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Original Research Article

Six Minute Walk Distance (6MWD) Improvements in Symptomatic Pleural Effusion Patients with Therapeutic Thoracocentesis

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Abstract:

Pleural effusion is a commonly encountered condition during routine clinical practice. Changes in respiratory mechanics secondary to pleural effusion causes various symptoms and also limits physical activity. Our study aims to analyze six minute walk test pre and post thoracocentesis. Material and method: a study was performed on 130 patients admitted in respiratory medicine department at SKN Medical College after obtaining necessary consent and fulfilling inclusion criteria. Patients with parenchymal disease, hydropneumothorax, preexisting respiratory illness were excluded Six Minute Walk Test was performed prior to 24 hours after therapeutic pleural tapping. Six minute walk distance, SpO₂, heart rate, dyspnea were recorded and analyzed. results and conclusion majority patients for young adults .pleural effusions causes significant symptoms and severity is proportional to great of the infusion drainage of moderate to massive effusions causes significant relief in symptoms and also cause increasing exercise tolerance.

Keywords: Plural Effusion, Therapeutic Thoracocentesis.

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Introduction

The abnormal accumulation of fluid in the pleural space as a result of local or systemic disorders is known as pleural effusion [1]. This clinical disease alters the mechanics of breathing and reduces both static and dynamic lung function. Dyspnea, discomfort, and coughing are the most frequent symptoms reported by patients and typically get worse with effort, making it difficult to carry out routine daily tasks in many cases [2]. It is commonly encountered by chest physicians accounting for approximately 4% of attendanceto hospitals [3].

Per 1 million persons, pleural effusion affects more than 3000 people annually. Pleural effusions might have more than 60 different causes [4, 5]. The majority of these instances are brought on by pulmonary embolism, cancer, bacterial pneumonia, and congestive heart failure. Congestive heart failure is the primary cause of pleural effusion, accounting for one-third of all pleural effusions [4,5]. Patients are able to resume their regular activities after having their pleural fluid removed via thoracocentesis, which also improves the mechanical function of their chest[6,7]. Studies have shown that the removal of pleural fluid significantly improves pulmonary function, particularly in FVC and FEV1, 6 minute walk test (6MWD)[8–11]. This improvement was seen right away or 24 to 48 hours after the thoracocentesis. Therefore, it is important to study the changes brought about by the evacuation of expressive quantities of fluid both statically pleural and dynamically during physical activity, when the symptom alleviation may be more obvious. Numerous studies[8-12] have examined how well patients tolerated activities of daily life and pulmonary function in the 24-48 hours following thoracocentesis. In this situation, the 6minute walk test (6MWT) evaluates the cardiopulmonary system response at an often submaximal level of exercise[13]. As a result, it accurately captures the majority of everyday activities and can be used to examine how thoracocentesis affects patient quality of life. There are very few reports of using the 6-minute walk test (6MWT) in patients with pleural effusions, despite the fact that this test is frequently used to assess the effectiveness of medication and to predict morbidity and mortality in heart failure, COPD, and pulmonary hypertension [14]. Therefore, 48 hours following thoracic surgery, this study assesses exercise tolerance. The study's objective is to evaluate how individuals with symptomatic pleural effusion respond to therapeutic thoracocentesis in terms of improvement in Six Minute Walk Distance (6MWD).

Materials and Methods:

Over the course of a year, a prospective observational study was conducted on patients with symptomatic pleural effusions who were admitted to the wards of the department of respiratory medicine at SKN Medical College. Everyone who participated was asked for their written, informed consent. After being screened for the exclusion criterion, patients with pleural effusion of recent onset who were at least 18 years old and of both sexes were included in the study. Pleural effusions with parenchymal disease, encysted collections, hydropneumothorax, effusions secondary to systemic diseases and asthma, COPD patients were excluded from the study. Patients having skeletal and muscular deformities who are unable to walk and patients desaturating at rest were excluded from the study. Patients will have routine blood testing as well as a clinical assessment. Patients will be categorised as mild, moderate, and major pleural effusions based on chest X-ray results. Patients with pleural effusion up to the lower border of the second rib anteriorly are defined as having severe pleural effusion, above the second rib as having massive pleural effusion. Dyspnea of the patient will be classified based on the MMRC scale of dyspnea[15]. Six minute walk test (6MWT) is to be complete in all patients of symptomatic pleural effusion patients before thoracocentesis after results of laboratory investigations are obtained and criteria exclusion ruled out. Thoracocentesis of the patients with such effusions will be carried out.

The procedure of thoracocentesis will be verbally explained to the patient in the language he or she best understands. Along with the procedure, the various risk factors associated with the procedure will also be explained to the patient. Only after obtaining a written informed consent from the patient shall the procedure be performed. Ideal target of therapeutic thoracocentesis being a dry tap, maximum be possible fluid to removed. Thoracocentesis to be abandoned if the patient coughs. Post thoracocentesis, after 24 hours a repeat 6MWT shall be executed.

Parameters assessed in the study:

SpO₂ (Peripheral blood saturation), Total distance walked in 6 minutes (6MWD), Maximum Heart Rate (HRmax), Dyspnea

grading as per MMRC, Percentage predicted six minute walk distance (%)

Observation and Results:

All of the collected data was tabulated in Microsoft Excel sheets and then transferred SPSS software version 17 for analysis. to To check for statistical significance, a paired t test was used to analyse the data. P values less than 0.05 were considered to be significant. Age distribution among study population: Ages between 21 and 30 were most prevalent (26.16%) in a group amongst the study population, followed by 31 to 40 years (24.62%) and 41 to 50 years (17.69%). The mean age was 36.8 (+/-13.5)years with range of 18 to 70 years.

Gender distribution in study population: There were 80 (62%) males and 50 (38%) females in the study population.

Ray findings pre thoracocentesis: As observed in the Table 1, 80 patients (61.54 %) presented with a moderate pleural effusion, forming the maximum number of the study population. Number of patients presenting with minimal and massive pleural effusions were 25 (19.23 %) each.

Table 1: Findings of Chest X-ray						
Findings Chest X-ray	Frequency (n)	Percentage (%)				
Minimal	25	19.23				
Moderate	80	61.54				
Massive	25	19.23				

MMRC Grade of dyspnea post thoracocentes

	Table 2. Minike grade of Dyspilea								
MMRC	grade of	Prethoracocentesis	Postthoracocentesis						
Dyspnea		Number of patients	Number of patients Percent						
			(%)						
0		95	73.07						
1		31	23.84						
2		4	3.07						
3		0	0						
4		0	0						
Total		130	100						

Table 2. MMRC grade of Dyspnea

As depicted from the above table, majority of the patients in the study population had grade 0 MMRC dyspnea post thoracocentesis (95 patients= 73.07 %), followed by grade 1 MMRC dyspnea (31 patients=23.84 %). Only 4 (3%) patient had grade 2 MMRC dyspnea post thoracocentesis.

Table 5. Amount of pleur at hund aspirated						
Amount of Fluid Aspirated (ml)	Frequency (n)	Percentage (%)				
<500	25	19.23				
500 to 1000	21	16.15				
1000 to 1500	41	31.53				
1500 to 2000	14	10.76				
>2000	29	22.3				
Mean Fluid Aspirated = $1386.92 + 982.20$						

Table 3. Amount of nleural fluid asnirated

Symptomatic Improvement post thoracocentesis:

Table 4. Symptomatic improvement					
Symptomatic improvementNumber of patientsPercentage					
Yes	122	93.84			
No	8	6.15			
Total	130	100.00			

Table 4:	Sympt	tomatic	improvement
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Improvement post thoracocentesis in patients with Minimal Pleural Effusion:

Minimal Pleural	Pre Post			t Value	p Value		
Effusion (n=25)	Mean	SD	Mean	SD			
Grade of Dyspnoea	0.48	0.5	0	0	4.8	0.00001588	
(MMRC)							
Heart Rate (per	89.28	7.56	84	8.06	2.38	0.02087	
minute) (HRmax)							
6MWD (meters)	529.4	45.46	540.52	42.14	0.89	0.3742	
% Predicted6MWD	91.68	5.84	93.64	5.45	1.22	0.2259	

Table 5: Minimal Pleural Effusion

Improvement post thoracocentesis in patients with Moderate Pleural Effusion:

Table 6: Moderate PleuralEffusion L Base

Moderate Pleural	Pre		Post		t Value	p Value
Effusion (n=80)	Mean	SD	Mean	SD		
Grade of Dyspnoea	2.15	0.47	0.2	0.4	28.26	0.0000001
(MMRC)						
Heart Rate (per	106.3	10.51	92.3	8.4	9.3	0.0000001
minute) (HRmax)						
6MWD (meters)	392.67	58.35	486.7	63.61	9.74	0.0000001
% Predicted6MWD	69.79	9.29	86.46	9.49	11.22	0.0000001

Improvement post thoracocentesis in patients with Massive Pleural Effusion:

Table 7: Massive Pleural Effusion

Massive Pleural	Pre		Post		t Value	p Value
Effusion (n=25)	Mean	SD	Mean	SD		
Grade of Dyspnoea	3.28	0.45	0.92	0.64	15.08	0.0000001
(MMRC)						
Heart Rate (perminute)	129.8	5.84	101.12	7.69	14.85	0.0000001
(HRmax)						
6MWD (meters)	243.8	45.13	408.56	68.31	10.06	0.0000001
% Predicted6MWD	44.12	7.14	73.85	9.85	12.21	0.0000001

Conclusion:

From our study we can conclude that pleural effusions causes significant impairment in baseline functional exercise capacity. We can also conclude that drainage of most of the massive and moderate pleural effusion causes statistically significant improvement in functional exercise capacity causing symptom relief. Improvements in dyspnea let patients more easily reintegrate into their daily activities. 6MWD, which is a measure of functional sub- maximal exercise capacity, increases significantly after thoracocentesis, only in patients of moderate and massive pleural effusions. Although more studies are required to conclude 6MWT to be used as routine investigation pre and post thoracocentesis. But 6MWT test can definitely be used as a add on test to predict improvement in symptoms caused by massive and moderate symptomatic pleural effusions. Its role in minimal pleural effusion is not justifiable.

Limitations: Patients with co-morbid conditions and having bilateral pleural effusions were excluded from the study. So, more data in these patients is required to conclude the same. Perception of dyspnea, amount of Pleural effusion, underlying pathology causing pleural effusion varies in each patient. So more studies are required to prove statistically significant objective improvement in six minute walk distance and its relation with amount of pleural fluid removed post thoracocentesis.

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