

(RESEARCH ARTICLE)



Effectiveness of autogenic drainage Vs incentive spirometry in intensive care unit

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Abstract

Background: Intensive Care Units are the most demanding place in hospital setup as they provide clear and fair information to patients and family. Physical therapy involves several techniques that plays significant role in intensive care unit, focusing on goals like recruit lung volume, improving ventilation perfusion, improving oxygenation, promoting secretion clearance.

Studies has been conducted regarding effectiveness of Incentive spirometry and autogenic drainage but there was very low data regarding Comparison of Incentive spirometry and autogenic drainage.

Objective: The aim of this study was to find the effectiveness of Incentive spirometry vs Autogenic Drainage in Intensive Care Unit.

Methodology: This was an experimental study conducted in LIAQUAT NATIONAL HOSPITAL from MAY-NOV. Systematic sampling technique was used, single blinding was done. Samples were allocated into 2 groups. One group receiving autogenic drainage while other receiving incentive spirometry. Total number of 10 sessions were given to each group. Pulmonary function testing and ABGs were used as assessment tools, consent form was signed by participants. Data was analyzed using SPSS 22 Version.

Result: The result of autogenic drainage measuring expiratory reserve volume showed that before autogenic drainage the mean of the group was 748+-182.8 and after session of 7 days there was significant increase of expiratory reserve volume as well which is 864+-207.9, Thus the result of this study showed that Autogenic Drainage was statically significant in improving expiratory reserve volume.

Conclusion: Result of this study showed Autogenic Drainage was more effective than Incentive Spirometry in improving expiratory reserve volume. Apart from this, Physiotherapists should use these techniques more in ICUs for better results and to reduce mortality rate.

Keywords: Incentive spirometry; Autogenic drainage; Intensive Care Units; Hospital

1. Introduction

Nowadays, the most demanding place in hospital setup are intensive care units as they have to provide clear and fair information to patients and family.(1) Advance's in intensive care unit are leading to less rate of mortality and increased chances of survival rate among intensive care population. Working in Intensive care unit is a team work. Team involve in working for betterment of intensive care unit comprises of intensivists , pharmacist, physiotherapist , dieticians , clinical psychologist .Physiotherapist plays an important role in intensive care unit (2).In year 2007 , study was

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conducted in 460 intensive care units of several countries showed that 35% Physiotherapist worked in intensive care unit 24 hours per day(3). Study conducted in Australia showed that in intensive care unit of Australia one Senior Physiotherapist is always involved with staff and with almost 5 years of intensive care unit experience (4).

There are several techniques involve in physical therapy playing significant role in intensive care unit leading to fast recovery and decrease risk of bed bound complications. Most common goals of respiratory physical therapist are to recruit lung volume, improving ventilation perfusion, improving oxygenation, promoting secretion clearance (5). Commonly used techniques in intensive care unit involves Mobilization techniques, respiratory muscles training, electrical stimulation, and chest physiotherapy exercises (1). Physiotherapy helps in improving lung compliance, Delay in weaning and total dependence on the ventilator is eased by initial startup of physiotherapy treatment (6). Chest Physiotherapy involves vast category of techniques including Manual Hyperinflation along with percussions and oscillation (7). Study conducted in Australia showed that most commonly used physiotherapy technique in Intensive Care Unit involved diaphragmatic breathing exercises, Early mobilization and proper positioning to involve inspiratory capacity and lung compliance (4).

One of the most common technique used in intensive care unit is Incentive Spirometry. Incentive Spirometry is a mechanical device to reduce respiratory complications which was invented by Barlette et al in the year 1970, when he observed that how efficiently yawning improved lung compliance leading to significant improvement in pulmonary complications (8).

Incentive Spirometry is subdivided into two categories involving Flow oriented incentive spirometer and Volume Oriented Spirometer (9). In flow oriented Spirometry there is a 3 interconnected columns with a chamber where light plastic ball sits , negative transthoracic pressure is generated due to which inspiratory efforts are required to raise the balls at certain height. In volume oriented incentive spirometry, tube is connected to it which shows measurement of volume, patient inhales through the tube connected to chamber. Reychler et al conducted study in 2018 Showed that Incentive spirometry and Positive expiratory pressure were equally effective in improving post-operative complications. Incentive spirometry was assessed by using Grading of Recommendations Assessment Development and Evaluation scoring system that showed that incentive spirometry should be used with deep breathing exercise, direct coughing, early mobilization, they also recommended that volume oriented device should be used as incentive spirometry device (10).

Another technique evolved in 1967 by Jean Chevallier known as autogenic drainage that sequentially attain the highest possible expiratory flow to move secretions from peripheral to central airways without forced expiration (11). It involves 3 phases including Unsticking, Collection and Evacuation. (12) This technique is really efficient but it requires patient cooperation and only recommended for patients with good sense of their own breathing with age >8 years old. Although it is most difficult breathing technique to master as it requires substantial feedback of patients. Various studies showed that Autogenic drainage technique is as effective as postural drainage in mobilizing secretions (7). There has been limited research conducted regarding Autogenic Drainage. There was a study conducted by P flegar et al, he compared autogenic drainage to high pressure PEP in cystic fibrosis, results showed that both were equally effective in improving pulmonary function test results but autogenic drainage was more effective in decreasing sputum as compared to high pressure PEP. Another study showed that autogenic drainage was well tolerated and there was significant improvement in 1 hour after treatment (11).

Studies has been conducted regarding effectiveness of Incentive spirometry and autogenic drainage but there was very low data regarding Comparison of Incentive spirometry and autogenic drainage. Common limitations present in literature shows that studies of autogenic drainage was conducted mostly over cystic fibrosis , another common limitation found in literature was that autogenic drainage and spirometry was rarely used in tracheostomy patients, no specific age group has been shown in literature regarding incentive spirometry and autogenic drainage.

So, this study was conducted to find the effectiveness of Incentive spirometry vs Autogenic Drainage in Intensive Care Unit.

Hypothesis

- There is no difference between effectiveness of Incentive Spirometry and Autogenic Drainage in Intensive Care Unit Operational definitions
- There is a difference between effectiveness of Incentive Spirometry and Autogenic Drainage in Intensive Care Unit

Limitations

Limitations of the study includes small sample size which is not enough to significantly represent the authenticity of result on behalf of a large population thus, further studies with comparatively large sample sizes are required with the same objective to prove the result. Convenience based sampling was preferred and No blinding was done throughout the study.

2. Methodology

It was a single-blinded experimental study conducted in year 2020 within the specified time duration of SIX (6) months (May-Nov.), in a tertiary healthcare organization, Liaquat National Hospital Karachi, Pakistan. In order to conduct the study, Adult population was targeted selecting 100 patients randomly using non-probability sampling technique, admitted in intensive care units, out of which 50 patients were included in the study, systematically divided into two groups following the incentive spirometry and autogenic drainage. Both treatment techniques to be used were consisted of total 10 sessions. Each patient was attended under the supervision of a senior physical therapist with clinical expertise. Inclusion Criteria was; Age 35-55, Oxygen(FiO₂ >50%), Lung Volume: >1.5ml, Oriented with MILD GCS and those with Malignancy, Pulmonary Embolism or Acute Pulmonary Embolism, Asthma, ARDS, Severe GCS Neurological problems were excluded

Before proceeding towards the treatment, Self-administered Questionnaire was used for baseline assessment including patient's demographic details based on Gender, Age, Diagnosis, Comorbid (if any), History of any respiratory disease, if present and duration of Hospital stay. After documenting the basic data, ABGS (followed by SPO₂ and PCO₂) and Pulmonary function testing (followed by Vital Capacity, Inspiratory Reserve Volume and Expiratory Reserve Volume) were used before and after each session, as assessment tools.[15, 16] Inspiratory Reserve Volume was measured by asking patient to inspire forcefully using incentive spirometry device raising the balls, and try to hold as long as possible for him/her, volume at which patient performed spirometry was then noted and multiplied by the time duration for which the patient was able to keep the balls raised up. Tidal Volume and Vital Capacity were later measured with the help of inspiratory Reserve Volume and expiratory reserve volume. Once the baseline assessment ended, Subjects who were being treated with incentive spirometry had been given a detailed description and the whole mechanism of the device was taught by the respective physiotherapist along with a practical demonstration. Patient was then uplifted to 45° in long sitting position and asked to hold the device in one of his/her dominant hand, then he/she was instructed to inhale using the tube connected to the chamber, therapist kept encouraging the patient to raise the balls applying maximum inspiratory pressure. Therapist directed the patient to keep repeating the procedure for about 18-20 times. Readings were documented at the end of the session. Each subject had been followed up twice a day in order to conduct the respective Physiotherapy session. And a total number of 10 sessions were given to every single patient in a whole week. On the other hand patients being treated with Autogenic Drainage technique were briefly counselled regarding each of the 3 stages involving the procedure and their efficacy separately. Each of the following step including Unsticking, Collection and Evacuation were thoroughly demonstrated by the assigned therapist. At the end of the counselling session after gaining patient's confidence and trust, the therapist asked the patient to adopt long sitting position with neck slightly extended in order to begin the procedure and to breath in deeply through nose and to relax the mouth for relaxed breath out in a sighing manner for as long as possible, then moving towards the next step patient was asked to take a small breath in and small breath out so that low lung volume breathing could be made possible and afterwards the patient was instructed to take a large breath in and small breath out. After repeating each of the step for 3 times at least, patient was finally asked to cough twice or thrice in order to expectorate the secretions. The cycle was meant to be repeated for at least 3 times (15-20 breaths) per session. An informed Consent Form comprising basically of two parts A and B respectively, was provided to every single subject/subject's attendant. Part A consisted all the information regarding advantages, disadvantages and risk factors associated with the study to be conducted and Part B consisted of a participation certificate.

3. Results

Results of this study showed that mean age of participants was 45+-7.40, out of which 20(40%) were male and 30(60%) were females as shown in figure 1. Female were more prone to respiratory infections. Result of co-morbid was quite interesting which showed that majority of participants were having more than one co-morbid (62%). Baseline Assessments are shown in table 1.

Table 1 Baseline Assessments

Baseline Assessment	Mean/Frequency%
Age	45+-7.40
Gender	
Male	40%
Females	60%
Co morbid	
1 comorbid	38.0%
More than 1 comorbid	62.0%

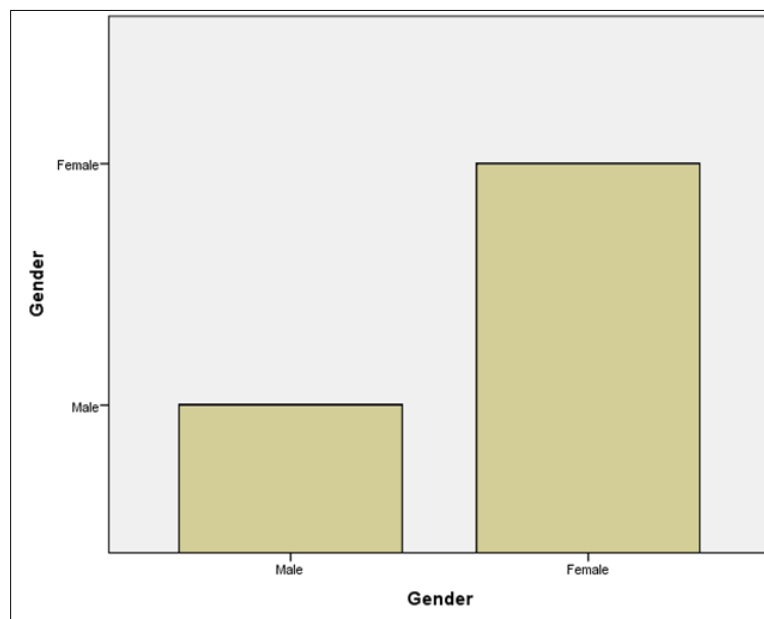


Figure 1 Comparison between male and female gender

Inspiratory and expiratory reserve volume were measured by using techniques that were incentive spirometry and automatic drainage respectively. Incentive spirometry was used to measure Inspiratory reserve volume and autogenic drainage was used to measure expiratory reserve volume. . Paired sample T-test was applied to find pre and post effect of incentive spirometry and autogenic drainage. The result of autogenic drainage measuring expiratory reserve volume showed that before autogenic drainage the mean of the group was 748+-182.8 and after session of 7 days there was significant increase of expiratory reserve volume as well which is 864+-207.9, as shown in table 2.

Table 2 Descriptive and Paired Sample Statistics of Autogenic Drainage

Variable	Mean±S.D	p value
Autogenic Drainage (pre and post)	748 ± 182.8	0.01

Similarly, pre and post effect of incentive spirometry showed that before incentive spirometry, the mean of the group was 956 +-129.3 and after session of 7 days there was significant increase of inspiratory reserve volume which is 1056+-152.9, as shown in table 3.

Table 3 Descriptive and Paired Sample Statistics of incentive spirometry

Variable	Mean±S.D	p value
Incentive Spirometry (pre and post)	100±200	0.02

Result showed that Autogenic Drainage was statistically significant in improving expiratory reserve volume (0.13)

4. Discussion

This was a quasi-experimental study intended to test the effectiveness of Autogenic Drainage and Incentive Spirometry in Intensive Care Unit. We had patients admitted to the Intensive Care Unit who were on mechanical support/Intubated ventilation. The outcome of this study showed that in the Intensive Care Unit, incentive spirometry and autogenic drainage were successful in improving inspiratory and expiratory reserve volume. Adam E. M. Eltorai et al. in their study showed that incentive spirometry was effective in improving atelectasis while our study showed that Incentive Spirometry was effective in improving inspiratory reserve volume.[14] William Poncin et al. in their study showed that Autogenic Drainage improved ventilation inhomogeneity while result of our study showed that Autogenic Drainage was effective in improving expiratory reserve volume.[17] Pamela McCormack et al. In their study showed that Autogenic Drainage wasn't found to be superior to any other form of airway clearance technique while our study showed that Autogenic Drainage was more effective than Incentive Spirometry in Intensive Care Unit.[11] Elliot Wallaert et al. in their study showed that Autogenic Drainage significantly increased the forced vital capacity, Forced Expiratory Volume and Inspiratory resistance while our study showed that Autogenic Drainage was significant in improving Expiratory Reserve Volume.[19] Gregory Reyhler et al. in their study showed that Incentive Spirometry improvised ventilation and recruitment even after stopping the exercise while our study showed that Incentive Spirometry was beneficial in increasing Inspiratory reserve volume after continuous sessions for 7 days.[15] Limitations of the study includes small sample size which is not enough to significantly represent the authenticity of result on behalf of a large population thus, further studies with comparatively large sample sizes are required with the same objective to prove the result. Convenience based sampling was preferred and No blinding was done throughout the study.

5. Conclusion

Result of this study showed Autogenic Drainage was more effective than Incentive Spirometry in improving expiratory reserve volume. Apart from this, Physiotherapists should use these techniques more in ICUs for better results and to reduce mortality rate.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

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