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COMPARISON OF EFFECTIVENESS OF DIAPHRAGMATIC BREATHING AND PURSED-LIP EXPIRATION EXERCISES IN IMPROVING THE FORCED EXPIRATORY FLOW RATE AND CHEST EXPANSION IN PATIENTS WITH BRONCHIAL ASTHMA

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ABSTRACT

Background: Asthma is growing problem in India and throughout the world. Breathing exercises are commonly in-corporated in overall pulmonary rehabilitation program of patients with bronchial asthma. However there is a lack of awareness regarding following a specific exercise prescription which is based on individual's requirements. Physio-therapist can help in designing an exercise prescription specific to an individual possibly to achieve more control over bronchial asthma.

Methods: Thirty patients both male and female aged between 20 and 40 years diagnosed with bronchial asthma by the physician were assigned in two groups. Group-1 patients were given diaphragmatic breathing exercises and group-2 patients were given pursed-lip expiration exercises. Both groups received selected intervention for 6 weeks, 5 days in a week, 2 times in a day, and 20 minutes per session. Pre and post-test measures of forced expiratory flow rate were taken by peak expiratory flow meter and chest expansion was measured by inch tape. Data were analysed using Statistical Package for Social Sciences (SPSS) version 17.0 software. The analysis was performed by using students paired t-test.

Results: The study shows statistically significant improvement in diaphragmatic breathing exercise group when com-pared to pursed-lip expiration exercise group. The value of chest expansion has shown 2.04 % improvement in group 1 and 1.01 % in group 2 whereas peak expiratory flow rate (PEFR) showed 16.9 % improvement in group 1 and 2.27 % in group 2.

Conclusion: Diaphragmatic breathing exercises play a vital role in rehabilitation of asthmatic patients to gain function-al improvement and independence.

Keywords: Bronchial asthma, Diaphragmatic breathing exercise, Pursed-lip expiration exercise, Forced expiratory flow rate, Chest expansion

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INTRODUCTION

Bronchial asthma is a growing problem throughout the world. It is one of the commonest respiratory diseases occurring in younger age group as well as older population [1-12]. In bronchial asthma smooth muscles of bronchial wall become hyper responsive to a wide range of stimuli resulting in coughing, wheezing, chest tightness and dyspnea [2]. This can be treated prophylactically and physiotherapeuticaly. Prophylactic measures aim at reducing bronchospasm, whereas physiotherapeutic measures aim at relax-ing the patient improving lung function, gaining breathing control (breathing control consist of normal breathing using the lower chest with the upper chest and limbs re-laxed), reducing severity of attacks and rehabilitation [3].

Incidence of asthma is increasing and demands more effective treatment procedures. It is known fact that exercise has a positive effect in controlling bronchial asthma, but there is lack of awareness on following a specific exercise prescription which is based on individuals' requirements. Physiotherapist can help in designing an exercise prescription specific to an individual possibly to achieve more control over bronchial asthma [4,5].

Even though the diaphragmatic breathing and pursed-lip expiration exercises are the two available forms of treatment, a thorough understanding of the procedure will enable the therapist to advice the patient and improve the pulmonary function and chest expansion. [6] Hence the study is undertaken to throw more light on the two physio-therapy techniques (diaphragmatic breathing and pursed-lip expiration) and their effect on forced expiratory flow rate (FEFR) and chest expansion in patients with bronchial asthma.

MATERIALS AND METHODS

The present study is a pre-test post-test experimental study, conducted in bronchial asthma patients (both male and female) between the age group of 20-40 years. The bronchial asthma patients referred from the Department of Medi-cine by the physician reporting to Yenepoya Medical Col-lege Hospital, Mangalore, Karnataka, India, constituted the population of the study. A total number of 50 patients were screened using the following proforma out of which 30 met the inclusion criteria. The patients were required to fulfil the following criteria to be included in the study: (i) mild (daytime symptoms more than once a week, (ii) nocturnal symptoms more than twice a month, peak expiratory flow rate/ force expiratory flow volume in one second (PEFR / FEV1 > 80%) and (iii) moderate (day time symptoms daily, nocturnal symptoms more than once a week, PEFR / FEV1: 60 – 80%) persistent bronchial asthma patients. Subjects were excluded from the study if they had the following problems: (i) non co-operative patients, (ii) status asthmatics patients and (iii) patients of asthma associated with other respiratory and cardiac diseases.

Ethical clearance from the Yenepoya University Ethical Committee was obtained prior to the commencement of the study. The purpose of the study was explained to the patients in their language. All patients signed an institutionally approved informed consent statement prior to data collection. Thirty patients were assigned into two groups (group-1 and group-2). Each group consisted of equal number (15) of patients.

(a) Group - 1

Patients were given diaphragmatic breathing exercise for 6 weeks (5 days in a week, 2 times in a day for 20 minutes per session). The patient was asked to relax and positioned in a comfortable position so that his/her back and head are fully supported and his/her abdominal wall relaxed (fowler's position). The researcher places his hands on the rectus abdominals just below the anterior costal margin. Patient was asked to breathe in slowly and deeply through the nose. Patient was instructed to keep the shoulders re-laxed and upper chest quiet, following the abdomen to rise. Then the patient was asked to slowly let all the air out using controlled expiration with pursed-lip. This was applied for three or four times and then rest. Care was taken not to hyperventilate the patient. Three or four sets were applied in a 20 minutes treatment session.

(b) Group - 2

Patients were given only pursed-lip expiration exercise for 6 weeks (5 days in a week, 2 times per day for 20 min-utes per session). The patient was asked to relax his or her shoulder muscles and asked to breathe in (inhale) slowly through his or her nose for two counts, keeping mouth closed. Then he/she was asked to pursue their lips as if they were going to whistle or gently flicker the flame of a candle. Finally breathe out (exhale) slowly and gently through pursed-lips while counting to four. Periodic assessment was taken every week by the physiotherapist to find out whether the patients were doing the exercise daily or not.

Mini wright peak flow meter was used to measure the peak expiratory flow rate. The meter was calibrated by hand to ensure consistent accuracy and reproducibility. The flow meter measures the speed at which air is exhaled from lungs, giving a measurement of how well airways are work-ing. It has a clear, easy to read scale which measures from 30 to 400 L/min (low range) and from 60 to 850 L/min (standard range).

FEFR readings provide an objective measure of how well the lungs are functioning. An increase in an individual's FEFR value reveals lung function that has got better and, a decrease in FEFR highlights that the lung function has got worse. When asthma is well controlled, FEFR readings are at their highest, and do not vary from day to day; big changes in peak flow suggests that the disease is not ful-ly under control. The patient was asked to take in deepest breath possible then to put the mouth piece in the mouth and to give a short sharp, fast explosive blow into the meter. The meter readings were kept at zero. The test was repeated twice and the best of the three attempts was recorded.

Standard inch tape was used to measure the chest expansion. The flat inch tape was placed around the chest and

then the patient was asked to breath out as far as possible in which the measuring tape was drawn taut, patient was then asked to breathe in as deeply as possible, at the same time allowing the tape measure to be released and the two measurements were recorded.

Data were analysed using Statistical Package for Social Sci-ences (SPSS) version 17.0 software. The analysis was per-formed by using students paired t-test and statistical sig-nificance was accepted for $p < 0.05$.

RESULTS

Table 1 compares the age of patients involved in the study. The mean age in diaphragmatic and pursed lip expiration group was 58.00 ± 8.28 and 53.33 ± 7.65 respectively. There was no significant difference between the two groups with respect to ages ($p = 0.121 > 0.05$). In group 1, 86.7 % were males and 13.3 % were females and in group 2; 93.3 % were males and 6.7 % were females (Figure 1 and Table 2). There was no significant difference between the groups with re-spect to male/female ratio as $p = 0.543 > 0.05$.

Table 1: Comparison of age of patients in the experimental groups

Age Group	No. of Patients (N)	Minimum age	Maximum age	Mean	Standard deviation	t value	p value
Diaphragmatic breathing exercise group	15	38	69	58.00	8.289	1.601	0.121 NS
Pursed-lip breathing exercise group	15	39	62	53.33	7.659		
Total	30	38	69	55.67	8.193	-	-

NS – not significant

Table 2: Gender wise distribution of patients in the study group

Sex	Group		Total
	Diaphragmatic breathing Exercise Group	Pursed lip breathing Exercise Group	
F	2 13.3%	1 6.7%	3 10.0%
M	13 86.7%	14 93.3%	27 90.0%
Total	15 100.0%	15 100.0%	30 100.0%

Figure 1: Bar diagram showing gender distribution of patients

The chest expansion and PEFR recorded before the treatment (pre-test) are shown in Table 3. The difference between the two groups was not significant (Table 3). The post-test results for group 1 are provided in Table 4. In diagrammatic breathing group, chest expansion before the intervention was 81.67 ± 10.17 and it becomes 83.33 ± 9.98 after the treatment; resulted in 2.04 % improvement ($p < 0.001$). PEFR before the treatment was 96.67 ± 34.16 and after the treatment, it becomes 113.00 ± 36.34 (16.9 % improvement). The results hence showed that the treatment was effective for both chest expansion and PEFR. Figure 2 schematically shows the result.

Table 3: Comparison of chest expansion and PEFR before (Pre-) treatment

Parameter	Group	N	Mean	Std. Deviation	t value	p value
Chest expansion (cm)	Diaphragmatic breathing Exercise Group	15	81.67	10.168	1.162	0.255
	Pursed lip breathing Exercise Group	15	86.13	10.868		NS
PEFR (Lt/min)	Diaphragmatic breathing Exercise Group	15	96.67	34.157	0.528	0.602
	Pursed lip breathing Exercise Group	15	105.33	53.601		NS

Table 4: Pre- and post-comparison of chest expansion and PEFR in diaphragmatic breathing exercise group

Parameter		N	Mean	Std. Deviation	Mean Difference	Change (%)	t value	p value
Chest expansion (cm)	Pre	15	81.67	10.17	1.67	2.04	13.23	P<0.001 HS
	Post	15	83.33	9.98				
PEFR (Lt/min)	Pre	15	96.67	34.16	16.33	16.90	8.25	P<0.001 HS
	Post	15	113.00	36.34				

HS –highly significant

Figure 2: Pre- and post-comparison of chest expansion and PEFR in diaphragmatic breathing exercise group

Table 5 shows the results of pursed-lip breathing group where the chest expansion before and after the treatments were 86.13 ± 10.87 and 87.00 ± 10.72 respectively (1.01 %

improvement). PEFR before the treatment was 105.33 ± 53.60 and after the treatment, it turned out to be 108.20 ± 53.45 with 2.72 % improvement. Hence the treatment is effective for both chest expansion as well as PEFR (Figure 3).

Table 5: Pre and post comparison of chest expansion and PEFR in pursed-lip breathing exercise group

Parameter	N	Mean	Std. Deviation	Mean Difference	Change (%)	t value	p value
Chest expansion (cm) Pre	15	86.13	10.87	0.87	1.01	4.52	P<0.001 HS
Post	15	87.00	10.72				
PEFR (Lt/min) Pre	15	105.33	53.60	2.87	2.72	8.53	P<0.001 HS
Post	15	108.20	53.45				

Figure 3: Pre- and post-comparison of chest expansion and PEFR in Pursed lip breathing exercise group

A comparison of % change between the groups is also provided (Table 6 and Figure 4). The value of chest expansion has shown 2.04 % improvement in group 1 and 1.01 % in group 2 whereas the PEFR showed 16.9 % improvement in group 1 and 2.27 % in group 2. The results hence clearly showed that the treatment performed in group 1 was significantly more effective than that performed in group 2.

Table 6: Comparison between groups

Parameter	Group	N	Mean Difference	Standard Deviation	Change (%)	t value	p value	p value
Chest expansion (cm)	Diaphragmatic Exercise Group	15	1.67	0.488	3.485	3.485	0.002	HS
	Pursed lip Exercise Group	15	0.87	0.743				
PEFR (Lt/min)	Diaphragmatic Exercise Group	15	16.33	7.669	6.705	6.705	P<0.001	HS
	Pursed lip Exercise Group	15	2.87	1.302				

Figure 4: Bar diagram comparing % change

DISCUSSION

The study was conducted on 30 bronchial asthma patients between the age group of 20 to 40 years. The result of the study in six weeks duration showed that there is significant improvement in FEFR and chest expansion in diaphrag-matic breathing exercise group. The results are in agree-ment with the report of Holloway and Ram [13], where it was found that diaphragmatic breathing technique re-lives the symptoms of bronchial asthma and also increases FEFR, chest expansion and a significantly improves the quality of life.

Literature on diaphragmatic breathing and pursed-lip breathing reveals that pursed-lip breathing is effective in decreasing dyspnoea, it improves gas exchange in people with moderate to severe, but stable chronic obstructive pulmonary disease. These positive effects appear to be related to the technique's ability to decrease air way narrow-ing during expiration, an effect attributed to decreasing the resistive pressure drop across the air way wall. Thus pursed-lip breathing could only be expected to be ben-eficial to those people with narrowing of larger air ways during expiration which would exclude people with mild disease. Only a few studies demonstrated positive effects during diaphragmatic breathing. These effects appeared to be associated with slowing the respiratory rate and not improving ventilation or volume of oxygen maximum. Pursed-lip breathing is often adopted naturally and dia-phragmatic breathing requires skill and extensive training. Our interpretation of the evidence is that pursed-lip can be a valuable rehabilitation tool in selected cases and that there is no rationale for teaching diaphragmatic breathing to this patient population.

Traditionally, physical therapist classifies diaphragmatic breathing and pursed-lip breathing as breathing retraining techniques. To date, no studies were found that investigat-ed patients' ability to use these techniques during function-al activities, which may require use of the techniques over prolonged periods of time. This should be a focus of future

research. Future studies would include measures which may better clarify the mechanisms for dyspnoea reduction with pursed-lips breathing and diaphragmatic breathing such as inspiratory capacity, the duty cycle, pace, and tho-raco abdominal changes during walking [14].

In recent years, asthma treatment has been focused on pharmacological protocols designed to control asthma and the inflammatory process of the disease. Other therapeutic approaches to help control asthma have been neglected. Studies on physical exercise, breathing exercises, and physiotherapeutic approaches have been performed to determine the clinical and physical benefits of these interventions on bronchial asthma. Specific inspiratory muscle training improves muscle strength and endurance which results in reduced asthma symptoms, hospitalizations for asthma, emergency department contacts, absences from school or work, and medication consumption.

The use of breathing exercise in the clinical treatment of older adults with asthma can be effective, and the improvements in muscle strength can help in dealing with asthma crisis. New randomised, double-blind, placebo-controlled studies with larger sample populations are needed, especially for older asthmatic patients. Future studies could examine both the outcomes used in this study and outcomes associated with airway hyper-reactivity and inflammatory markers to better understand the physiological mecha-nisms of these interventions [15].

CONCLUSION

The results of the study are in favour of diaphragmatic breathing exercise group as it has resulted significant improvement in FEFR and chest expansion. Thus it can be concluded that diaphragmatic breathing exercise plays a vital role in the rehabilitation of asthmatic patients to gain the functional improvement, independence and to reduce functional impairments and symptoms.

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REFERENCES

[1] Guyton NC. Text book of medical physiology. 9thedition; 1996.

[2] Mc Ardel WD. Muscular strength, training muscles to become stronger, exercise physiology. 3rd ;1991.

[3] Irwin S, Tecklin JS. Cardiopulmonary physical therapy. 3rd edition; 1990.

[4] Frownfelterd, D. Chest physical therapy and pulmonary rehabilitation: aninter disciplinary approach. 2nd edition; 1987.

[5] Elizabeth Elias AJ. Key issues in cardio respiratory physiotherapy. Butterworth-Heinemann, NewYork, 1992.

[6] Downie PA. Cash's text book of chest, heart and vascular disorders for physiotherapists. 4th edition; 1993.

[7] Kisner C. Therapeutic exercise foundations and techniques. 3rdedition; 1996.

[8] Hodgkin JE. Pulmonary rehabilitation guidelines to success. 2ndedition; 1993.

[9] Koshak EA. Classification of asthma according to revised 2006 GINA: evolution from severity to control. Ann Thorac Med. 2007; 2: 45-46.

[10] Ernst. Systematic review of breathing exercise as adjunctive treatment modalities for asthma. (Pub Med. gov) US National library of medicine national institutes of health, 2000; 15: 969-972.

[11] Vedanathan et al. Systematic review of the effectiveness of yoga breathing retraining in asthma management. Resp Med, 1998; 5(6): 689-807.

[12] Han JN. Influence of breathing therapy on complaints, anxiety and breathing pattern in patient with hyper-ventilation syndrome and anxiety disorders. J Psycho-ses Res, 1996; 41(5): 481-493.

[13] Holloway E, Ram FS. Says diaphragmatic breathing techniques have been used to relive the symptoms of asthma. (PubMed.gov) US National library of medicine national institutes of health, 2000; 3: CD 001277.

[14] Girodo M, Ekstrand KA, Metivier GJ. Deep diaphrag-matic breathing: rehabilitation exercises for the asth-matic patient. Arch Phys Med Rehabil, 1992; 73: 717– 720

[15] [15] Tais L, Gomieiro Y. Respiratory exercise program for elderly individuals with asthma. Clinics (Sao Pau-lo), 2011; 66(7): 1165-1169.

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Lampiran Jurnal 2

Effectiveness of Passive Chest Physiotherapy in Prevention of Ventilator Associated Pneumonia in Sepsis

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Abstract

Background: Around 19 million cases of sepsis are reported annually, with 5 million deaths are estimated to be recorded in middle and low income countries due to sepsis. Ventilator Associated Pneumonia is most common risk factor associated with sepsis. Passive chest physiotherapy involves various techniques including Percussions, Compression and Manual Hyperinflation Technique for external manipulation; they basically dislodge chest secretions by applying kinetic energy to chest wall.

Objective: To evaluate effectiveness of passive chest physiotherapy in prevention of ventilator associated pneumonia in sepsis.

Methodology: This was a Quasi Experimental Study conducted in Liaquat National Hospital from February

to October with non probability convenient based sampling. Total 60 intubated patients diagnosed with sepsis on the basis of American college of chest physicians and society of critical care principle or conditions that could lead to sepsis like impaired immune system, infection, renal failure, burn, Urinary Tract Infection,exposure to invasive devices were included in this study. Excluded were those with pulmonary embolism, pulmonary edema, clotting disorders, osteoporosis of ribs, lung contusion,emphysema, Intracranial pressure greater than 20mmHg, hemodynamically unstable patients, cardiac problems, skin infections . Ethical Approval was taken from Institutional Review Board of Liaquat National School Of Physiotherapy. Passive chest physiotherapy was administered to patient twice daily (11:00 am and 3:30 pm) in 10 days. Patients were given standard care as per ICU protocol in the form of nursing, pharmacology as prescribed by physician/Surgeon throughout intervention period. Acute Physiology, Age, Chronic Health Evaluation II (APACHE II) and Clinical Pulmonary Infection Scoring (CPIS) were used as assessment tools. Data was analyzed using spss 22. 0.

Result: APACHE II was used for predicting mortality of patients diagnosed with sepsis during first 24 hours of Intensive Care Unit stay (1. 38 ± 0. 49); on 10^{th} day after passive chest physiotherapy mortality rate was significantly decreased (0. 05 ± 0. 22). The CPIS Scoring used for predicting chances of Ventilator Associated Pneumonia showed that before initiation of passive chest physiotherapy chances of ventilator associated pneumonia was 53. 3% (1. 53 ± 0. 50) while CPIS Scoring at 10th day showed significant decrease i. e. 3. 3% (1. 28 ± 0. 78) (0. 03).

Conclusion: It was observed that passive chest physiotherapy twice daily leads to significant decrease in CPIS scoring suggesting decrease in occurrence of Ventilator associated pneumonia in sepsis and Passive Chest physiotherapy was significant in decreasing mortality rate of patients.

Keywords: Effectiveness; Passive Chest Physiotherapy; Physiotherapy; Prevention; Ventilator; Ventilator Associated Pneumonia; Sepsis

Abbreviations: APACHE II- Acute Physiology, Age, Chronic Health Evaluation II; APACHE- Acute Physiology, Age, Chronic Health Evaluation; CPIS- Clinical Pulmonary Infection Scoring; VAP- Ventilator Associated Pneumonia; CMV- Continous Mandatory Ventilation; PCV- Pressure Control Ventilation; SIMV- Synchronized Intermittent Mandatory Ventilation; MHT- Manual Hyperinflation Technique; Na- Sodium; k- Pottasium; Fio2- Fraction Of Inspired Oxygen; Aado2- Alveolar Arterial Oxygen Gradient; PaO2- Partial Pressure of Oxygen; WBC- White Blood Cell; Hct- Hematocrit; LAMA- Leaving Against Medical Advice; mmHg- Millimetre of mercury; mmol/L- Milimoles per litre; mm3- Milimeter per cube; °C- Degree Celsius

1. Introduction

Around the world 19 million cases of sepsis are reported, with 5 million deaths are estimated to be in middle and low income countries due to sepsis [1]. 95% deaths are occurring in low and middle income countries due to maternal sepsis [2]. Sepsis by definition is a ‘life-threatening organ dysfunction caused by a dysregulated host response to infection’ [3]. American college of Chest Physicians and society of critical care

medicine established standard principle in classification of sepsis on basis of their symptoms in which Systemic Inflammatory response is define as Core Body temperature > 38°c or < 36 °c, Heart Rate ≥ 90 bpm, Respiratory Rate ≥ 20/min (or PaCO2 <32 mmHg),White blood cells ≥ 12,000/µl or ≤ 4000/µl or >10% immature forms, Sepsis is define on at least 2 or more systemic inflammatory response criteria with underlying infection, Severe sepsis involve sepsis with organ damage, Septic shock involve sepsis with persistent or refractory low blood pressure [4-6]. Proper management of patients diagnosed with sepsis can only be done by knowing rate of mortality [7]. Severity and mortality of Patient admitted in Intensive care unit (Icu) with sepsis can be analyzed by scale i. e. Acute Physiology, Age and Chronic Health Evaluation II (APACHE II) introduced by Knaus et al. in 1985 which was considered as modification of Acute Physiology, Age and Chronic Health Evaluation (APACHE) by removing infrequently used variables like lactate, osmolality [8]. Respiratory Tract Infections frequently leads to sepsis [9]. Other sources of sepsis include urinary tract, abdomen, invasive devices, central nervous system, endocarditis [10].

Ventilator Associated Pneumonia (VAP) is considered as common risk factor frequently associated with intubated sepsis patients [11]. It is common problem in patient intubated for more than 48 hours. Estimated occurrence of ventilator associated pneumonia is around 9-27% of all mechanically ventilated patients [12]. VAP leads to difficulty in weaning off leading to increase financial and medical resources burden. Common risk factors that increase chances of VAP are classified into modifiable factors and non-modifiable factors. Modifiable factors include Prolong Supine Positioning, abdominal distention, colonization in ventilator circuit, low pressure in endotracheal tube cuff circuit while nonmodifiable factors include gender, immunocompromised, history of trauma or disease and old age (over 60 years) [13, 14]. Clinical diagnosis of Ventilator Associated Pneumonia is often difficult due to decreased sensitivity and specificity. Based on 6 parameters, In 1992 Clinical Pulmonary infection score was evolved [14]. As discussed above that any patient intubated for more than 48 hours can develop Ventilator Associated Pneumonia so prevention of ventilator associated pneumonia begins with decreasing time of mechanical ventilation which can only be decreased by using strategies that includes use of Noninvasive positive pressure ventilator [15, 16], avoiding reintubation, early tracheostomy [17] and preventive measures which includes elevation of bed to 45 degree, antimicrobial coated endotracheal tube, endotracheal suctioning [15] . Patients intubated for prolong time are with impaired level of consciousness and absence of cough reflex which shows significant reduction in airway clearance [18]. Passive Chest physiotherapy is commonly used to promote airway clearance, to overcome ventilation perfusion mismatch in mechanically ventilated patient [19, 20]. Passive Chest physiotherapy uses manual techniques that are responsible for sputum clearance and help in preventing lung from atelectasis, air way obstruction, and hyperinflation. Passive Chest Physiotherapy is also responsible for removing infected secretions by decreasing rate of proteolytic tissue damage [21]. Passive chest physiotherapy involves various techniques for external manipulation of thorax. They basically dislodge chest secretions by applying kinetic energy to chest wall [22]. Passive Chest Physiotherapy plays significant role in ICU patients but there was very low

data regarding prevention of ventilator associated pneumonia in sepsis patients through passive chest physiotherapy so this study was conducted to assess efficacy of Passive Chest Physiotherapy in Prevention of Ventilator Associated Pneumonia in Sepsis Patients.

2. Methodology

This was a Quasi Experimental study conducted in Liaquat National Hospital from February to October 2019 with convenient based non probability sampling technique. Total 60 patients were included in this study. All those patients intubated for more than 48 hours, diagnosed with sepsis on the basis of American college of chest physicians and society of critical care principle [6]. or conditions that leads to sepsis including Urinary Tract Infection, burns,invasive devices, Immunocompromised patients, Acute Kidney Injury, Chronic Kidney disease, End Stage Renal Disease, Diabetic Ketoacidosis, Neurological cases, Poisoning, Post-surgical complications were included in this study while those who suffered from undrained pneumothorax, Pulmonary embolism, pulmonary edema, clotting disorders, osteoporosis of ribs, lung contusion, emphysema, Intra cranial pressure greater than 20 mm hg, hemodynamically unstable patients, myocardial infarction, irregular arrhythmias, hemodialysis, recent open heart surgery, open wounds or skin infections were excluded from this study. Ethical Approval was taken from Institutional Review Board of Liaquat National School Of Physiotherapy before commencement of this study.

Patients included in this study were served with positive pressure ventilator including Continous Mandatory Ventilation (CMV), Pressure Control Ventilation (PCV) and Synchronized Intermittent Mandatory Ventilation (SIMV). Informed consent form was signed by patient's relative. Informed consent form consisted of purpose of the study as well as description of procedure, All risk and benefits were mentioned in informed consent form . After taking informed consent form from patient's relative, baseline assessment was done which included Gender, age, diagnosis, comorbid and mode of ventilator used. Acute Physiological Age Chronic Health Evaluation II (APACHE II) And Clinical Pulmonary Infection Scoring (CPIS) scales were used as assessment tools [23]. Acute Physiological Age Chronic Health Evaluation II also known as APACHE II was used for measuring mortality rate of patients [7, 24]. Ayazogu TA in his study showed that sensitivity and specificity of APACHE II for predicting mortality rate was 100% and 86. 6% respectively [25]. APACHE II was based on 12 variables including mean arterial blood pressure, heart rate, temperature, oxygenation, respiratory rate, arterial PH, serum sodium, potassium and creatinine, hematocrit, white blood cell count, and GCS and chronic health, age score. Each variable was ranked from 0-4. APACHE II score ranged from 0-71. Score of 25% represents mortality 50% and score of over 35% represents mortality 80%. APACHE II was calculated during first 24 hours in ICU to predict mortality rate of patients admitted in ICU [26]. APACHE II scoring has been shown in Table 1. Clinical Pulmonary Infection Scoring also known as CPIS scoring was used as diagnostic tool for confirmation of ventilator associated pneumonia with sensitivity of 79% and specificity of 75% as shown in Swoboda SM et al. study [27]. CPIS scoring scale was based on 6 parameters including Temperature, WBC count, tracheal secretions, pulmonary radiography, oxygenation, tracheal culture. Score greater than 6 considered as Likelihood of Ventilator associated

pneumonia [14]. CPIS scoring has been shown in Table / All 60 patients received same treatment i. e. Passive Chest Physiotherapy. Total days of treatment session were 10 days and twice daily i. e. 11:00 am and 3:30 PM. CPIS scoring was taken in all 10 days to measure difference before initiation of passive chest physiotherapy and at end of passive chest physiotherapy session. Standard care in terms of nursing, drugs, therapies as implemented by doctor was strictly followed throughout the intervention. The treatment of patient was left entirely on decision of senior intensivist or doctor/surgeon. Passive Chest Physiotherapy administered to patients was as follow:

Manual Hyperinflation Technique (MHT): It uses technique that delivers deep breaths to patient mechanically ventilated by rebreathing bag [27]. Mapleson Water Circuit of 2L was used. Slow deep inspiration and inspiratory hold at full inspiration was done with both hands to improve collateral ventilation. MHT was carried out twice daily at a rate of 8-13 breaths per minute during 20 minutes session

Suctioning: Duration of endotracheal suctioning was limited to 15 seconds [28]. Quickly and gently catheter was passed down tube until obstruction was felt and catheter was withdraw 2cm prior to negative pressure, withdrawing of catheter was done with twisting motion while suctioning intermittently. 1-2 ml of normal saline was used to enhance aspiration of dry secretions. Size of Suction catheter used were 14 and 16. Specimen from Lower respiratory tract was collected in sterile mucous extractor for culture testing. After end of suctioning, bed was elevated to 45 degree to improve ventilation for minimum 30 minutes [29].

3. Percussions: Percussions are defined as rhythmically striking patient's chest with cupped hand over area of secretion. The patient was position in supine and therapist hands were placed on patient's chest, Shoulder, elbows and wrist were straight to apply percussion in wavy motion. Percussions duration used was 5 minutes on each lobe twice daily [30].

[4] Compressions: Chest compressions are mainly used in mobilization of secretions in central airway from periphery. Patient was positioned supine and therapist placed his fingers over intercostal spaces and shoulder, elbow, wrists were kept straight and compression force was applied at the end of inspiration and start of expiration. Compressions were performed three times on each lobe [30].

Data was analyzed using SPSS 22. 0. Descriptive Statistics was reported. Paired t-test was used to assess the significance. P value of <0. 05 was set as significant level.

Physiologic Variable	**Point Score**								
	+4	**+3**	**+2**	**+1**	**0**	**+1**	**+2**	**+3**	**+4**
Temperature	>41	39-40. 9	-	38. 5-38. 9	36-38. 4	34-35. 9	32-33. 9	30-31. 9	<29. 9
Mean Arterial Pressure (mmHg)	>160	130-159	110-129	-	70-109	-	50-60	-	<49

Heart Rate	>180	140-179	110-139	-	70-109	-	55-69	40-54	<39
Respiratory Rate	>50	35-49	-	25-34	12-24	10-11	6-9	-	<5
Oxygenation : a) Fio2 >0. 5 (Use AaDo2)	>500	350-499	200-349	-	<200	-	-	-	-
b) Fio2 <0. 5 (Use PaO2)	-	-	-	-	>70	61-70	-	55-60	<55
Arterial pH	>7. 7	7. 6-7. 69	-	7. 5-7. 59	7. 33-7. 49	-	7. 25-7. 32	7. 15-7. 24	<7. 15
Serum Na (mMol/L)	>180	160-179	155-159	150-154	130-149	-	120-129	111-119	<110
Serum K (mMol/L)	>7	6-6. 9	-	5. 5-5. 9	3. 5-5. 4	3-3. 4	2. 5-2. 9	-	<2. 5
Serum Creatinine (mg/dl)	>3. 5	2-3. 4	1. 5-1. 9	-	0. 6-1. 4	-	<0. 6	-	-
Hct (%)	>60	-	50-59. 9	46-49. 9	30-45. 9	-	20-29. 9	-	<20
WBC (in 1000S)	>40	-	20-39. 9	15-19. 9	3-14. 9	-	1-2. 9	-	<1
Glasgow Coma Scale (GCS) SCORE= MINUS ACTUAL GCS									

Table 1: APACHE II Scoring Scale.

CPIS Points	**0**	**1**	**2**
Tracheal Secretions	Rare	Abundant	Purulent
Leukocyte Count (mm3)	>4,000 and <11000		
Temperature °C	>36. 5 or <38. 4	>38. 5 or <38. 9	>39 or <36
Pao2/FIO2 ratio (mmHg)	>240 or ARDS	-	<240 or no ARDS
Chest Radiograph	No Infiltrates	Diffused Infiltrates Infiltrates	Localized
Culture of Tracheal Aspirate	Negative	-	Positive

Table 2: Clinical Pulmonary Infection Scoring.

3. Result

Total 60 patients fulfilled inclusive criteria. Baseline Assessment was measured shown in Table 3. APACHE II was measured during first 24 hours in ICU stay for predicting mortality. Predicted mortality has been Shown in Table 4. CPIS the main outcome variable was measured before initiation of passive chest physiotherapy and after 10th day of passive chest physiotherapy which showed that chances of ventilator associated pneumonia was 32 (53. 3%) before initiation

of passive chest physiotherapy while on 10th day chances of ventilator associated pneumonia decreased to 2 (3. 3%). Passive Chest Physiotherapy was statistically significant in decreasing chances of ventilator associated pneumonia, shown in table 5. On 10^{th} day after passive chest physiotherapy out of 60 patients 37 (61. 7%) were extubated, died patients were 3 (5%), Leaving against Medical authority (lama) were 3 (5%) and 17 (28. 3%) were on ventilator at 10 day shown in Graph 1. Mortality rate was found to be decreased on 10th day after passive chest physiotherapy (0. 05 ± 0. 22). Mortality rate has been shown in table 6 and graph 2.

Variables		**Mean ± S. D / n (%)**
Age (years)		41. 58 ± 12. 93
Gender	Male	38 (63. 3%)
	Female	22 (36. 7%)
Comorbid	Hypertension (HTN)	11 (18. 3%)
	Diabetes	8 (13. 3%)
	No Known Comorbid	19 (31. 7%)
	More than 1Comorbid	22 (36. 7%)
Type Of ICU Stay	Medical Icu	18 (31%)
	Surgical Icu	10 (17. 2%)
	Nephrology Icu	11 (19. 2%)
	Chest Icu	11 (19. 2%)
	Neurology Icu	4 (6. 9%)
	Cardiac Icu	4 (6. 9%)
Mode Of Ventilator	CMV	34 (58. 6%)
	SIMV	17 (29. 3%)
	PCV	7 (12. 1%)
APACHE II		1. 38 ±0. 49

{Data are presented as mean ± SD or number (%)}

Table 3: Characteristics Of Baseline Assessment.

Variable	**n%**
0% mortality	37 (61. 7%)
80% mortality	23(38. 3%)

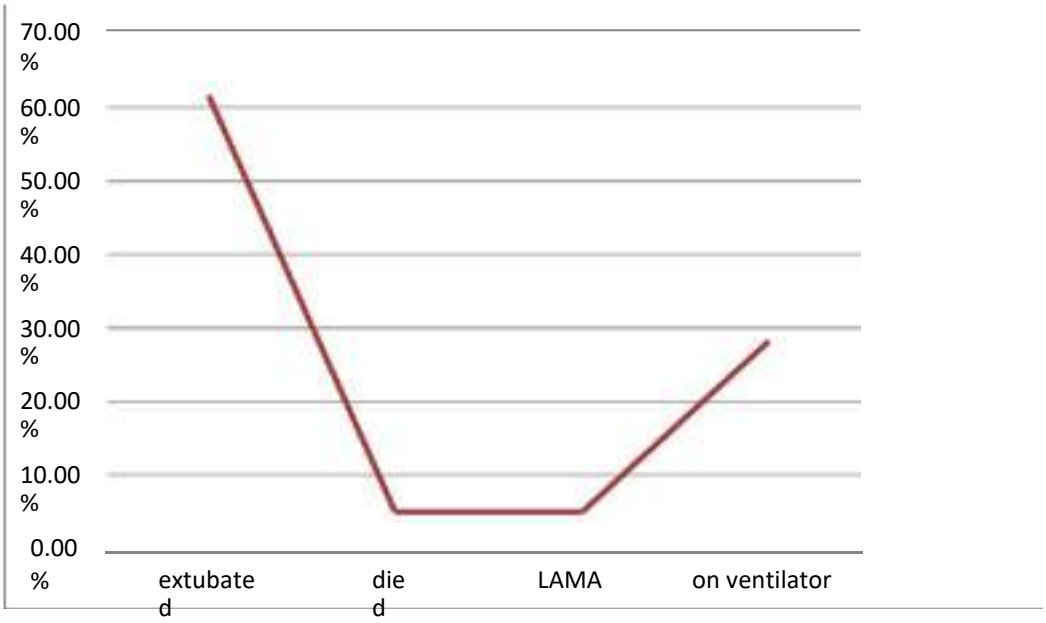
{Data are presented as number (%)}

Table 4: Frequency of Mortality Rate using APACHE II.

Variable	CPIS Score Mean ± S. D		P-Value
Passive Chest Physiotherapy	Before passive chest physiotherapy	1.53±0.50	0. 03
	10 Days after Passive Chest Physiotherapy	1.28±0.78	

{Data are presented as mean ± SD}

Table 5: Descriptive statistics for Clinical Pulmonary Infection Scoring.



Graph 1: Showing number of patients extubated, on ventilator, LAMA, died after 10 days of Passive Chest Physiotherapy.

Variable	Mean +- S. D	p-value
APACHE II during first 24 hours	1.38±0.49	0. 00
Mortality Rate On 10th day after Passive Chest Physiotherapy {Data are presented as mean ± SD}	0.05±0.22	

Table 6: Descriptive Statistics Of Mortality Rate.

Graph 2: Showing Mortality Rate was significantly decreased after 10 days of Passive Chest Physiotherapy.

4. Discussion

This was a quasi-experimental study designed to assess the impact of passive chest physiotherapy in prevention of ventilator associated pneumonia in sepsis. We included patients diagnosed with sepsis or condition that could lead to sepsis, with intubation more than 48 hours Patients included in this study were all treated with passive chest physiotherapy twice daily in total 10 days. This study revealed that mortality rate was significantly decreased at 10th day after passive chest physiotherapy i. e. 3 (5%). Nakagawa NK et al. in their study revealed that immobility in intensive care leads to impaired mucocilliary clearance [31]. Castro et al. [32] in their study showed that Passive Chest physiotherapy included body positioning, percussions and suctioning was significantly effective in decreasing duration of mechanically ventilated patients and decreasing chances of respiratory infections. In our study chances of ventilator associated pneumonia was significantly decreased to 2% (0. 03). Wang TH et al. [33] in their study showed that intensive chest physiotherapy was effective in preventing reintubation (0. 01) and was effective in decreasing rapid shallow breathing index while in our study we found that 31 (61. 7%) were extubated after 10 days passive chest physiotherapy. Grap M et al. [34] in their study revealed that 30 to 45 degree of bed elevation was effective in early preventive measure of ventilator associated pneumonia. Yang M et al. [22] in their study showed that APACHE was useful in predicting mortality of patients diagnosed with ventilator associated pneumonia (0. 00) and CPIS was also found to be useful in diagnosing ventilator associated pneumonia (0. 02). We observed that passive chest physiotherapy was effective in decreasing mortality rate of patients diagnosed with sepsis (0. 00). dos Santos RS et al. [35] in their study showed that passive chest physiotherapy was effective in decreasing lactate (0. 00) and increasing PaO2 (0. 03) after 15 minutes in Septic Shock Patients. Pattanshetty RB et al. [36]. in their study showed that multimodality passive

chest physiotherapy twice daily including Manual Hyper Inflation and suctioning was effective in prevention of ventilator associated pneumonia (0. 00) and weaning was successful in 62% patients in the control group receiving Manual Hyperinflation and suctioning. Limitations of this current study were quite few which were that we used convenience based sampling from only 1 hospital, which may not be representative of the entire population . No blinding was held during the entire course of the study.

5. Conclusion

Results of this study showed that passive chest physiotherapy was effective in preventing Ventilator Associated Pneumonia in Sepsis Patient; there was significant decrease in mortality rate after passive chest physiotherapy when compared with before initiation of passive chest Physiotherapy. Further Studies in term of Large Sample size are required to confirm the effectiveness of passive chest physiotherapy in prevention of VAP in Sepsis Patients. Furthermore, this study can be helpful for Physiotherapists to carry out their responsibilities in the ICU in a more professional manner in future. Several patients in the Intensive Care Unit (ICU) suffer from sepsis, which leads to ventilator associated pneumonia among them. By using Passive Chest Physiotherapy we can reduce patients' dependency on ventilators and help in their early discharge from hospitals, help reduce patients' dependency on medicines to a great extent, and bring down the rate of mortality in sepsis, which is quite high in the country.

Conflict of Interest

Author had no conflict of interest

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References

1. Fleischmann C, Scherag A, Adhikari NK, et al. Assessment of global incidence and mortality of hospital-treated sepsis. Current estimates and limitations. Am J Respir Crit Care Med 193 (2016): 259-272.

2. Say L, Chou D, Gemmill A, et al. Global causes of maternal death: a WHO systematic analysis. The Lancet Global Health 2 (2014): e323-e333.

3. Singer M, Deutschman CS, Seymour CW, et al. The third international consensus definitions for sepsis and septic shock (Sepsis-3). JAMA 315 (2016): 801-810.

4. Mandell GL, Bennett JE, Dolin R Philadelphia. In Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases. 6th edition. Elsevier Churchill Livingston (2005): 3661-3664.

5. Shankar-Hari M, Phillips GS, Levy ML, et al. Developing new definition and assessing new clinical criteria for septic shock: for the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA 315 (2016): 775-787.

6. Sen P, Demirdal T, Nemli SA, et al. Diagnostic and prognostic value of new bioscore in critically ill septic patients. Archives of physiology and biochemistry (2019): 1-6.

7. Giamarellos-Bourboulis EJ, Norrby-Teglund A, Mylona V, et al. Risk assessment in sepsis: a new prognostication rule by APACHE II score and serum soluble urokinase plasminogen activator receptor. Critical care 16 (2012): R149.

8. Naved SA, Siddiqui S, Khan FH. APACHE-II score correlation with mortality and length of stay in an intensive care unit. Journal of the College of Physicians and Surgeons Pakistan 21 (2011): 4.

9. Esper AM, Moss M, Lewis CA, et al. The role of infection and comorbidity: Factors that influence disparities in sepsis. Crit Care Med 34 (2006): 2576.

10. Mayr FB, Yende S, Linde-Zwirble WT, et al. Infection rate and acute organ dysfunction risk as explanations for racial differences in severe sepsis. JAMA 303 (2010): 2495-2503.

11. Raghuram A, Gnoni M, Wiemken TL, et al. Sepsis in Patients with Ventilator Associated Pneumonia due to Methicillin-Resistant Staphylococcus aureus: Incidence and Impact on Clinical outcomes. The University of Louisville Journal of Respiratory Infections 1 (2017): 3.

12. Resende MM, Monteiro SG, Callegari B, et al. Epidemiology and outcomes of ventilator-associated pneumonia in northern Brazil: an analytical descriptive prospective cohort study. BMC infectious diseases 13 (2013): 119.

13. Hunter JD. Ventilator associated pneumonia. Bmj 344 (2012): e3325.

14. Michetti CP, Prentice HA, Rodriguez J, et al. Supine position and nonmodifiable risk factors for ventilator-associated pneumonia in trauma patients. The American Journal of Surgery 213 (2017): 405-412.

15. Keyt H, Faverio P, Restrepo MI. Prevention of ventilator-associated pneumonia in the intensive care unit: a review of the clinically relevant recent advancements. The Indian journal of medical research 139 (2014): 814.

16. Hess DR. Noninvasive positive-pressure ventilation and ventilator-associated pneumonia. Respir Care 50 (2005): 924-931.

17. Ledgerwood LG, Salgado MD, Black H, et al. Tracheotomy tubes with suction above the cuff reduce the rate of ventilator-associated pneumonia in intensive care unit patients. Ann Otol Rhinol Laryngol 122 (2013): 3-8.

18. Spapen HD, De Regt J, Honoré PM. Chest physiotherapy in mechanically ventilated patients without pneumonia-a narrative review. J Thorac Dis 9(2017): E44.

19. Pisi G, Chetta A. Airway clearance therapy in cystic fibrosis patients. Acta Biomed 80 (2009): 102-106.

20. Makhabah DN, Ambrosino N. Airway clearance in the intensive care unit. EMJ Respir 1 (2013): 135-139.

21. Holland AE, Button BM. Is there a role for airway clearance techniques in chronic obstructive pulmonary disease? Chron Respir Dis 3 (2006): 83-91.

22. Yang M, Yan Y, Yin X, et al. Chest physiotherapy for pneumonia in adults. Cochrane Database of Systematic Reviews (2010).

23. Niu T, Luo Q, Li Y, et al. Comparison of Tigecycline or Cefoperazone/Sulbactam therapy for bloodstream infection due to Carbapenem-resistant

Acinetobacter baumannii. Antimicrobial Resistance & Infection Control 8 (2019): 52.

24. Nair R. A study of acute physiological and chronic health evaluation (apache) index in critically ill patients. Paripex-Indian Journal Of Research 8 (2019).

25. Polderman KH, Girbes AR, Thijs LG, et al. Accuracy and reliability of APACHE II scoring in two intensive care units: problems and pitfalls in the use of APACHE II and suggestions for improvement. Anaesthesia 56 (2001): 47-50.

26. Taylor SL, Morgan DL, Denson KD, et al. A comparison of the Ranson, Glasgow, and APACHE II scoring systems to a multiple organ system score in predicting patient outcome in pancreatitis. The American journal of surgery 189 (2005): 219-222.

27. Swoboda SM, Dixon T, Lipsett PA. Can the clinical pulmonary infection score impact ICU antibiotic days?. Surg Infect (Larchmt) 7 (2006): 331-339.

28. Pedersen CM, Rosendahl-Nielsen M, Hjermind J, et al. Endotracheal suctioning of the adult intubated patient-what is the evidence?. Intensive Crit Care Nurs 25 (2009): 21-30.

29. Bakhtiari S, Yazdannik A, Abbasi S, et al. The effect of an upper respiratory care program on incidence of ventilator-associated pneumonia in mechanically ventilated patients hospitalized in intensive care units. Iran J Nurs Midwifery Res 20 (2015): 354.

30. Kisner C, Colby LA. Therapeutic exercises 5th edition. Jaypee Punlishers (2007).

31. Nakagawa NK, Franchini ML, Driusso P, et al. Mucociliary clearance is impaired in acutely ill patients. Chest 128 (2005): 2772-2777.

32. Castro AA, Calil SR, Freitas SA, et al. Chest physiotherapy effectiveness to reduce hospitalization and mechanical ventilation length of stay, pulmonary infection rate and mortality in ICU patients. Respiratory medicine 107 (2013): 68-74.

33. Wang TH, Wu CP, Wang LY. Chest physiotherapy with early mobilization may improve extubation outcome in critically ill patients in the intensive care units. The clinical respiratory journal 12 (2018): 2613-2621.

34. Grap MJ, Munro CL, Unoki T, et al. Ventilator-associated pneumonia: the potential critical role of emergency medicine in prevention. The Journal of emergency medicine 42 (2012): 353-362.

35. dos Santos RS, Donadio MV, da Silva GV, et al. Immediate effects of chest physiotherapy on hemodynamic, metabolic, and oxidative stress parameters in subjects with septic shock. Respir Care 59 (2014): 1398-1403.

36. Pattanshetty RB, Gaude G. Effect of multimodality chest physiotherapy in prevention of ventilator-associated pneumonia: a randomized clinical trial. Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine 14 (2010): 70.

Original Article

Effect of Therapeutic Ultrasound versus Shortwave Diathermy Combined with Suboccipital Release and Manual Drainage Techniques for Chronic Sinusitis: A Randomized Clinical Trial

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Abstract

Background: The repeated occurrences of sinusitis hinders patients from carrying out their daily life activities efficiently. The successful application of therapeutic ultrasound and shortwave diathermy (SWD) with the addition of suboccipital release and manual techniques could develop a new paradigm in the treatment of chronic sinusitis.

Objectives: The aim of the study was to compare the effect of therapeutic ultrasound versus SWD combined with suboccipital release and manual drainage techniques in chronic sinusitis in terms of pain intensity, tenderness, and quality of life.

Materials and Methods: Forty-six patients with chronic sinusitis were randomly assigned to therapeutic ultrasound and SWD groups consisting of 23 patients each. Both groups received suboccipital release and manual drainage techniques and the outcome measures were assessed at baseline and after five sessions.

Results: Compared with the baseline levels, pain intensity, tenderness, and quality of life significantly reduced in both the study groups ($P < 0.05$) at the end of five sessions. Further, the ultrasound group showed to be better as compared to SWD group.

Conclusion: Both therapeutic ultrasound and SWD combined with suboccipital release and manual drainage techniques improve pain intensity, tenderness, and quality of life in chronic sinusitis. However, ultrasound therapy showed quicker and better effects as compared to SWD along with suboccipital release and manual drainage techniques.

Keywords: Chronic sinusitis, Manual therapy, Pain pressure threshold, Shortwave diathermy, Therapeutic ultrasound

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INTRODUCTION

Sinusitis is the inflammation or the infection of the mucus lining of any sinuses.[1] The sinuses are a connected system of hollow air-filled cavities located in the skull.[2] Rhinosinusitis is a condition with symptomatic inflammation of the paranasal sinuses with inflammation of the connecting nasal mucosa.[3] The frontal, maxillary, ethmoid, and sphenoid sinuses are the four sinuses located.[4,5]

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In an article by Times of India, it was reported that almost 134 million people in India suffer from sinusitis. It is estimated that sinusitis affection in the adult population is translated into a huge burden of the health−care costs and increases the burden on the economy of health−care facilities. The pain and discomfort endured by these patients make them seek additional adjunct therapy.[6] The peak prevalence rate is noted in between 44 and 64 years old. It affects all socioeconomic backgrounds and races of the society. Sinusitis can affect the quality of life, requiring considerable direct medical expenditures.[7]

Sinusitis is mainly divided into four stages depending on the duration: acute stage which lasts up to 2–4 weeks, subacute stages for 4–8 weeks, chronic stage lasting up to ≥8–12 weeks, and recurrent sinusitis which occurs more than thrice per year.[8]

Acute sinusitis is caused by viral, bacterial, or fungal infections. Chronic sinusitis presents with a history of swelling and sinus inflammation. It can result from repeated and consistent episodes of acute sinusitis or other health conditions such as allergic rhinitis, asthma, or structural abnormalities (e.g., deviated septum or nasal polyps). Sinusitis presents with clinical manifestations such as nasal discharge, facial pain/pressure, severe headache, fever, decreased sense of smell, cough, ear pain, and pressure. Chronic sinusitis is an enhanced immune response to ubiquitous airborne fungi infection.[9] Pathogenesis of sinuses involves narrowing of the sinus ostia, obstruction in the free flow of the air, thereby causing the blockage. Dysfunction of mucociliary apparatus may also lead to the pathogenesis of sinusitis.[10,11]

Confirmatory diagnosis of sinusitis comprises of patient symptoms, physical examination, nasal endoscopy, questionnaires, laboratory investigations, and imaging techniques such as radiographs and computed tomography scans.[11−15]

The first line of treatment for sinusitis is mostly medical drugs including antimicrobial drugs, decongestants, nasal sprays, corticosteroids, and antihistamine drugs which can effectively dry the mucus. In extreme troublesome cases of recurrent sinusitis, operative procedures such as functional endoscopic sinus surgery, balloon sinuplasty, insertion of drainage tube, and invasive conventional surgery may be required.[15,16] Physical therapy also offers a variety of treatment approaches in sinusitis. It includes various electrotherapy modalities, manual drainage techniques, suboccipital release for sinus headache, Kinesio taping, nebulization, stretching the muscles of the neck, dry needling, and rhinoflow therapy.[17] Ultrasound is the most widely used physiotherapeutic agent in the treatment of sinusitis. Shortwave diathermy (SWD) is a deep heating modality used for the treatment of sinusitis. It works on the basic principle of heat production of the body tissues.[18] A study which was done to measure the quality of life and nonattendance in patients with chronic rhinosinusitis concluded that almost 20% of the patients had probable anxiety and depression disorders and remaining reported lack of presence at work due to sinus problems.[6]

In spite of many studies and treatment approaches done on sinusitis, there are limitations faced in evidence where comparisons between two electrotherapy modalities have been done. In addition, there is a paucity in the literature on the evidence of use of manual draining techniques as adjunct to electrotherapy modalities. The basic idea of the study was to control the infection and pathological cycle leading to sinusitis. The objective of the study was to study and compare the effect of therapeutic ultrasound versus SWD combined with suboccipital release and manual drainage techniques in chronic sinusitis in terms of pain intensity, tenderness, and quality of life.

MATERIALS AND METHODS

The present study was an experimental randomized clinical trial conducted on patients who were referred the outpatient department of physiotherapy from a tertiary care hospital, Belagavi city, between March 2017 and February 2018. The study protocol was approved by the Institutional Ethical Committee (KIPT/SI No. 130/29.05.2017), and written informed consent was obtained from all the patients before their recruitment. In addition, the study was registered under the Clinical Trial Registry − India with registration number CTRI/2018/04/013030. The inclusion criteria were: patients who were clinically diagnosed by ENT surgeon with chronic sinusitis with a history of 3 months or longer, age group from 18 to 50 years, presence of either two or more major symptoms, or one major plus two minor symptoms of sinusitis according to the task force diagnosis [Table 1].[19]

Patients were excluded from the study presenting with any metal implants (pacemakers, dental implants, or any other implants), individuals with involvement of ≥1 sinus area (frontal or maxillary), and history of any space−occupying lesions or malignancy. Patients with history of low blood pressure and dizziness and suffering from any systemic illness, any history of neurological or cognitive deficits, and pregnancy. Prior consent was taken to include the photographs of the patients [Figure 1].

Visual analog scale

A visual analog scale is an instrument used for measuring the pain intensity or frequency of various symptoms. The patient was asked to mark his/her pain levels according to the severity.[20] This was recorded pre− and post−intervention.

Pressure algometer

It is a clinical tool which is used to identify the pressure and/or force eliciting a pain pressure threshold. The digital pressure algometer was placed perpendicularly on the site to be tested and pressed against the area while increasing the force. The unit at which the patient gets pain was noted. The unit of measurement was in kg/cm$_2$ [Figures 2 and 3].[21]

Table 1: Task force diagnosis for sinusitis*

Major factors	Minor factors
Facial pain/pressure	Headache
Nasal obstruction/blockage	Fever
Nasal discharge/purulence/ discolored postnasal drainage	Halitosis
Hyposmia/anosmia	Fatigue
Purulence in nasal cavity on examination	Dental pain
	Cough
	Ear pain/pressure/fullness

*Enumerates the major & minor factors for diagnosis of sinusitis

Sino−nasal Outcome Test−22[22]

This is a Quality Of Life Questionnaire specifically designed for sinusitis patient. It consists of 22−item sinus specific question which has to be administered to the patient and the total sum of all the items will be recorded based on the severity of the patient's condition and the scores were calculated.

Procedure

An ethical approval for the study was obtained from the Institutional Ethical Committee. Patients were taken in the study based on the inclusion and exclusion criteria before their enrollment. The outcome measures were obtained from the patient before and after the treatment on day 1 and 5, respectively. Both the groups received the treatment for 5 consecutive days. Patients were assigned to two groups.

Common intervention (suboccipital release and manual drainage techniques)

Both the experimental groups in the study received a common intervention which consisted of suboccipital

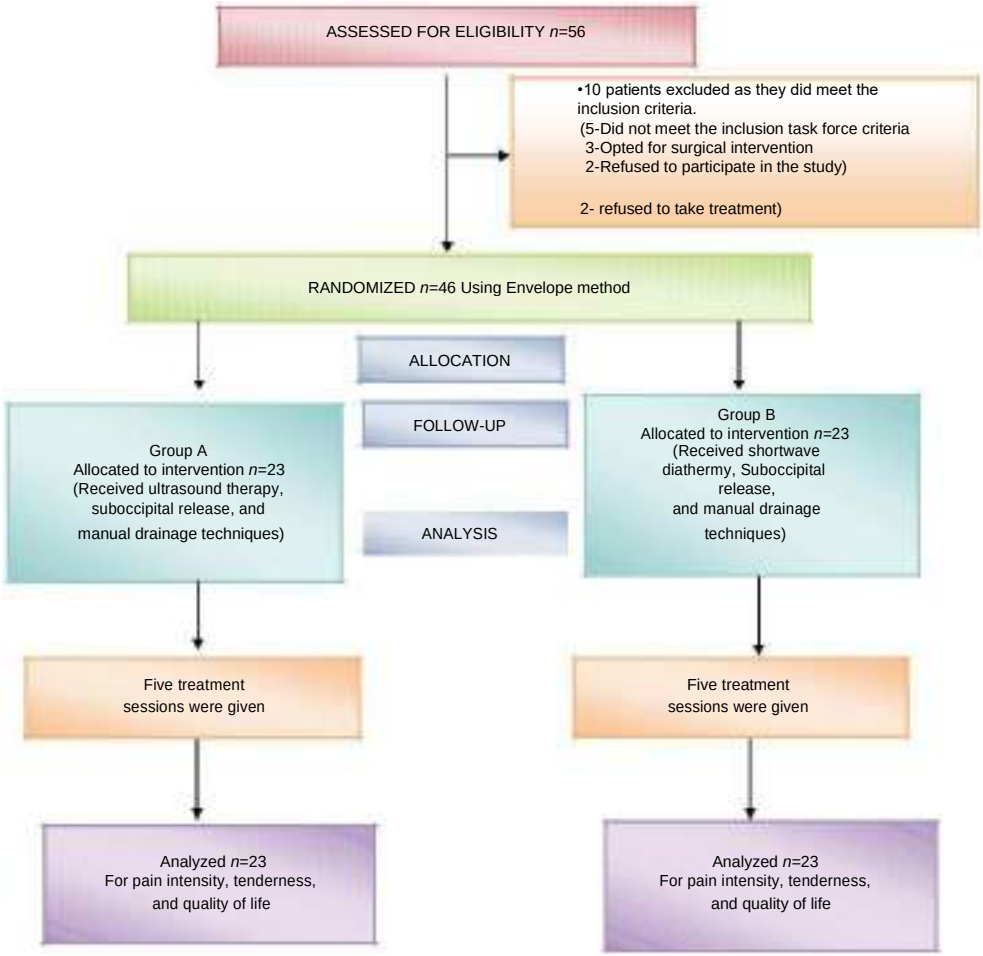

Figure 1: CONSORT chart

release and manual drainage techniques for chronic sinusitis. The patients were advised not to take any antibiotic medication till the complete treatment sessions were done unless they found no relief with the treatment or the sinus attack aggravated.

Suboccipital release: The patient was in a supine position with the therapist sitting at the head of the table. The finger pads were placed over the suboccipital muscles bilaterally by the therapist, just inferior to the superior nuchal line down approximately to the level of C2. The patient's head was then lifted by the therapist so as the weight of it is supported upon the pads of the fingers. Traction was then applied with fingers curled into the suboccipital muscles down until your fingers sink into muscle. The amount of traction that is used results in a force to the tissues without producing significant movement of the structures. This position was then held by the therapist until the tissues relax for 1 min.[23]

[1]. Manual drainage for the sinuses:

i. Drainage for frontal sinus [Figure 4]

Hand positioning: The therapist placed his/her thumb over the frontal sinuses so as to apply direct pressure and then drained the sinuses by moving his/her thumbs inferiorly while staying in front of the ears. This was performed seven times.[24]

ii. Drainage for maxillary sinus [Figure 5]

Hand positioning: The therapist places her thumbs over the maxillary sinuses of the patient so as to apply direct pressure and then drained the sinuses by moving her thumbs inferiorly until you are just below the ears. This was performed seven times.[24]

Dosimetry

Total duration of the treatment delivered was of 30 min each session for 5 consecutive days.

Experimental Group A (therapeutic ultrasound therapy)

This group received ultrasound therapy combined with suboccipital release and manual drainage techniques for the sinuses. The patients were instructed to be in supine lying position on the wooden plinth. The therapist was in a

Figure 2: Pressure algometer – frontal sinus

Figure 3: Pressure algometer – maxillary sinus

Figure 4: Manual drainage for the frontal sinus

Figure 5: Manual drainage for the maxillary sinus

standing position at the head end of the patient [Figure 6]. The patients received ultrasound therapy with continuous mode with an intensity of 1 and 0.5 W/cm2 for maxillary and frontal sinus, respectively, with a frequency of 1MHz. The area of US application was the skin over the cheeks for maxillary sinus and forehead for the frontal sinus. The handheld US applicator was moved in circular motion, using a slow continuous technique for the duration of 5 min over the maxillary sinuses and 4 min over the frontal sinuses on each pair of sinuses.[21] Ultrasound transmission gel was used between the applicator and the skin.

Experimental Group B (shortwave diathermy)

The patients in this group received SWD with small disc electrodes on continuous mode with an intensity according to the tolerance of the patient and also to produce only minimal heating of the sinuses. A standard cross-fire method was used to treat the maxillary and frontal sinuses. The patient was instructed to be in supine lying position. For the treatment of all the sinuses, one electrode was placed on the lateral part of the forehead and the other on the opposite side of the face, below the angle of jaw [Figure 7]. After 10 min of treatment, the placement of the electrodes was changed to the opposite sides so as to cause the heating of the sinuses equally.[25] Total duration of the treatment was 30 min/session for 5 consecutive days. Postcompletion of the treatment of five sessions, patients of both groups were reassessed for visual analog scale, sinus questionnaire, and pressure algometer.

Statistical analysis

Statistical analysis for the present study was done manually as well as using SPSS version 22.0 IBM (SPSS Sttistics for windows, Armonk, NY: IBM Corp., USA) so as to verify the results obtained. Normality of all quantitative parameterswas checked using Shapiro–Wilk's test, visual inspection of their histograms, normal Q-Q plots, and box plots. Homogeneity of variances was tested by Levene's test for equality of variances. Various statistical measures such as mean, standard deviation, and interquartile range (IQR) were used. Within the current data set, visual analog scale (VAS) and pressure algometer were not normally distributed, hence were compared between the two groups using Mann–Whitney U-test (median IQR). Sino-nasal Outcome Test-22 (SNOT-22) outcome questionnaire followed the normal data distribution within each intervention groups and hence was compared using two-way mixed-ANOVA. Categorical variables were compared between the two groups using Chi-square test or Fisher's exact test. Probability values <0.05 were considered statistically significant.

RESULTS

Forty-six patients were divided into therapeutic ultrasound and SWD groups. Table 2 presents with data of demographic distribution in two study groups. There was a significant reduction in pain intensity on VAS postintervention (P = 0.001) in both the study groups as compared to pretreatment scores. The between-group difference on median IQR showed ultrasound group to be more effective than SWD group with $P < 0.001$ [Tables 3 and 4]. For the pain pressure threshold, both groups showed significant improvement postintervention (P = 0.001). The between-group comparison of postintervention score for therapeutic ultrasound group was 4 (IQR: 3.50–4) and SWD group was 3 (IQR: 3–3.20) and difference scores resulted in statistically significant values ($P <$ 0.001) indicating a therapeutic ultrasound group showing significant improvement in pain pressure threshold than SWD group [Tables 5 and 6].

Figure 6: Ultrasound therapy

Figure 7: Shortwave diathermy

Table 2: Demographic distribution of parameters in two study groups (*n*=46)

Baseline parameter	Study group		χ^2/t	*P*
	Ultrasound (*n*=23)	Shortwave diathermy (*n*=23)		
Age (mean±SD)	23.09±1.88	22.65±1.85	0.791	0.433
Gender, *n* (%)				
Male	2 (8.7)	2 (8.7)	0.000	1.000
Female	21 (91.3)	21 (91.3)		
Anthropometric				
Height (cm), (median IQR)	163 (157-167)	158 (157-161)	*	0.112
Weight (kg), (mean±SD)	62.74±9.62	62.78±8.21	0.016	0.987
BMI (mean±SD)	23.84±3.86	24.63±2.62	0.816	0.419
Duration of symptoms (IQR)	4 (2-5)	6 (3-8)	*	0.026*

*No statistical test was applied, as data was not satisfying, statistical assumptions to performs statistical tests. SD: Standard deviation, BMI: Body mass index, IQR: Interquartile range

Table 3: Comparison of pre- and post-visual analog scale scores within each intervention groups (*n*=46)#

Intervention group	VAS score, median (IQR)		*P*
	Preintervention	Postintervention	
Ultra sound	7 (6-8)	3 (3-4)	<0.001*
SWD	7 (6-8)	4 (3-5.50)	<0.001*

#Using Wilcoxon signed−rank test, *P<0.05. IQR: Interquartile range, SWD: Shortwave diathermy, VAS: Visual analog scale

Table 4: Comparison of visual analog scale scores between the two intervention groups (*n*=46)#

VAS score	Intervention group, median (IQR)		*P*
	Ultrasound	SWD	
Preintervention	7 (68)	7 (6-8)	0.521
Postintervention	3 (3-4)	4 (3-5.50)	<0.001*

#Using Mann−Whitney U−test, *P<0.05. IQR: Interquartile range, SWD: Shortwave diathermy, VAS: Visual analog scale

Table 5: Comparison of pre- and post-pressure algometer within each intervention group (*n*=46)#

Intervention group	Pressure algometer, median (IQR)		*P*
	Preintervention	Postintervention	
Ultra sound	2 (1.50-2)	4 (3.50-4)	<0.001*
SWD	2 (1.50-2.20)	3 (3-3.20)	<0.001*

#Using Wilcoxon signed−rank test, *P<0.05. IQR: Interquartile range, SWD: Shortwave diathermy

Table 6: Comparison of pressure algometer between the two intervention groups (*n*=46)#

Pressure algometer	Intervention group, median (IQR)		*P*
	Ultrasound	SWD	
Preintervention	2 (1.50-2)	2 (1.50-2.20)	0.357
Postintervention	4 (3.50-4)	3 (3-3.20)	0.011*

#Using Mann−Whitney U−test, *P<0.05. IQR: Interquartile range, SWD: Shortwave diathermy

The quality of life as assessed by SNOT−22 demonstrated significant difference between pre− and post−interventional scores for both the study groups. The between-group comparison for post-intervention score for both the study groups showed statistically significant difference (P = <0.001). The SNOT−22 noticed a sharper decline from pre to post in the therapeutic ultrasound group as compared SWD group [Tables 7−9].

DISCUSSION

The present randomized clinical trial was done to compare the effect of therapeutic ultrasound therapy versus SWD combined with suboccipital release and manual drainage techniques in patients with chronic sinusitis. The results from the statistical analysis of the present study support that both the experimental groups were beneficial and showed statistically significant improvement in reduction of symptoms and showed to be effective in treating patients with chronic sinusitis. However, the ultrasound therapy group showed a sharper and faster improvement as compared to that in SWD group.

In the present study, the age of the patient ranged from 18 to 50 years with the mean age for the ultrasound therapy group of 23.09 ± 1.88 and for SWD group of 22.65 ± 1.85 years indicating occurrence of chronic sinusitis is predominantly seen during the second decade of life.[26]

In the present study, ultrasound group has a significant reduction in pain posttreatment. Possible reasons for this could be explained as below. It is suggested that the latent amount of heat that is accumulated within the tissues with continuous US may attribute to increase the blood flow in the surrounding regional regions mucosa[27,28] which have reduced circulation[29] as in cases of chronic sinusitis. Since clearing of the infection is dependent on the blood flow, the authors suggest that healing in the treatment groups may have been facilitated by this increased blood circulation. Thus, ultrasound therapy proved to be more effective for chronic rhinosinusitis. Furthermore, another possible reason for this improvement may be the psychological effect reported for US application.[27] Blockage of sinus ostium occurs due to the mucosal inflammation and then causes retention of secretions that are blocked in the sinus cavities.

Ultrasound therapy causes mechanical vibration of the molecules which might help in the faster drainage and facilitation of the secretions and thus reducing pain.[21,30,31]

Table 7: Comparison of change in Sino-nasal Outcome Test-22 questionnaire score within each intervention groups (*n*=46)#

Intervention group	SNOT (mean±SD)		*P*
	Pretreatment	Posttreatment	
Ultrasound	60.61±8.68	34.86±8.64	<0.001*
SWD	65.13±12.31	47.09±11.09	<0.001*

*P<0.05, #Paired *t*−test was used. SWD: Shortwave diathermy, SD: Standard deviation, SNOT: Sino−nasal Outcome Test

Table 8: Comparison of Sino-nasal Outcome Test-22 Questionnaire between the two intervention groups (*n*=46)#

SNOT parameter	Intervention group, mean±SD		*P*
	Ultrasound (*n*=23)	SWD (*n*=23)	
SNOT at baseline (pretreatment)	60.61±8.68	65.13±12.32	0.154
SNOT at follow-up (posttreatment)	34.87±8.64	47.09±11.1	<0.001*

*P<0.05, #Paired *t*−test was used. SWD: Shortwave diathermy, SD: Standard deviation, SNOT: Sino−nasal Outcome Test

Table 9: Summary of two-way mixed-methods ANOVA to assess the interaction between group and time (*n*=46)

Within participants effect	Degrees of freedom	*F* statistic	Partial η^2	*P*
Time	1	337.566	0.885	<0.001*
Time × study group	1	10.429	0.192	0.002*

*P<0.05

Another study was done by Nakhostin Ansari *et al.* to study the effect of continuous ultrasound on chronic rhinosinusitis. The results of the trial concluded that continuous ultrasound to be an effective tool in the treatment of chronic rhinosinusitis. The significant effect of ultrasound therapy could also be because of the heating effects of ultrasound. Therapeutic ultrasound when applied to tissues converts into heat, thereby causing molecular vibration which increases the blood supply and helps in reduction of the symptoms experienced in sinusitis.[21]

The findings also suggest that the SWD group showed significant improvement in the present study. A similar study was done to find the effect of SWD by Shinde and Jayawant on efficacy of SWD in patients with sinusitis. The study groups were only SWD, SWD combined with medicinal treatment and only medical treatment. It was derived from the study that the effect of SWD or medicines alone almost had the same effects of symptomatic relief, but when used in combination, it was better.[32] The heat production and phagocytosis could have possibly helped in the reduction of the symptoms in SWD group.

A sharper and a faster decline in the symptoms were noted better in the therapeutic ultrasound group as compared to the shortwave therapy group. A possible reason for this could be the continuous contact of the ultrasound probe with the sinuses as compared to the positioning of the SWD disc electrodes which were maintained at a fix distance. This continuous friction caused by the ultrasound head must have resulted in significant friction, thereby aiding to increased heat production leading to thermal effects and thus causing a reduction in the symptoms at a quicker and faster rate. The superiority of ultrasound therapy is advisable and is a better treatment approach since SWD is now an obsolete modality and is rarely used.

The suboccipital release as mentioned in the studies reduces the overactivity of the neck muscles which is caused in chronic sinusitis, thus reducing the pain and also affects the functional outcome. When healthy, fascia is a flexible, pliable, and strong tissue, it helps in reducing the overactivity of the neck muscles. Studies suggest that overactivity of the neck muscles also can be a cause in aggravating headache in the patients. A literature review study was done to find the effectiveness of physical therapy techniques in patients with tension−type headache. The findings from these studies provide evidence that physiotherapy manual therapy techniques such as cervical muscle stretching, massage, and suboccipital release are effective in the treatment of tension−type headaches.[33]

The addition of the manual drainage techniques helped in easy removal and aiding the drainage of these sinuses into the lymphatic system postthermal production as it would have loosed the sinuses which were filled blocked pus−filled cavities. This removal of waste metabolites helped in reducing the pain intensity, facial pressure, and the tenderness over the sinuses, thereby additionally improving the symptoms and quality of life in patients suffering from chronic duration sinusitis. The limitation of the study was that long−term effects were not assessed and it was a single−center trial. Treatment of maxillary and frontal sinuses was done together and was not assessed separately. The future scope could be that a study can be done with a larger sample size and control group. Newer physiotherapy treatment approaches such as dry needling, taping, and rhinoflow therapy can be used to compare in the treatment of chronic sinusitis. Further studies can be carried out using these techniques in combination with placebo ultrasound and low−intensity laser therapy.

CONCLUSION

The study concluded that only five sessions of both therapeutic ultrasound and SWD when combined with suboccipital release and manual drainage techniques interventions resulted in significant improvement in patients with chronic sinusitis. However, therapeutic ultrasound therapy group showed faster and quick reductions of

symptoms as compared to the SWD group. Thus, the study suggests that ultrasound therapy should be implemented as treatment protocols for the treatment of individuals with chronic sinusitis patients. The clinical implication of the study states that successful application of therapeutic ultrasound and SWD with the addition of manual techniques has developed a new paradigm in the treatment of chronic sinusitis, thus helping in the reduction of antibiotic resistance and improving the medical management with a subsequent reduction in requirement of surgical intervention.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

/ Mahmood KT, Younas A, Rasheed M. Treatment and prevention of sinusitis. J Pharm Sci Res 2011;3:1019.

/ Drake R, Vogl W, Mitchell A, Gray H. Gray's Anatomy for Students. Philadelphia [etc.]: Elsevier; 2005.

/ Rocha WA, Rodrigues KM, Pereira RR, Nogueira BV, Gonçalves WL. Acute effects of therapeutic 1−MHz ultrasound on nasal unblocking of subjects with chronic rhinosinusitis. Braz J Otorhinolaryngol 2011;77:7−12.

/ Chaurasia BD. Chaursia's Human Anatomy. 5th ed., Vol. 3. CBS publishers & Distributors pvt ltd., Bangalore;2011. p. 230.

/ Bhargava KB, Bhargava SK, Shah TM. A Short Textbook of E.N.T.Diseases. 10th Edition, Usha Publications, Pune, Maharashtra; 2014. p. 192.

/ Sahlstrand−Johnson P, Ohlsson B, Von Buchwald C, Jannert M, Ahlner−Elmqvist M. A multi−centre study on quality of life and absenteeism in patients with CRS referred for endoscopic surgery. Rhinology 2011;49:420−8.

/ Sarber KM, Dion GR, Weitzel EK, McMains KC. Approaching chronic sinusitis. South Med J 2013;106:642−8.

/ Leung RS, Katial R. The diagnosis and management of acute and chronic sinusitis. Prim Care 2008;35:11−24, v−vi.

/ Bachert C, Mannent L, Naclerio RM, Mullol J, Ferguson BJ, Gevaert P, *et al.* Effect of subcutaneous dupilumab on nasal polyp burden in patients with chronic sinusitis and nasal polyposis: A randomized clinical trial. JAMA 2016;315:469−79.

/ Mustafa M, Patawari P, Iftikhar HM, Shimmi SC, Hussain SS, Sien MM. Acute and chronic rhinosinusitis, pathophysiology and treatment. Int J Pharm Sci Invent 2015;4:30−6.

[11] Wald ER. Epidemiology, pathophysiology and etiology of sinusitis. Pediatr Infect Dis 1985;4:S51−4.

[12] Bolger WE, Butzin CA, Parsons DS. Paranasal sinus bony anatomic variations and mucosal abnormalities: CT analysis for endoscopic sinus surgery. Laryngoscope 1991;101:56−64.

[13] Rosbe KW, Jones KR. Usefulness of patient symptoms and nasal endoscopy in the diagnosis of chronic sinusitis. Am J Rhinol 1998;12:167−71.

[14] Marple BF. Allergic fungal rhinosinusitis: Current theories and management strategies. Laryngoscope 2001;111:1006−19.

[15] Gwaltney JM Jr., Jones JG, Kennedy DW. Medical management of sinusitis: Educational goals and management guidelines. The international conference on sinus disease. Ann Otol Rhinol Laryngol Suppl 1995;167:22−30.

[16] Smith KA, Orlandi RR, Rudmik L. Cost of adult chronic rhinosinusitis: A systematic review. Laryngoscope 2015;125:1547−56.

[17] Jurkiewicz D, Ligeziński A, Adamiak G. Use of "rinoflow" inhalation in treatment of paranasal sinusitis. Pol Merkur Lekarski 1997;2:99−101.

[18] Khatri SM. Basics of Electrotherapy. 2nd ed. Jaypee Brothers Medical Publishers, New Delhi; 2012. p. 75, 77, 78.

[19] Nakhostin Ansari N, Naghdi S, Farhadi M. Physiotherapy for chronic rhinosinusitis: The use of continuous ultrasound. Int J Ther Rehabil 2007;14:306−10.

[20] DeLoach LJ, Higgins MS, Caplan AB, Stiff JL. The visual analog scale in the immediate postoperative period: Intrasubject variability and correlation with a numeric scale. Anesth Analg 1998;86:102−6.

[21] Park G, Kim CW, Park SB, Kim MJ, Jang SH. Reliability and usefulness of the pressure pain threshold measurement in patients with myofascial pain. Ann Rehabil Med 2011;35:412−7.

[22] Hopkins C, Gillett S, Slack R, Lund VJ, Browne JP. Psychometric validity of the 22−item sinonasal outcome test. Clin Otolaryngol 2009;34:447−54.

[23] Kim BB, Lee JH, Jeong HJ, Cynn HS. Effects of suboccipital release with craniocervical flexion exercise on craniocervical alignment and extrinsic cervical muscle activity in subjects with forward head posture. J Electromyogr Kinesiol 2016;30:31−7.

[24] Bipasha M. Curing Nasal Congestion with Acupressure Points – Causes, Symptoms. Available from: http://www.modernreflexology.com/curing−nasal−congestion−with−acupressure−points/. [Last accessed on 2018 Mar 20].

[25] Heggannavar AB, Harugop AS, Madhale DM, Walavalkar LS. A randomised controlled study to evaluate the effectiveness of shortwave diathermy in acute sinusitis. Int J Physiother Res 2017;5:2066−72.

[26] Revai K, Dobbs LA, Nair S, Patel JA, Grady JJ, Chonmaitree T. Incidence of acute otitis media and sinusitis complicating upper respiratory tract infection: The effect of age. Pediatrics 2007;119:e1408−12.

[27] Dyson M. Mechanisms involved in therapeutic ultrasound. Physiotherapy 1987;73:116−20.

[28] Speed CA. Therapeutic ultrasound in soft tissue lesions. Rheumatology 2001;40:1331−6.

[29] Kumlien J, Schiratzki H. The vascular arrangement of the sinus mucosa. A study in rabbits. Acta Otolaryngol 1985;99:122−32.

[30] Kitchen SA. A review of therapeutic ultrasound. Physiotherapy 1990;76:593−600.

[31] Baker KG, Robertson VJ, Duck FA. A review of therapeutic ultrasound: Biophysical effects. Phys Ther 2001;81:1351−8.

[32] Shinde N, Jayawant SK. Efficacy of short wave diathermy in patients with sinusitis. Infection 2012;1:7.

[33] Espí−López GV, Gómez−Conesa A, Gómez AA, Martínez JB, Pascual−Vaca AO, Blanco CR. Treatment of tension−type headache with articulatory and suboccipital soft tissue therapy: A double−blind, randomized, placebo−controlled clinical trial. J Bodyw Mov Ther 2014;18:576−85.

Resume Jurnal 1

Judul Jurnal : Comparison of effectiveness of diaphragmatic breathing and pursed-lip expiration exercises in improving the forced expiratory flow rate and chest expansion in patients with bronchial asthma
Sumber Jurnal : International Journal Physiotheraphy. Vol 3(2), 154-158

Penulis : G.Shine, Shaikhji Saad, Shaikhji Nusaibath, Abdul Rahim Shaik, S. Padmakumar

Tahun : April 2016
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Resume Jurnal :	
Pengantar	Asma bronkial merupakan masalah yang berkembang di seluruh dunia. Pada asma bronkial, otot polos dinding bronkial menjadi hiper responsif terhadap berbagai rangsangan yang mengakibatkan batuk, mengi, sesak dada dan dispnea. Ini dapat diobati secara profilaksis dan fisioterapi. Insiden asma meningkat dan menuntut prosedur pengobatan yang lebih efektif. Fisioterapis dapat membantu dalam merancang resep latihan khusus untuk individu yang mungkin dapat mengontrol asma bronkial lebih banyak. Meskipun latihan pernapasan diafragma dan gerakan ekspirasi bibir adalah dua bentuk pengobatan yang tersedia, pemahaman menyeluruh tentang prosedur ini akan memungkinkan terapis untuk menasihati pasien dan meningkatkan fungsi paru dan ekspansi dada.
Tujuan penulisan	Menjelaskan lebih lanjut tentang dua teknik k fisioterapi (pernapasan diafragma dan ekspirasi bibir) dan pengaruhnya terhadap laju aliran ekspirasi paksa (FEFR) dan ekspansi dada pada pasien dengan asma bronkial.
Bahan dan Metode	Penelitian ini merupakan penelitian eksperimental pre-test post-test, dilakukan pada pasien asma bronkial (baik laki-laki maupun perempuan) antara kelompok umur 20-40 tahun. Sebanyak 50 pasien diskrining menggunakan proforma berikut yang 30 memenuhi kriteria inklusi. Pasien diminta untuk memenuhi kriteria berikut untuk dimasukkan dalam penelitian: (i) ringan (gejala siang hari lebih dari sekali seminggu, (ii) gejala nokturnal lebih dari dua kali sebulan, laju aliran ekspirasi puncak / volume aliran ekspirasi paksa di satu detik (PEFR / FEV1> 80%) dan (iii) sedang (gejala siang hari setiap hari, gejala nokturnal lebih dari sekali seminggu, PEFR / FEV1: 60 - 80%) pasien asma bronkial persisten. Subjek dikeluarkan dari penelitian jika mereka memiliki masalah berikut: (i) pasien non kooperatif, (ii) status pasien asma dan (iii) pasien asma yang berhubungan dengan penyakit pernapasan dan

	jantung lainnya. Kelompok 1: Pasien diberikan latihan pernapasan diafragma selama 6 minggu (5 hari dalam seminggu, 2 kali dalam sehari selama 20 menit per sesi). Pasien diminta untuk rileks dan diposisikan pada posisi yang nyaman sehingga punggung dan kepalanya ditopang sepenuhnya dan dinding perutnya rileks (posisi fowler). Peneliti meletakkan tangannya di bagian perut rektus tepat di bawah batas kosta anterior. Pasien diminta untuk bernapas perlahan dan dalam hidung. Pasien diinstruksikan untuk menjaga bahu tetap kendur dan dada bagian atas tenang, setelah perut terangkat. Kemudian pasien diminta untuk perlahan-lahan mengeluarkan semua udara menggunakan ekspirasi terkontrol dengan mengerucutkan bibir. Ini diterapkan tiga atau empat kali dan kemudian istirahat. Perhatian diberikan agar pasien tidak mengalami hiperventilasi. Tiga atau empat set diterapkan dalam sesi perawatan 20 menit. Kelompok 2: Pasien hanya diberikan latihan kedaluwarsa bibir selama 6 minggu (5 hari dalam seminggu, 2 kali sehari selama 20 menit per sesi). Pasien diminta untuk mengendurkan otot bahunya dan diminta untuk menghirup (menghirup) perlahan melalui hidung selama dua hitungan, dengan menjaga mulut tetap tertutup. Kemudian dia diminta untuk mengejar bibir mereka seolah-olah mereka akan bersiul atau dengan lembut mengedipkan nyala api lilin. Akhirnya hembuskan napas (hembuskan) perlahan dan lembut melalui mengerucutkan bibir sambil menghitung sampai empat. Penilaian berkala diambil setiap minggu oleh fisioterapis untuk mengetahui apakah pasien melakukan latihan setiap hari atau tidak.
Hasil	Tabel 1 membandingkan usia pasien yang terlibat dalam penelitian ini. Tidak ada perbedaan yang signifikan antara kedua kelompok sehubungan dengan usia ($p = 0,121 > 0,05$). Tabel 2 : Distribusi gender. Tidak ada perbedaan yang signifikan antara kelompok sehubungan dengan rasio pria / wanita karena $p = 0,543 > 0,05$. Tabel 3 : Ekspansi dada dan PEFR dicatat sebelum pengobatan (pre-test) Perbedaan antara kedua kelompok tidak signifikan, Hasilnya menunjukkan bahwa pengobatan itu efektif untuk ekspansi dada dan PEFR. Tabel 4 : Perbandingan sebelum dan sesudah ekspansi dada dan

	PEFR pada kelompok latihan pernapasan diafragma. Dengan hasil sangat signifikan Tabel 5 menunjukkan hasil kelompok pernafasan mengerucutkan bibir dimana ekspansi dada sebelum dan sesudah perlakuan adalah pengobatan efektif untuk ekspansi dada serta PEFR
Diskusi	Penelitian dilakukan pada 30 pasien asma bronkial antara kelompok usia 20 sampai 40 tahun. Hasil penelitian selama enam minggu menunjukkan bahwa terdapat peningkatan yang signifikan pada FEFR dan ekspansi dada pada kelompok senam diafragma. Hasilnya sesuai dengan laporan Holloway dan Ram, di mana ditemukan bahwa teknik pernapasan diafragma menghidupkan kembali gejala asma bronkial dan juga meningkatkan FEFR, ekspansi dada dan secara signifikan meningkatkan kualitas hidup.
Kesimpulan	Hasil penelitian mendukung kelompok latihan pernapasan diafragma karena telah menghasilkan peningkatan yang signifikan dalam FEFR dan ekspansi dada. Dengan demikian dapat disimpulkan bahwa latihan pernafasan diafragma berperan penting dalam rehabilitasi pasien asma untuk memperoleh perbaikan fungsional, kemandirian serta mengurangi gangguan dan gejala fungsional.

Resume Jurnal 2

Judul Jurnal : Effectiveness of passive chest physiotherapy in prevention of ventilator associated pneumonia in sepsis
Sumber Jurnal : Archives of Physiotherapy and Rehabilitation

Penulis : Nida Rizvi, Syed Muhammad Fahad, Syed Hasan Abbas Rizvi, Faizan Saeed Syed, Syed Ali Farooq Zaidi, Adnan Anwar, Muhammad Ali

Tahun : 15 June 2020
DOI : 10.26502/fapr0012

Resume Jurnal :	
Pendahuluan	Sekitar 19 juta kasus sepsis dilaporkan setiap tahun, dengan 5 juta kematian diperkirakan terjadi di negara berpenghasilan menengah dan rendah akibat sepsis. Penatalaksanaan yang tepat pada pasien yang terdiagnosis sepsis hanya dapat dilakukan dengan mengetahui angka kematian. Infeksi Saluran Pernafasan sering menyebabkan sepsis. Ventilator Associated Pneumonia (VAP) dianggap sebagai faktor risiko umum yang sering dikaitkan dengan pasien sepsis yang diintubasi. Ini adalah masalah umum pada pasien yang diintubasi selama lebih dari 48 jam. Fisioterapi dada pasif menggunakan teknik manual yang bertanggung jawab untuk pembersihan dahak dan membantu mencegah paru-paru dari atelektasis, obstruksi saluran udara, dan hiperinflasi. Fisioterapi dada pasif melibatkan berbagai teknik untuk manipulasi dada eksternal, juga bertanggung jawab untuk menghilangkan sekresi yang terinfeksi dengan mengurangi tingkat kerusakan jaringan proteolitik.
Tujuan Penulisan	penelitian ini dilakukan untuk menilai efektivitas Fisioterapi Dada Pasif dalam Pencegahan Ventilator Associated Pneumonia pada Pasien Sepsis.
Metodologi	Penelitian ini merupakan penelitian Kuasi Eksperimental yang dilaksanakan di Rumah Sakit Nasional Liaquat dari bulan Februari sampai Oktober 2019 dengan teknik pengambilan sampel non probability sampling berbasis kenyamanan. Total 60 pasien dilibatkan dalam penelitian ini. Semua pasien tersebut diintubasi selama lebih dari 48 jam, didiagnosis dengan sepsis berdasarkan prinsip perawatan kritis American College. Pasien immunocompromised, cedera ginjal akut, penyakit ginjal kronis, penyakit ginjal tahap akhir, ketoasidosis diabetik, kasus

	neurologis, keracunan, komplikasi pasca operasi dimasukkan dalam penelitian ini sementara. pasien tidak stabil secara hemodinamik, miokard infark, tidak teratur aritmia, hemodialisis, operasi jantung terbuka baru-baru ini, luka terbuka atau infeksi kulit dikeluarkan dari penelitian ini. Persetujuan Etis diambil dari Institutional Review Board of Liaquat National School Of Physiotherapy sebelum dimulainya penelitian ini. Pasien yang termasuk dalam penelitian ini dilayani dengan ventilator tekanan positif termasuk Continous Mandatory Ventilation (CMV), Pressure Control Ventilation (PCV) dan Synchronized Intermittent Mandatory Ventilation. Formulir informed consent ditandatangani oleh kerabat pasien. Setelah mengambil formulir informed consent dari kerabat pasien, dilakukan penilaian awal yang meliputi jenis kelamin, usia, diagnosis, komorbiditas dan mode ventilator yang digunakan. Usia Fisiologis Akut Evaluasi Kesehatan Kronis II (APACHE II) dan skala Skor Infeksi Paru Klinis (CPIS) digunakan sebagai alat penilaian. Fisioterapi Dada Pasif yang diberikan kepada pasien adalah sebagai berikut: 1. Manual Hyperinflation Technique (MHT): Teknik ini menggunakan teknik yang menghantarkan napas dalam-dalam kepada pasien yang diventilasi secara mekanis dengan rebreathing bag. 2. Pengisapan: Durasi pengisapan endotrakeal dibatasi hingga 15 detik 3. Perkusi: Perkusi didefinisikan sebagai pukulan yang berirama pada dada pasien dengan tangan yang menangkup di atas area sekresi. Pasien dalam posisi terlentang dan tangan terapis diletakkan di dada pasien, bahu, siku dan pergelangan tangan diluruskan untuk melakukan perkusi dengan gerakan bergelombang. Durasi perkusi yang digunakan adalah 5 menit pada setiap lobus dua kali sehari. 4. Kompresi: Kompresi dada terutama digunakan dalam mobilisasi sekresi di jalan napas sentral dari pinggiran. Pasien diposisikan terlentang dan terapis meletakkan jari-jarinya di atas ruang interkostal dan bahu, siku, pergelangan tangan dijaga tetap lurus dan kekuatan kompresi diterapkan pada akhir inspirasi dan dimulainya ekspirasi. Kompresi dilakukan tiga kali pada setiap lobus.
Hasil	APACHE II digunakan untuk memprediksi kematian pasien yang didiagnosis dengan sepsis selama 24 jam pertama perawatan Intensive Care Unit (1. 38 ± 0. 49); pada 10 hari setelah angka kematian fisioterapi dada pasif menurun secara signifikan (0. 05 ± 0.

	22). Skor CPIS yang digunakan untuk memprediksi peluang Ventilator Associated Pneumonia menunjukkan bahwa sebelum memulai fisioterapi dada pasif, peluang pneumonia terkait ventilator adalah 53,3% (1. 53 ± 0. 50) sedangkan Skor CPIS pada hari ke-10 menunjukkan penurunan yang signifikan i. e. 3. 3% (1. 28 ± 0. 78) (0. 03).
Diskusi	Ini adalah studi kuasi eksperimental yang dirancang untuk menilai dampak fisioterapi dada pasif dalam pencegahan pneumonia terkait ventilator pada sepsis. Kami memasukkan pasien yang didiagnosis dengan sepsis atau kondisi yang dapat menyebabkan sepsis, dengan intubasi lebih dari 48 jam. Pasien yang termasuk dalam penelitian ini semua dirawat dengan fisioterapi dada pasif dua kali sehari dalam total 10 hari. Hasil penelitian menunjukkan bahwa angka kematian menurun secara signifikan pada hari ke 10 setelah fisioterapi dada pasif yaitu 3 (5%). studi menunjukkan bahwa fisioterapi dada intensif efektif dalam mencegah reintubasi (0. 01) dan efektif dalam menurunkan indeks pernapasan cepat dangkal sementara dalam penelitian kami kami menemukan bahwa 31 (61,7%) diekstubasi setelah 10 hari fisioterapi dada pasif.
Kesimpulan	Hasil penelitian ini menunjukkan bahwa fisioterapi dada pasif efektif dalam mencegah Ventilator Associated Pneumonia pada Pasien Sepsis; ada penurunan yang signifikan dalam angka kematian setelah fisioterapi dada pasif jika dibandingkan dengan sebelum memulai fisioterapi dada pasif. Studi lebih lanjut dalam hal ukuran Sampel Besar diperlukan untuk memastikan efektivitas fisioterapi dada pasif dalam pencegahan VAP pada Pasien Sepsis.

Resume Jurnal 3

Judul Jurnal : Effect of therapeutic ultrasound versus shortwave diathermy combined with suboccipital release and manual drainage techniques for chronic sinusitis: A randomized clinical trial
Sumber Jurnal : Indian Journal of Physical Therapy and Research
Penulis : Sharon Kalekar, Peeyoosha Gurudut
Tahun : 04-04-2019
DOI : 10.4103/ijptr.ijptr_12_19

Resume Jurnal :	
Pendahuluan	Dilaporkan bahwa hampir 134 juta orang di India menderita sinusitis. Diperkirakan bahwa penyakit sinusitis pada populasi orang dewasa diterjemahkan menjadi beban besar biaya perawatan kesehatan dan menambah beban ekonomi fasilitas perawatan kesehatan. Ini mempengaruhi semua latar belakang sosial ekonomi dan ras masyarakat. Sinusitis dapat mempengaruhi kualitas hidup, membutuhkan pengeluaran medis langsung yang cukup besar. Sinusitis yang berulang kali terjadi membuat pasien tidak dapat melakukan aktivitas sehari-hari secara efisien. Keberhasilan penerapan terapi terapi gelombang dan gelombang pendek (SWD) dengan penambahan pelepasan suboksipital dan teknik manual dapat mengembangkan paradigma baru dalam pengobatan sinusitis kronis.
Tujuan Penulisan	Tujuan dari penelitian ini adalah untuk mempelajari dan membandingkan pengaruh USG terapeutik versus SWD yang dikombinasikan dengan pelepasan suboksipital dan teknik drainase manual pada sinusitis kronis dalam hal intensitas nyeri, nyeri tekan, dan kualitas hidup.
Bahan dan metode	Penelitian ini merupakan uji klinis acak eksperimental yang dilakukan pada pasien yang dirujuk ke bagian rawat jalan fisioterapi dari rumah sakit tersier, kota Belagavi, antara bulan Maret 2017 hingga Februari 2018. Kriteria inklusi adalah: pasien yang didiagnosis secara klinis oleh ahli bedah THT dengan riwayat sinusitis kronis dengan riwayat 3 bulan atau lebih, kelompok usia 18 sampai 50 tahun, adanya dua atau lebih gejala mayor. Pasien dikeluarkan dari penelitian yang menunjukkan implan logam (alat pacu jantung, implan gigi, atau implan lainnya), individu dengan keterlibatan ≥1 area sinus (frontal atau rahang atas), dan riwayat lesi atau keganasan yang menempati ruang. Pasien dengan riwayat tekanan darah rendah dan pusing serta menderita penyakit sistemik,

	riwayat defisit neurologis atau kognitif, dan kehamilan. Skala analog visual: Pasien diminta untuk menandai tingkat rasa sakitnya menurut tingkat keparahannya. Ini dicatat sebelum dan sesudah intervensi. Algometer tekanan: Algometer tekanan digunakan untuk mengidentifikasi tekanan dan atau kekuatan yang muncul diatas ambang batas dan tekanan nyeri. Tes hasil sino-nasal: Ini merupakan kuesioner kualitas hidup yang dirancang khusus untuk pasien sinusitis, yang terdiri dari 22 pertanyaan spesifik tentang sinus dan jumlah total dari semua item akan dicatat berdasarkan tingkat keparrahan kondisi pasien dan skor dihitung.
Prosedur	Persetujuan etis untuk penelitian ini diperoleh dari Komite Etik Kelembagaan. Pasien diambil dalam penelitian berdasarkan kriteria inklusi dan eksklusi sebelum pendaftaran mereka. Ukuran hasil diperoleh dari pasien sebelum dan sesudah perawatan pada hari ke-1 dan 5, masing-masing. Kedua kelompok menerima perlakuan selama 5 hari berturut-turut. Pasien dibagi menjadi dua kelompok. Intervensi umum (pelepasan suboksipital dan teknik drainase manual) Pasien dalam posisi terlentang dengan terapis duduk di kepala meja. Bantalan jari ditempatkan di atas otot suboksipital secara bilateral oleh terapis, hanya lebih rendah dari garis nuchal superior ke bawah kira-kira ke tingkat C2. Kepala pasien kemudian diangkat oleh terapis sehingga beratnya ditopang di atas bantalan jari. Traksi kemudian diterapkan dengan jari-jari meringkuk ke dalam otot suboksipital sampai jari-jari Anda masuk ke dalam otot. Jumlah traksi yang digunakan menghasilkan gaya ke jaringan tanpa menghasilkan pergerakan struktur yang signifikan. Posisi ini kemudian dipegang oleh terapis sampai jaringan relaks selama 1 menit. Posisi tangan: Terapis meletakkan ibu jarinya di atas sinus frontal untuk memberikan tekanan langsung dan kemudian mengeringkan sinus dengan menggerakkan ibu jarinya ke arah inferior sambil tetap berada di depan telinga. Ini dilakukan tujuh kali. Drainase untuk sinus maksilaris: Posisi tangan: Terapis meletakkan ibu jarinya di atas sinus maksilaris pasien untuk memberikan tekanan langsung dan kemudian mengeringkan sinus dengan menggerakkan ibu jarinya ke arah inferior sampai Anda berada tepat di bawah telinga. Ini dilakukan tujuh kali. Dosimetri :

	Total durasi pengobatan yang diberikan adalah 30 menit setiap sesi selama 5 hari berturut-turut. Grup eksperimental A (Terapi US terpaeutik) Kelompok ini menerima terapi ultrasound yang dikombinasikan dengan pelepasan suboksipital dan teknik drainase manual untuk sinus. Pasien mendapat terapi USG dengan mode kontinyu dengan intensitas 1 dan 0,5 W / cm3 2 untuk sinus maksilaris dan frontal, masing-masing, dengan frekuensi 1MHz. Area aplikasi US adalah kulit di atas pipi untuk sinus maksilaris dan dahi untuk sinus frontal. Grup Eksperimental B (diatermi gelombang pendek) Pasien dalam kelompok ini menerima SWD dengan elektroda cakram kecil pada mode kontinyu dengan intensitas yang sesuai dengan toleransi pasien dan juga menghasilkan pemanasan sinus yang minimal. Metode cross-fire standar digunakan untuk mengobati sinus maksilaris dan frontal. Untuk perawatan semua sinus, satu elektroda ditempatkan di bagian lateral dahi dan yang lainnya di sisi berlawanan dari wajah, di bawah sudut rahang. Setelah 10 menit pengobatan, penempatan elektroda diubah ke sisi yang berlawanan sehingga menyebabkan pemanasan sinus secara merata.
Analisis Statistik	Dalam kumpulan data saat ini, skala analog visual (VAS) dan algometer tekanan tidak terdistribusi normal, oleh karena itu dibandingkan antara dua kelompok menggunakan uji Mann-Whitney U-test (median IQR). Kuesioner hasil Sino-nasal Outcome Test-22 (SNOT-22) mengikuti distribusi data normal dalam setiap kelompok intervensi dan karenanya dibandingkan menggunakan dua arah campuran-ANOVA. Variabel kategori dibandingkan antara kedua kelompok menggunakan uji Chi-square atau uji eksak Fisher. Nilai probabilitas
Hasil	Tabel 2 (data distribusi demografis dalam dua kelompok studi): Ada penurunan yang signifikan dalam intensitas nyeri pada VAS pasca intervensi (P = 0,001) di kedua kelompok studi dibandingkan skor pengobatan ulang. Tabel 3 dan 4: Perbedaan antara kelompok pada IQR median menunjukkan kelompok USG lebih efektif daripada kelompok SWD P < 0,001 Tabel 5 dan 6: Untuk ambang tekanan nyeri, kedua kelompok menunjukkan peningkatan yang signifikan pasca intervensi (P = 0,001). Perbandingan antarkelompok skor pasca-intervensi untuk kelompok USG terapeutik adalah 4 dan kelompok SWD adalah 3 dan skor perbedaan menghasilkan nilai yang signifikan secara statistik (P <

	0,001) menunjukkan kelompok USG terapeutik yang menunjukkan peningkatan yang signifikan dalam ambang batas nyeri dibandingkan kelompok SWD. Tabel 7 – 9 : Kualitas hidup yang dinilai oleh SNOT-22 menunjukkan perbedaan yang signifikan antara skor sebelum dan sesudah intervensi untuk kedua kelompok studi. Perbandingan antara kelompok untuk skor pasca-intervensi untuk kedua kelompok studi menunjukkan perbedaan yang signifikan secara statistik (P = < 0,001). SNOT-22 melihat penurunan yang lebih tajam dari pra hingga pasca dalam kelompok ultrasound terapeutik dibandingkan dengan kelompok SWD.
Diskusi	Hasil dari analisis statistik dari penelitian ini mendukung bahwa kedua kelompok eksperimen bermanfaat dan menunjukkan peningkatan yang signifikan secara statistik dalam pengurangan gejala dan terbukti efektif dalam mengobati pasien dengan sinusitis kronis. Namun, kelompok terapi USG menunjukkan peningkatan yang lebih tajam dan lebih cepat dibandingkan dengan kelompok SWD. Pada penelitian ini, usia pasien berkisar antara 18 sampai 50 tahun dengan rata-rata usia kelompok terapi USG 23,09 ± 1,88 dan untuk kelompok SWD 22,65 ± 1,85 tahun yang menunjukkan terjadinya sinusitis kronis terutama terlihat selama dekade kedua kehidupan. Dalam penelitian ini, kelompok USG mengalami penurunan nyeri pasca perawatan yang signifikan. Dengan demikian, terapi USG terbukti lebih efektif untuk rinosinusitis kronis. Temuan juga menunjukkan bahwa kelompok SWD menunjukkan peningkatan yang signifikan dalam penelitian ini. s. Itu berasal dari penelitian bahwa efek SWD atau obat-obatan saja hampir memiliki efek yang sama dalam meredakan gejala, tetapi bila digunakan dalam kombinasi, itu lebih baik. Penurunan gejala yang lebih tajam dan lebih cepat tercatat lebih baik pada kelompok ultrasonografi terapeutik dibandingkan dengan kelompok terapi gelombang pendek. Alasan yang mungkin untuk ini bisa jadi kontak terus menerus probe ultrasound dengan sinus dibandingkan dengan posisi elektroda cakram SWD yang dipertahankan pada jarak tetap.
Kesimpulan	Dengan demikian, penelitian tersebut menyarankan bahwa terapi ultrasound harus dilaksanakan sebagai protokol pengobatan untuk pengobatan individu dengan pasien sinusitis kronis. Implikasi klinis

	dari penelitian ini menyatakan bahwa aplikasi yang berhasil dari USG terapeutik dan SWD dengan penambahan teknik manual telah mengembangkan paradigma baru dalam pengobatan sinusitis kronis, sehingga membantu dalam pengurangan resistensi antibiotik dan meningkatkan manajemen medis dengan pengurangan berikutnya dalam kebutuhan pengobatan.