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Difference between Continuous Positive Airway Pressure via mask therapy and Incentive Spirometry plus chest physiotherapy to treat or prevent post-surgical atelectasis: Prospective Randomized Study

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RATIONALE:

The most common cause of acute atelectasis is post-surgical atelectasis, characterized by restricted breathing after abdominal or cardiac surgery.

Large doses of opioids or sedatives, tight bandages, chest or abdominal pain, abdominal swelling (distention), and immobility of the body increases the risk of acute atelectasis following cardiac surgery.

AIM:

This study aims to clarify the difference of effectiveness between CPAP therapy plus chest physiotherapy (CPT) and IS therapy plus CPT to treat or prevent post-operative atelectasis.

INCENTIVE SPIROMETRY

IS (the regular method to treat atelectasis) - is often used as part of the breathing exercises and is also used to prevent atelectasis after surgery.

The objectives of the IS method of therapy are:

(a) to improve the performance of inspiratory muscle,
(b) increase the inspiratory volumes and transpulmonary pressure,
(c) create or restore the normal pattern of lungs expansion,
(d) Also, once the IS therapy is used frequently on a regular basis, airway patency might be maintained and alveoli atelectasis prevented or inverted.

(Agostini & Singh, 2009)



IS Therapy Equipment

PRINCIPLE OF OPERATION OF CPAP

- *The first form of CPAP* is generated by a flow generator, which is attached to an oxygen supply and delivers high levels of oxygen. The oxygen level is delivered to the patient by a nasal mask, face mask, mouth piece, hood or tracheostomy.

- During CPAP therapy, the patient breathes from a pressurized circuit against a threshold resistor (water-column, weighted, or spring-loaded) that maintains consistent pre-set airway pressures from 5 to 20 cm H_2O, during both inspiration and expiration. The expiratory pressures are set above atmospheric pressure and therefore both inspiratory and expiratory pressures are increased.

(AARC, 1993)

- The *second form of CPAP* is used in the treatment of obstructive sleep apnea. This form of CPAP is generated by a small, portable electrical compressor and delivers pressure at a continuous level throughout the breathing cycle. CPAP delivers a continuous pressure in order to maintain a patient's airway during sleep, which keeps the airway clear of obstruction.

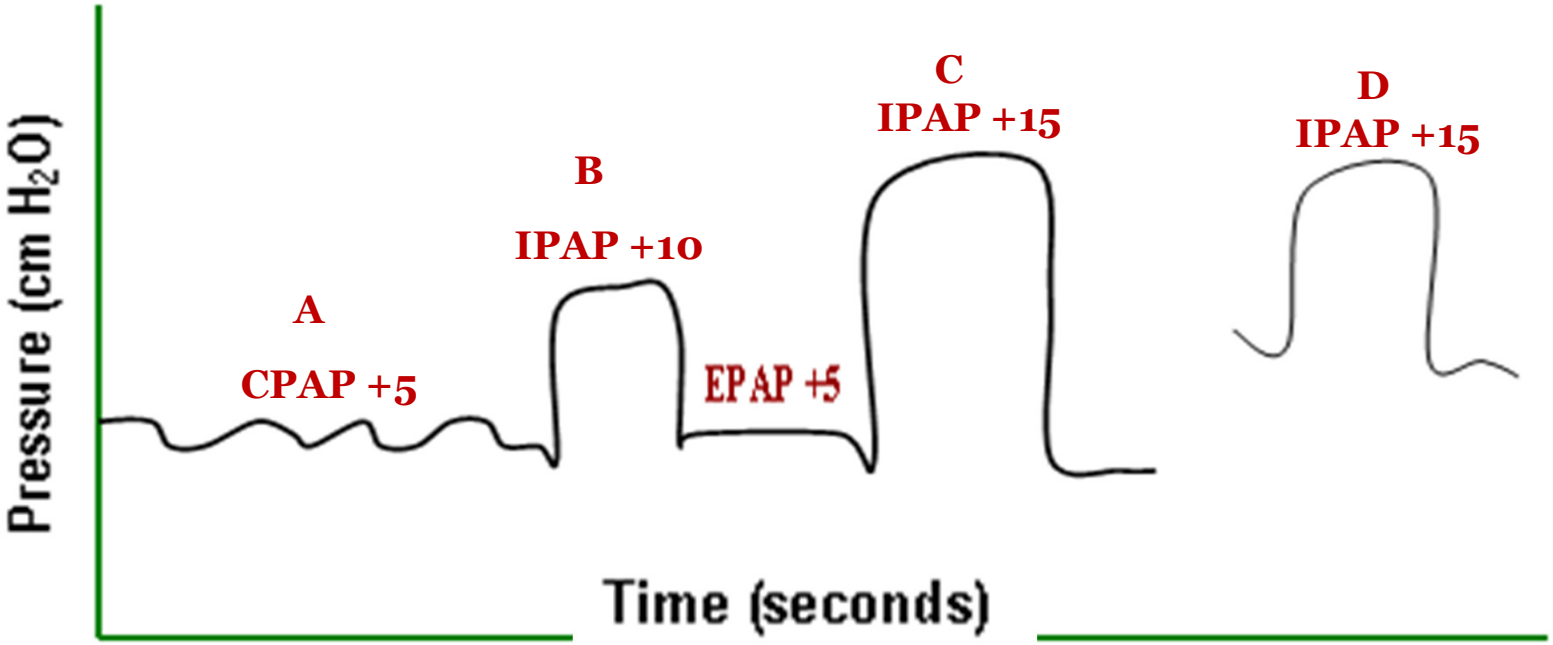
Modes of non-invasive positive ventilators usually include features such as :

1. CPAP,
2. IPAP,
3. EPAP,
4. inspiratory time,
5. and pressure-assist spontaneous mode.

- CPAP mode is a baseline pressure that is elevated above atmospheric pressure in a spontaneously breathing patient.

- During the spontaneous or timed mode, the baseline pressure at the end of expiration is referred to as *expiratory positive airway pressure (EPAP),* and the increase in airway pressure that occurs during inspiration is referred to as *inspiratory positive airway pressure (IPAP)*.

(Kallet & Diaz, 2009)



A, continuous positive airway pressure of 5 cm H_2O with a patient breathing spontaneously. **B**, patient-triggered breath during NIV with an IPAP of 10 cm H_2O and EPAP of 5 cm H_2O. **C**, inspiratory positive airway pressure has been increased to 15 cm H_2O. **D**, inspiratory positive airway pressure remains 15 cm H_2O, but EPAP has been increased to 10 cm H_2O.

PATIENT INTERFACES

- Positive pressure ventilation is greatly influenced by the chosen interface to deliver the positive ventilation to patients.

- A variety of interfaces is available, including face masks and nasal masks. Among these interfaces, nasal masks are the most widely used for both NIV and CPAP.

- Nasal masks are preferable for long-term ventilation, but have also been used for acute hypercapnic and hypoxemic respiratory failure.

(Bardi *et al.,* 2010)



CPAP Therapy.

METHODS:

Seventy two post cardiac surgery patients who fit the inclusive criteria (smoker, Hemodynamically stable, the lungs are healthy and above 50 years old) participated in this study.

The participants were divided randomly in two groups:

(a)The control group used IS 15 times per hour plus CPT every four hours for 3 days, and

(b) the trial group used CPAP via masks (4 – 6 cmH_2O) for half hour every two hours plus CPT every four hours .

(c) Both regimens applied only during the waking hours

- Inspiratory capacity (IC) in litre was used to compare the two groups of therapy. It was measured by an Incentive Spirometer after the cardiac operation as baseline-test, after 12 hours from the start of each therapy, after 24hours, 48 hours and post therapy..

- At the same time, Respiratory Rate (RR), Heart Rate (HR) and Saturation of Peripheral Oxygen (SpO2 %) were measured for both groups.

- Failure was defined as a need for advance therapy such as mechanical ventilation and Bi-level Positive Airway Pressure (BiPAP). SPSS t-tests were used to examine the difference between the baseline and post therapy.



RESULTS:

36 patients participated in each group (57 male and 15 female mean ages; 54 ± 6.8 years). IC was increased significantly in CPAP group (baseline mean for control group 1.23L and CPAP group 1.41L , post-therapy mean 1.59L and 1.98L respectively, p= 0.005) (figure1).

SpO2 was decreased significantly in control group (baseline 97.83%, 97.44%, post-therapy 96.56%, 97.11 respectively, p=0.037) and there was no significant difference in RR and HR.

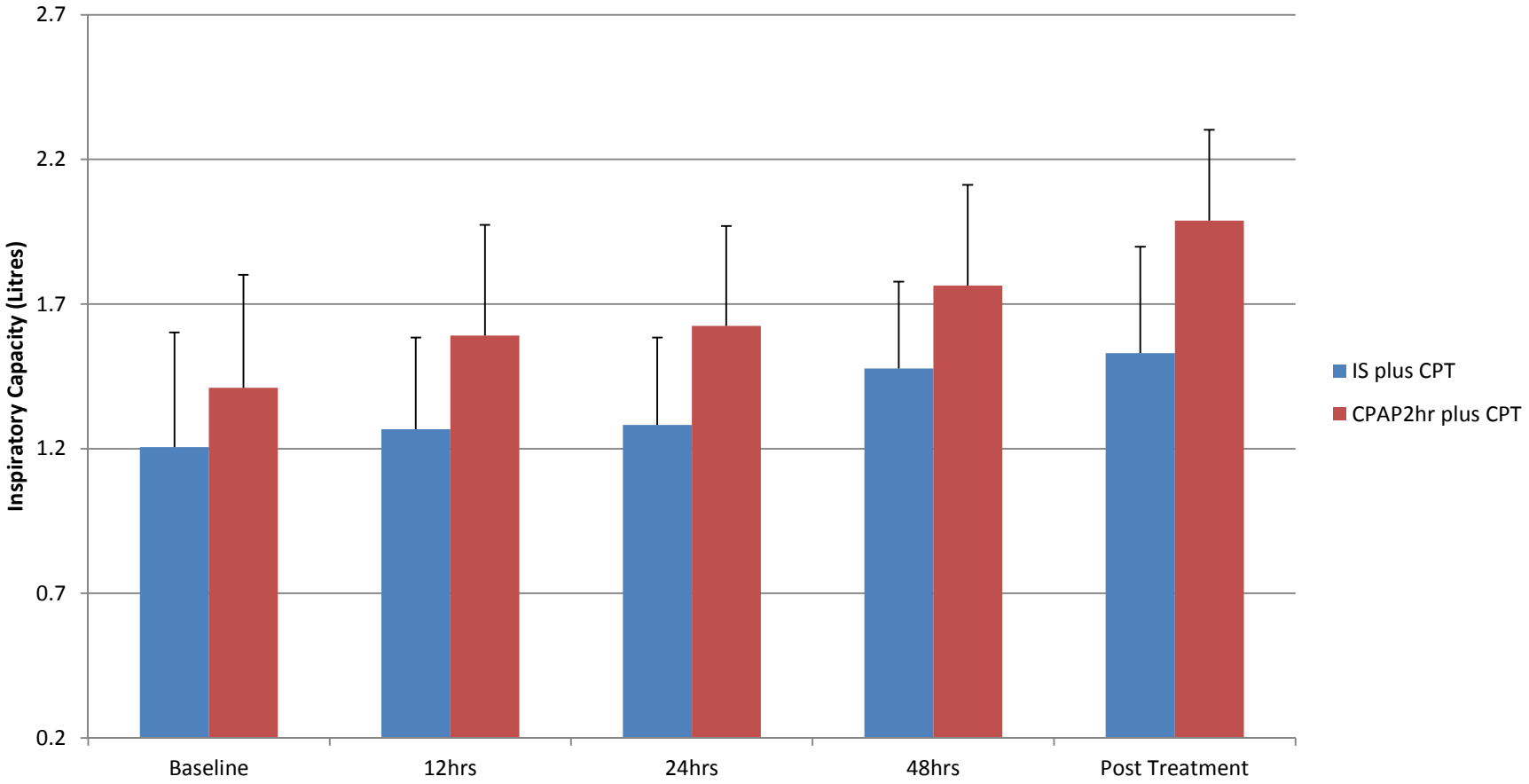


Figure 1. The inspiratory capacity difference between CPAP via mask therapy every two hours plus CPT and IS therapy plus CPT (control plus CPT)

CONCLUSION:

Add Chest Physiotherapy (CPT) to CPAP via mask therapy for half an hour every two hours had better outcomes to re-open collapsed alveoli after major thoracic surgery especially in smoker and elderly patients.

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Thank you



Thanks' for your kind attention!!!!!!



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