

Original Research Article

Effect of Intercostal Stretch Technique and Anterior Basal Lift Technique on Respiratory Rate, Saturation of Peripheral Oxygen and Heart Rate among ICU Patients

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ABSTRACT

Background and Objective: Intensive care unit (ICU) is a specialized area for the management of patients with life-threatening illnesses, injuries or complications. Mechanical ventilator is the assistive device for the respiration for critically ill patients. Intercostal stretch and anterior basal lift are techniques of proprioceptive neuromuscular facilitation which have beneficial effects among ventilatory patients. Objective of this study is to compare the efficacy of the IC stretch and ABL on respiratory rate, saturation of peripheral oxygen and heart rate.

Materials and Methodology: 30 patients from ICU of C.U. Shah medical hospital were taken for the study who fulfilled the eligibility criteria and were systematically divided into Group A (IC stretch) and Group B (ABL). Patients were given the intervention according to their allocated group for 3 days and effects of these techniques on RR, SpO₂ and HR parameters were observed. Data were taken at baseline and after 3 days of intervention.

Result: Results were analyzed with the SPSS 16 for windows. Independent t-test was taken for comparison of inter group data and paired t-test was taken for comparison of intra group data. Result shows significant difference in group A in terms of RR, HR and SpO₂ ($p < 0.05$) compare to Group B results.

Conclusion: It has been found that IC stretch is more effective in reduction of respiratory rate and heart rate and improving oxygen saturation over anterior basal lift technique.

Keywords: PNF in respiration, Intercostal stretch, Anterior basal lift.

INTRODUCTION

Intensive Care Unit (ICU) is a specially staffed and equipped hospital which is dedicated to the management of patients with life-threatening illnesses, injuries or complications.⁽¹⁾ These patients require close, constant monitoring and

support from special equipments and medications in order to maintain normal bodily functions.⁽²⁾

A medical ventilator is a machine designed to move breathable air into and out of the lungs to provide mechanism of

breathing for a patient who is suffering from breathing insufficiency.^(3,4) In Intensive Care Unit ventilator is a lifesaving intervention for immune-compromised patients. The chest care of unconscious and recombinant patients are difficult and challenging because they lack self (voluntary) breathing effort. In such cases mechanical ventilation helps in reducing work of breathing by preventing hypoxemia. Assist control ventilator delivers a set tidal volume when triggered by the patient's inspiratory effort and helps in weaning process.⁽⁵⁻⁷⁾

Diaphragm is the main muscle for inspiration. There are mainly two type of intercostals muscle - internal Intercostal muscles and external Intercostal muscles. These muscles work in unison when inspiration-expiration process occurs. This muscle of respiration may undergo atrophy in physical inactivity. This may affect chest wall mobility and Chest expansion and reduce lung compliance.⁽⁸⁻¹⁰⁾

Neuro physiological facilitation of respiration is a proprioceptive and tactile stimuli that alter the depth and rate of breathing. Intercostal stretching is an effective PNF technique helps in improving breathing pattern and respiratory muscle activity. The IC stretch enhances the chest wall elevation and increase chest expansion and diaphragm excursion to improve intra-thoracic lung volume which contributes to improvement in flow rate percentage. Anterior basal lift is another respiratory PNF technique which helps in improving respiratory muscle activity and thereby improves intra-thoracic lung volume which contributes to improvement in flow rate percentage.⁽¹¹⁾

In this study we have compared intercostals stretch and anterior basal lift in adults on spontaneous mode of ventilation and checked effects on respiratory rate, peripheral oxygen saturation and heart rate. Since no one has compared these two

techniques and also information regarding anterior basal lift technique is limited, so the aim of our study is to compare both these techniques in order to gain a conclusion by observing and comparing the results.

MATERIALS & METHODOLOGY

30 subjects from C. U .Shah medical hospital ICU (MICU, SICU) who were kept on spontaneous mode of ventilator were systemically assigned into two groups. Group A received Intercostal stretch and B received anterior basal lift for 2 times/day for 3 days. Before and after third day of treatment Heart rate, Oxygen saturation and Respiratory rate was taken.

Male patients of Age 18 to 55 years were included who were mechanically ventilated; having stable cardio-vascular function with Heart rate <140/min; Blood pressure (systolic: <180mmHg). Patients were excluded: who were on CMV Mode; who were having fever, chest infection, malignancy; Subjects who underwent cardiac surgery and abdominal surgery; Patients with rib fracture and untreated haemothorax or pneumothorax.

Procedure:

Inter Costal Stretch: Subject positioning was standardized to supine flat, limbs positioned in neutral. The position of the therapist is behind the patient. First palpate the supra sternal notch. Then goes downward about 5cm and palpate the angle of Louis. 2nd rib lies at the level of angle of Louis. From the angle of Louis trace the finger laterally. The Intercostal stretch technique is applied over 2nd and 3rd rib bilaterally. The technique is given with the help of index finger. The direction of the pressure is downward towards the next rib. Technique is applied during expiration phase. It is applied for three breaths with 1 minute rest and three times repetition. This technique will be applied twice in a day

Anterior Basal Lift: This procedure is performed by placing the hands under the posterior ribs of the supine patient and lifting gently upwards. The lift is maintained and provides a maintained stretch and pressure posteriorly and stretches anteriorly as well. This may be performed bilaterally if the patient is small enough.

RESULT

Mean of minimum and maximum values of age of two groups are shown in Table 1. Table 1 gives the details of the two groups of men who completed the study. Mean values of the Respiratory rate, heart rate and SpO₂ at baseline level are 23.20±2.36, 126.40±5.52 and 93.40± 1.54 respectively for group A and Mean values of the Respiratory rate, heart rate and SpO₂ for group B at baseline level are 22.80 ±2.07 , 124.53± 6.51 and 93.40± 1.12 respectively. The changes in Respiratory rate, heart rate and SpO₂ for group A were 19.40±2.06, 119.8±5.18 and 96.20± 1.47 respectively. Whereas the changes in respiratory rate, heart rate and SpO₂ for group B were 21.46± 2.38, 121.73±6.27 and 95.13±1.45 respectively.

Table 1: Demographic detail.

	Mean Age (Year)	SD
Group A	29.53	±10.6
Group B	29.66	±11.06

Table 3: Intra Group Comparison Of RR,HR & SPO2

Group	Parameter	Pre	Post	t value	p value
A	Respiratory rate	23.20±2.36	19.40±2.06	21.76	0.000
	Heart rate	126.40±5.52	119.8±5.18	11.14	0.000
	SpO ₂	93.40± 1.54	96.20± 1.47	-7.61	0.000
B	Respiratory rate	22.80 ±2.07	21.46± 2.38	7.1	0.000
	Heart rate	124.53± 6.51	121.73± 6.27	2.09	0.054
	SpO ₂	93.40± 1.12	95.13 ±1.45	-9.53	0.000

DISCUSSION

The present study has focused on the comparison of effect of Intercostal stretch and Anterior basal lift techniques on respiratory rate, saturation of peripheral oxygen and heart rate parameters and has

Table 2: Inter group post comparison of RR, HR & SpO₂.

Parameter	Phase	Mean ±SD	t value	p-value
RR	Post A	19.40±2.06	-2.53	0.01
	Post B	21.46±2.38		
HR	Post A	119.8±5.18	-2.06	0.049
	Post B	124.54±6.93		
Spo2	Post A	96.20±1.4	1.99	0.05
	Post B	95.13±1.4		

There was no significant difference in Respiratory rate, heart rate and SpO₂ between the two groups at baseline. Pre (baseline) and post treatment intra group comparison was done using paired t-test which shows highly significant difference in both the groups in Respiratory rate, SpO₂ (with p=0.000) and heart rate (p=0.054). Independent t-test of the post intervention scores shows highly significant difference between the intervention groups (p<0.05). There was a statistically significant difference observed in both groups but the result of group A shows highly significant difference compared to group B. All the data was analyzed using SPSS16 with paired and unpaired t –test. Mean and SD for pre and post RR, SpO₂, HR was measured at baseline and after 3 days of treatment. Significance was accepted at <0.05 level of probability.

found that application of IC stretch is more effective in reduction of RR and HR along with shows more improvement in oxygen saturation level compare to anterior basal lift technique

Findings of the study supported by Rajiv Sharma who compared the proprioceptive neuromuscular facilitation vs. resistance training of respiratory muscles on respiratory rate on 30 ICU patients. Result of the study shows that PNF was successful in reducing respiratory rate in ICU patients when compared with patients treated with abdominal weights placed on their upper abdomen.⁽¹²⁾

N. B. Thakkar study statement also supporting our present study result by suggesting that PNF technique in ICU based patient is showing improvement in patient's condition by decrease in respiratory rate, increase in SpO₂, decrease in heart rate and helps in early weaning from mechanical ventilation.⁽¹³⁾

Respiratory drive is regulated by information from sensory receptors within the airway, lungs and respiratory muscles as well as central and peripheral chemo receptors. The respiratory muscles contraction and relaxation are under control of GTO which is sensitive to muscle stretch (active or passive) due to this there is a firing discharge of muscle spindle, which give this message to CNS via Alpha and Gamma motor neurons which directly responsible for initiating muscle contraction.

IC Stretch increases alpha motor neuron activity, causing the muscle fibers to contract and thus resist the stretching. Gamma motor neurons, which innervate intrafusal muscle fibers of muscle spindles regulate how sensitive the stretch reflex is. Application of a stretch to the chest wall just prior to inspiration, increases the gamma motor neuron discharge and alpha motor neuron activity is enhanced.^(14,15)

The anterior basal lift helps in ventilation improvement that increase in lung capacity such as tidal volume, minute ventilation and oxygen status by working on same principle of dorsal root mediated inter-segmental reflex.

According to Jennifer A. Pryor who discussed in the Physiotherapy for Respiratory and Cardiac Disorders about Neuro physiological facilitation of respiration, which is used to describe externally applied proprioceptive and tactile stimuli produces response as a reflex respiratory movement.

Advantage of application of IC stretch technique is it helps in lowering the raised RR and HR along with it also improves SPO₂ levels within near to range which is acceptable for ventilator weaning process thereby it is helpful in reducing the hospital stay of patients and social isolation.

Information regarding Anterior Basal Lift technique is limited so in the present study we have tried to explore its efficacy for that comparison between two techniques of PNF respiration has been done in order to aid professional knowledge.

Some limitations of the study were no follow up was done. To reach the significant conclusion further study with other PNF techniques should be done. There was limited information available regarding anterior basal lift technique attributing to study limitation

CONCLUSION

This study has shown that for the group of patients of IC stretch is more effective compared to anterior basal lift technique on RR, SPO₂ & HR Parameters in ventilatory patients.

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