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Effect of Orofacial Myofunctional Therapy along with BiPAP on Pathophysiological Parameters of Obstructive Sleep Apnea: A Case Study

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ABSTRACT

Background: Obstructive Sleep Apnea (OSA) is an increasingly common form of sleep-disordered breathing (SDB), with an incidence of 15% in men and 5% in women in adults. Itis characterized by repetitive collapse or obstruction of the pharyngeal airway during sleep. OSA is a multi-factorial disorder, where anatomical and non-anatomical factors can contribute to determine different pathophysiological traits. Obstructive sleep apnea (OSA) is the periodic transitory decline (hypopnea) or complete interruption (apnea) of breathing due to reduction or blocking of the upper airway during sleep.
Aim: This study aims to investigate the Effect of Orofacial myofunctional therapy along with BiPAP on pathophysiological parameters of Obstructive sleep apnea.
Case description: A 75 year old male presented with the history of Asthma and Hypertension & Diabetes Mellitus-II. He was diagnosed with Type 2 Respiratory Failure with Obstructive Sleep Apnea with Obesity. Orofacial Myofunctional Therapy (OMT) has been recently introduced as an OSA treatment option for patients with Obstructive Sleep Apnea. A One week exercise programme containing OMT with the routine physiotherapy (Breathing exercises, Active ROM for bilateral upper and lower extremities and functional activities) was given. The Epworth Sleepiness Scale assessing for patient's sleepiness, Pittsburgh Sleep Quality Index (PSQI) used for assessing sleep quality of patient and SPO2 assessing for oxygen saturation levels in the blood. A One week exercise programme effectively improves changes in weak and dysfunctional upper airway muscles.
Conclusion: Our present study concluded that Orofacial Myofunctional Therapy had proven to be effective in patient with OSA with BiPAP.

Keywords: Obstructive Sleep apnea, Orofacial Myofunctional Therapy, BiPAP

INTRODUCTION

Obstructive Sleep Apnea (OSA) is an increasingly common form of sleep-disordered breathing (SDB), with an incidence of 15% in men and 5% in women in adult age and characterized by repetitive collapse or obstruction of the pharyngeal airway during sleep.[2] The clinical picture of OSA may include one or more symptoms, including snoring, nocturnal polyuria, excessive daytime sleepiness, morning headache, fatigue, neurocognitive deficits, personality alterations, reduced libido, irritability, depressive symptoms and anxiety.[1] Excessive daytime sleepiness is frequent and increases the risk of vehicle crashes and occupational accidents. OSA is a multi-factorial disorder, where anatomical and non-anatomical factors can contribute to determine different pathophysiological traits. Hence, understanding the

pathophysiology of OSA is of pivotal importance for choosing the most effective therapy.[1] Orofacial Myofunctional Therapy (OMT) has been recently introduced as an OSA treatment option and consists of isotonic and isometric exercises targeted to oral and oropharyngeal structures with the aim of increasing muscle tone, endurance and coordinated movements of pharyngeal and peripharyngeal muscles. Obstructive sleep apnea (OSA) is the periodic transitory decline (hypopnea) or complete interruption (apnea) of breathing due to reduction or blocking of the upper airway during sleep.[2]

OSA, the most frequent sleep breathing disorder as far as morbidity and mortality are concerned, is a global problem affecting 2–4% of middle-aged adults. It is defined as the presence of pauses in breathing during sleep (apneic and hypopneas pause), lasting for at least 10 s and happening more than five times an hour of sleep, with preserved function of the breathing muscles.[3] It is caused by the collapse of the upper airways during sleep. Nocturnal symptoms typically include snoring, gasping episodes, and breathing pauses leading to transitory hypoxemia and micro-awakening with sleep fragmentation. Patients often suffer from a headache in the morning.[5] The day symptoms include increased sleepiness, falling asleep during monotonous activities, micro-sleep episodes, and impaired cognitive abilities. Left untreated, OSA confers an increased risk of potentially life-threatening disorders. It has been suggested that it is connected to the hypertension, ischemic heart disease, stroke, road traffic accidents, heart rhythm disorders, and premature death. OSA is also an independent risk factor for cardiovascular diseases. Few treatment possibilities are available for OSA.[6] The most commonly used strategy to reduce morbidity and mortality, and to improve the quality of life, is continuous positive airway pressure (CPAP). CPAP effectively reduces OSA symptoms by combining with reduction of snoring, elimination of daytime sleepiness, and improvement in sleep quality. CPAP treatment could significantly reverse OSA-associated hypoxia, sleep fragmentation, sympathetic activation, considerably decreasing the apnea–hypopnea index (AHI), increasing oxygenation, shortening sleep time with oxygen saturation below 90% and thus preventing micro-awakenings, improving daytime functioning, objective and subjective sleepiness and cognitive function.[5] To be effective, the therapy must be prolonged. CPAP can also decrease some OSA consequences, such as cardiovascular and metabolic conditions, leading to lower blood pressure compared with control. CPAP also decreases depressive symptoms and improves cognitive functions.

Studies have also reported improvements in metabolic risks in OSA following treatment with CPAP[2].

PATIENT DESCRIPTION

A 75 year old male resident of a nearby district presented with Asthma since 6 years and Hypertension & Diabetes Mellitus-II since 5 years. The patient started experiencing breathlessness on 16th August 2022 for which his family members directly shifted the patient to the Hospital where the patient was admitted for further investigations and treatment. The patient was then diagnosed with Type 2 Respiratory Failure with Obstructive Sleep Apnea with Obesity. Patient is a known case of Hypertension, Diabetes Mellitus-II and Chronic Obstructive Pulmonary Disease (COPD). As soon as the patient got admitted, he was on BiPAP mode of Mechanical Ventilator with 40% of FiO2, 5cm H2O PEEP. The patient was undergoing a routine physiotherapy treatment which included Breathing Exercises.

Orofacial Myofunctional Therapy (OMT) has been recently introduced as an OSA treatment option for patients with Obstructive Sleep Apnea. Oropharyngeal exercises include face, tongue, soft palate, throat and neck exercises. This consisted of isotonic and isometric exercises targeted to oral and oropharyngeal structures including

lips, tongue, and the soft palate, facial muscle exercises, as well as stomatognathic functions, including suction, breathing, speech, swallowing, and chewing, with the aim of increasing pharyngeal and peripharyngeal muscle tone, endurance, and coordinated movements of tongue.

Table 01: - Description of Orofacial Myofunctional exercises.

Tongue exercises	Push anterior half of the tongue against the hard palate for 5 s, keep the jaw open throughout the exercise, relax the tongue for 8 s, 10 repetitions, three times a day. • Open the mouth widely, try to touch the chin with the tip of the tongue, hold this position for 5 s, place the tongue into the month and relax for 8 s, 10 repetitions, three times a day. • Open the mouth widely, try to touch the nose with the tip of the tongue, hold this position for 5 s, place the tongue into the mouth and relax for 8 s, 10 repetitions, three times a day.
Soft Palate Exercises	Pronounce an oral vowel "A, E, I, O, U" intermittently (isotonic exercise) and continuously (isometric exercise), five repetitions, once a day. • Breath in through the nose, breath out through the mouth, during breath out press the lips together, maintain the blowing for 5 s, five repetitions, three times a day.
Exercises for the cheeks, throat, and neck	Tilt the head back, stick the tongue out and upward ("try to touch the ceiling with the tip of the tongue"), hold it for 5 s, then move the head into an upright position and relax the tongue in the mouth for 8 s, 10 repetitions, once a day. • Tilt the head back, gently bite the tongue and try to swallow once, then move the head in an upright position and relax the tongue in the mouth for 8 s, five repetitions, once a day. • Place the index finger inside the cheek, place the thumb on outside the cheek, pull the cheek outward with the fingers, at the same time contract the cheek muscle to resist the pulling for 5 s, relax for 8 s, 10 repetitions, once a day.
Exercises for lips and jaw	Purse the lips, hold the position for 10 s, relax for 12 s, five repetitions, once a day. • Purse the lips with the mouth wide open, hold the position for 5 s, relax for 8 s, five repetitions, once a day. • Place a hand under the chin, attempt to open the mouth for 5 s, but with the hand pushing against the lower jaw (the task is to stop the mouth opening), relax for 8 s, 10 repetitions, once a day.

RESULT

To study the effects of OMT in OSA two scales were used in the study.

1. The Epworth Sleepiness Scale and the Pittsburgh Sleep Quality Scale. The Epworth Sleepiness Scale is widely used in the field of sleep medicine as a subjective measure of a patient's sleepiness. The test is a list of eight situations in which you rate your tendency to become sleepy on a scale of 0, no chance of dozing, to 3, high chance of dozing. When you finish the test, add up the values of your responses. Your total score is based on a scale of 0 to 24. The scale estimates whether you are experiencing excessive sleepiness that possibly requires medical attention.
2. The Pittsburgh Sleep Quality Index (PSQI) is arguably the most popular index to measure sleep quality, often used in studies on insomnia and related conditions.
3. The third parameter was the measure of oxygen saturation levels in the blood i.e. SPO2.

SCALES	PRE	POST
ESS	17/24	09/24
PSQI	08	05

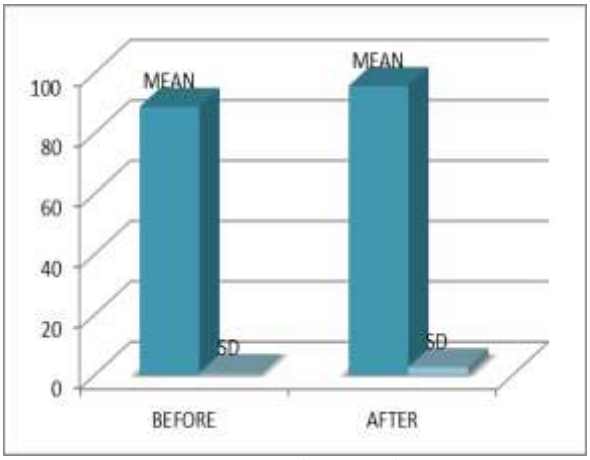
Table 02: The PRE-POST scores of the scales

SPO2:

We assessed SPO_2 everyday before and after the physiotherapy treatment protocol of 7 days.

SPO_2	**BEFORE**	**AFTER**
MEAN & SD	88.8+0.60	95.7+2.62

Table 03: - SPO_2 readings before and after the physiotherapy treatment.



Graph no. 01 - SPO_2 readings before and after the physiotherapy treatment.

DISCUSSION

The purpose of this study was to know the effect BiPAP with the OMT on OSA severity on sleep quality in a newly diagnosed patient with OSA. This is one of a handful case study evaluating the effects of OMT in Obstructive Sleep Apnea.

OMT is a treatment modality applied to subjects with orofacial myofunctional disorders (OMDs), that is, with changes in the orofacial structure, in the cervical musculature, or both, which may interfere with the development or functioning of orofacial structures and functions. OMT is based on exercises and other strategies that favor sensitivity, proprioception, mobility, coordination, and strength of orofacial structures, as well as promote an appropriate performance of respiration, mastication, deglutition, and speech. In 1990, the American Speech and Hearing Association first recognized the role of the speech-language pathologist in providing services to persons with OMD, and the knowledge and skills required to evaluate and treat OMD were later described. However, the starting point in the development of OMT was the recognition that the correction of malocclusion requires equilibrium of orofacial muscles[5]

The decrease in snoring and daytime sleepiness may result from improvements in muscle responsiveness, UA muscle gain, and subsequent reductions of inspiratory flow limitations and arousals. Stomatognathic exercises also enable the coordinated recruitment of different compartments of tongue and other pharyngeal muscles and probably eliminate bidirectional tongue movements typical of OSA. OMT may also improve the coordinated action of pharyngeal and peripharyngeal muscles, improve chewing, speech, breathing, and swallowing functions in OSA patients, thus improving quality of life. Therefore, the purpose of the investigation was to study the effects of oropharyngeal and facial exercises with BiPAP in OSA.

Unfortunately, treatment options for OSA remain imperfect. Although CPAP is effective when applied, much of its benefits go unrealized in practice due to low adherence. Other treatment possibilities, such as oral appliances and surgery of the upper airway, only incompletely decrease OSA severity, produce many adverse effects, and their particular effects on OSA health consequences are not well established. From this point of view, it may be beneficial to add an active treatment approach focused on exercise training and oropharyngeal exercises to BiPAP treatment with the aim of changing the patient's behavior to improve his/her physical and psychological condition. Nevertheless, there are not enough studies focused on the effect of the combination of BiPAP treatment with rehabilitation treatment.

CONCLUSION

Obstructive sleep apnea (OSA) is a common disease which impacts quality of life, mood, cardiovascular morbidity, and mortality. Continuous positive airway pressure (CPAP) is the first-line treatment for patients with moderate to severe OSA. As studies of OMT on BiPAP is very few, the present study aimed at effects of OMT in OSA patient on BIPAP.

In recent years, OMT for the treatment of patients with OSA has represented a new path in the fight aiming at the minimization or cure of a disease with serious consequences. The results of few studies, have shown that OMT is effective for the treatment of adult patients with mild and moderate OSA and with primary snoring. It is also effective in children with residual apnea. In addition, it provides benefits such as an improved quality of life and increased adherence to BiPAP. This study concluded that Orofacial Myofunctional Therapy is effective in patient with OSA with BiPAP and the above protocol can be successfully implemented in management of OSA patients with BiPAP.

Declaration by Authors

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