
	Before	After	Before	After	Before	After	Before	After
PEFR	283.60	338.60	240.00	340.00	252.50	282.60	271.50	243.90
	(79.37)	(85.71)	(99.05)	(111.91)	(82.59)	(89.85)	(77.98)	(81.86)

Table 6: PEFR according to the amount of effusion

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Age Group in years	No. of patients	PEFR in Ltre	PEFR in Ltre
15-25	2	290.26 (81.83)	319.26 (87.83)
26-35	8	275.75 (96.93)	311.72 (89.79)
36-50	13	279.04 (84.04)	312.08 (84.70)
50	6	275.03 (92.77)	302.05 (86.24)

Table 7: PEFR in relationship to age group in male patients Before and after complete thoracentesis

The above table shows PFTs in different age group before and after aspiration along with their S.D.

Age Group in years	No. of patients	PEFR in Ltre	PEFR in Ltre
15-25	4	216.66 (16.9)	219.17 (17.8)
26-35	4	215.77 (18.1)	220.18 (15.75)
36-50	7	208.24 (17.8)	217.04 (15.70)
50	0		

Table 8: PEFR in relationship to age group in female patients Before and after complete thoracentesis

Above table shows improvement in PEFR in female patients after thoracentesis. No female patient was above 50yrs. of age.

PFT Parameter in Ltrs.	Before Thoracentesis	After Thoracentesis	'p' value
PEFR	238.60 (79.37)	338.60 (65.71)	<0.001

TABLE 9: PEFR in all the cases of pleural effusion before and after complete thoracentesis

'p' value is found out in all cases before and after complete thoracentesis using 'z' table. showing significant improvement.

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No. of Cases	B.P. before thoracentesis	B.P. after thoracentesis
1.	122 / 76	124 / 76
2.	112 / 76	110 / 76
3.	120 / 70	120 / 72
4.	124 / 72	126 / 70
5.	116 / 68	118 / 70
6.	110 / 70	112 / 72
Average-	117 / 72	118 / 72

TABLE 10: Blood Pressure in Males with Minimal pleural effusion

This table shows blood pressure in males before and after thoracentesis.

No. of Cases	B. P. before thoracentesis	B. P. after thoracentesis
1.	120 / 70	120 / 72
2.	110 / 68	112 / 70
3.	120 / 76	121 / 76
4.	124 / 72	126 / 72
Average	118 / 71	120 / 72

TABLE 11: Blood Pressure in Females with Minimal Pleural effusion

Above table shows change in the blood pressure in females following thoracentesis with minimal effusion.

No. of Cases	B.P. before thoracentesis	B.P. after thoracentesis
1.	126 / 70	128 / 70
2.	124 / 72	126 / 72
3.	121 / 70	126 / 70
4.	128 / 80	128 / 82
5.	130 / 86	130 / 84
6.	132 / 76	132 / 80
7.	124 / 82	128 / 80
8.	119 / 78	122 / 82
9.	130 / 82	130 / 84
10.	128 / 84	128 / 88
Average	126 / 78	127 / 79

TABLE 12: Blood Pressure in Males with Moderate pleural effusion

Above table shows change in the blood pressure in males following Thoracocentesis with moderate effusion.

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No. of Cases	B. P. before thoracentesis	B. P. after thoracentesis
1.	130 / 86	130 / 84
2.	114 / 78	116 / 80
3.	110 / 70	112 / 76
4.	132 / 70	130 / 74
5.	126 / 84	128 / 80
6.	128 / 72	130 / 76
Average	124 / 76	124 / 78

TABLE 13: Blood Pressure in Females with Moderate Pleural effusion

Above table shows change in the blood pressure in females with moderate effusion.

No. of Cases	B. P. before thoracentesis	B. P. after thoracentesis
1.	130 / 80	132 / 84
2.	124 / 72	130 / 88
3.	112 / 80	124 / 82
4.	116 / 72	126 / 86
5.	132 / 70	138 / 84
6.	128 / 76	130 / 82
7.	118 / 70	126 / 84
Average -	122 / 74	130 / 84

TABLE 14: Blood Pressure in Males with Massive pleural effusion

Above table shows changes in the blood pressure in males with massive effusion.

No. of Cases	B. P. before thoracentesis	B. P. after thoracentesis
1.	130 / 70	132 / 78
Average	130 / 70	132 / 78

TABLE 15: Blood Pressure in Females with Massive Pleural effusion

Above table shows changes in blood pressure in females with massive effusion.

DISCUSSION: Out of 44 cases 65.91% were male and 34.09% were females. It shows major number of patients (45.47%) were in 36-50 years of age group. Next common age group was 26-35 years. Majority of the patients in all age group were male. Maximum number of the cases of either sex has pleural effusion on the right side (52.6%), left side had 45.47% of the cases of pleural effusion, and only one case had bilateral pleural effusion in the present study. Moderate amount of effusion seen in 59.0% of the cases, next common minimal effusion with 22.73% and massive effusion with 18.18% respectively. Average height of all the patients were 156.39 cms and mean age of patients were 38.9 years. The range of the age was between 15 to 70 years. Similar study conducted by Rupak Singla³ et al has an average height of 1.60+0.08 mts and mean age is was 26.6 + 11.0 with a range of 13-70 years. Predicted PEFR along with percentage of predicted was calculated using predicted formula as

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mentioned by Kammat et al⁴ and Jain S.K et al⁵ for both male and female respectively. Depending upon the amount of effusion and degree of obliteration of lung field through clinical examination / x-ray chest pleural effusion divided into minimal, moderate and massive effusion.⁶ Studies reported by Jain s. k and Ramiah mostly on vital capacity it becomes abundantly clear that mean vital capacity and other lung volumes in Indians are lower than their western counter part. However work done by Neil. E. Brown et al⁷ on pulmonary mechanics and gas exchange following Thoracocentesis did not found any change in vital capacity. Earlier studies by Rupak Singla³ have shown improvement in the lung volume following Thoracocentesis in all its parameter including PEFR. In our studies PEFR has shown a significant improvement following Thoracocentesis as compared to previous studies which have shown either no definite improvement in pulmonary function and blood pressure changes or relatively small improvement.⁸ Patients with large pleural effusion often experience rapid relief from dyspnoea after removal of pleural effusion. Some studies have demonstrated significant improvement in pulmonary function following removal of as little as 800 ml of fluid.⁹ Some definite improvement in both systolic and diastolic blood pressure especially with massive effusion indicate that more compliant the lung greater will be the change in pulmonary volume.

CONCLUSION: Significant improvement in PEFR was observed following Thoracocentesis in patients with pleural effusion while changes in blood pressure was observed in patients with massive pleural effusion.

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