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Effects of active static stretching in a patient with COPD after complication by COVID-19, case report.

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ABSTRACT

Background: COPD, called Chronic Obstructive Non-transmitted Pulmonary Disease, is a disease that causes severe sequelae in the respiratory system, which in combination with other types of viruses such as covid-19 aggravates the disease, with major effects on the locomotor system due to saturation instabilities. The main victims of the disease are elderly smokers and ex-smokers of both sexes. In more severe cases, there is a need for continuous treatment with oxygen therapy, limiting the quality of life and physical activity of the elderly. **Objective:** Physical activity is an alternative non-pharmacological treatment to help the recovery of the individual with severe COPD, minimizing the complications of the disease. **Method:** The study aims to describe the case of a 77-year-old elderly man, ex-smoker for 17 years, with severe sequelae post COPD-19 in the respiratory system, dependent on oxygen therapy for great instability of mean saturation below 70%, with reflexes on the locomotor system, having difficulties in locomotion. In this case, to keep him active, active static stretching exercises were proposed for five consecutive days. **Results:** After five consecutive days of active stretching, the results were positive, increasing saturation by an average of 1.75%, reaching 89.79% without the help of oxygen therapy, which was enough to reduce dyspnea, wean him off oxygen therapy, and improve his mobility and quality of life. **Conclusion:** that active static stretching is beneficial for severe cases of COPD, minimizing complications and reducing the use of oxygen therapy.

Keywords: Chronic Obstructive Pulmonary Disease. Muscle Stretching Exercises. Smoking. COVID-19.

BACKGROUND

Chronic Obstructive Pulmonary Disease (COPD) is a combination of chronic lung diseases that limit lung function, and breathing difficulties caused by inflammation in the lungs with loss of elasticity and alveolar loss[1]. COPD has become a significant public health problem in Brazil and the world[1], leading on average to 40,000 individuals to death between both sexes, regardless of age[2], with most of these deaths occurring among the elderly, for breathing difficulties[3]. COPD is associated with chronic non-communicable diseases (NCDs) such as heart disease, hypertension, stroke, and diabetes[4]. No risk of transmission by any type of contact[1]. The common symptoms of COPD are excessive production of mucous secretion, coughing, dyspnea, and fatigue. Other characteristics of the disease are physical disability with reduced strength, especially of the lower limbs (LL) resulting in loss of functional mobility[5]. It is explained that 70% of people with COPD have weakness in the quadriceps, making it difficult for them to stay in biped and locomotion due to insecurity[6]. All related problems are mainly caused by cigarette addiction[2-7]. COPD has smoking as its main attacker[2,3,7,8], along with contact with other viruses that cause respiratory complications, such as severe acute respiratory syndrome due to coronavirus 2 (SARS-CoV-2) cataloged as Coronavirus -19 (COVID-19)[7,9,10]. It has a high rate of COPD worsening[4].

COVID-19 has a high degree of mortality among people with excessive alcohol consumption and smoking[7,9,10]. The main feature of SARS-CoV-2 is the acute respiratory complication of dyspnea[4-7]. The smoker and ex-smoker have a strong contribution to the increase in respiratory complications by COVID-19[7]. People who smoke and or with a history of smoking have a risk of death up to 14 times higher, when compared to a non-smoker[4].

In milder cases, COPD generates only early fatigue in the affected, while in more severe cases there is a physical limitation and in more severe cases there is continued dependence on the use of Oxygen Therapy (Oxy), to help to breathe[11] and increase saturation. Oxy dependence caused by respiratory limitations and low saturation generates a logistical problem of transporting oxygen cylinders[11], reducing functional mobility to perform simple activities of daily living (ADL), and may become dependent on instrumental activities of everyday life (IADL)[12]. When it reaches the point of dependence on others, the affected person has a limitation in the practice of physical activity, further weakening the health of the elderly. The combination of equipment and supplies logistics and their physical incapacity creates more excellent isolation and, as a consequence, reduces their quality of life and health, in addition to increasing the level of sedentary lifestyle[11].

The quality of life of an elderly person is measured according to their ability to move around and perform their ADLs and IADLs, in short, their self-care and self-organization within and outside their living environment.

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The senescence process generates great physiological changes that are normal over the years, requiring a constant and continuous practice of physical activity to maintain ADL and IADL[12]. In this sense, the practice of physical activity is fundamental for all human beings but extremely necessary for the elderly to maintain their health and perform ADLs and IADLs[12,13]. However, in severe cases of COPD and the use of Oxy, the practice of physical exercises is almost impossible[6]. However, even in these circumstances, it is necessary to perform physical activity to improve the physical condition of the person with the disease, and physical exercise can minimize respiratory discomfort and also improve muscle function[6].

In this context, this article aims to describe the case of a patient diagnosed with post-covid-19 aggravated COPD to assist in her treatment through active static stretching exercises, minimize her sedentary lifestyle, and reduce the complications caused by the disease.

REPORT

The report involves an elderly man aged 77 years and 9 months, height 1m and 63cm, weighing 69 kg, BMI of 25.97, a former smoker for 17 years, not dependent on Oxy, with no history of physical activity, only services locksmith clamps. The participant was selected non-randomly.

A week before his hospitalization, the elderly man had a cold and mild fever, was taken to the Emergency Care Unit (ECU) in São Miguel, and was medicated. As the symptoms were mild, he was released to continue with home treatment. However, a week after the treatment, in the morning he was found on the floor by his son and grandson, without the strength to get up and short of breath.

In a new appointment at the São Miguel ECU, there was a suspicion of diagnosis for COVID-19, and thus he was referred to the Hospital de Campanha do Anhembi. Still, on the way to the hospital, he was intubated in the ambulance because he had severe dyspnea, and was hospitalized for 16 days due to covid-19, confirmed by tests.

The elderly already had a history of mild COPD sequelae caused by smoking, however, without prejudice to their routines and dependence on Oxy. However, after contagion by covid-19, the sequelae of COPD worsened, with severe acute respiratory infection of the lower respiratory tract. The saturation of the elderly reached less than 65%, with oxygen dependence and primary hypertension (high blood pressure - greater than 140/90 mmHg).

After recovering from COVID-19, his saturation was unstable and could not be released immediately due to his dependence on mechanical oxygen, his release was only carried out after family members confirmed the mechanical oxygen support for home treatment with oxygen therapy, and requested that he practice the same. some type of physical activity with a physical education professional.

Criteria for home oxygen therapy

In mild cases, patients are discharged from the hospital after the treatment of COVID-19 is completed, but in the case of the participant, said discharge was conditioned to the existence of Oxy at home, due to the instability of its saturation after infection with the disease.

The use of Oxy at home is indicated when the blood pressure of oxygen (PaO2) is < 55 mmHg or pulse oximetry (SatO2) ≤ 88%[14]. In the case of our participant, according to the doctor on the day of release, PaO2 was recorded at 36.3 mmHg and SatO2 at 82.4%.

CIDs Attached to your release to request Oxygen Therapy.

ICD 10: I10 Essential hypertension, also called primary hypertension, is high blood pressure (greater than 140/90 mmHg) without any identifiable cause.

ICD 10 J44.0 Chronic Obstructive Pulmonary Disease with Acute Respiratory Infection of the Lower Respiratory Tract – Diseases.

ICD 10 - B34.2 Coronavirus infection of unspecified location.

Physical activity

As mentioned above, physical activity is a relevant factor for people affected by COPD regardless of the stage of the disease, and physical activity can reduce the complications caused by the disease. COPD, in addition to its respiratory complications, affects the lower limbs, those affected by the disease feel weakness and insecurity in their legs, increasing their physical limitations. Given these limitations, it needs an activity that is easy to adhere to, such as active static stretching. Stretching, in addition to maintaining flexibility in general, improves the elderly's gait, generating more mobility, and firmness of the lower limbs, thus reducing fall rates. Stretching is an adaptive activity, zero cost, safe, and can be applied anywhere[14].

Stretching exercises have been growing in the

area of clinical health, showing that stretching generates benefits, not only in flexibility but also in circulation. The aging process generates physiological changes in all systems of the human body, such as loss of flexibility, muscular resistance, muscular strength, aerobic resistance, and physical conditioning.

Gallo et al. 2012[15] reported in their study, positive benefits with the protocol of time of 3 series of stretching per follow-up, with a duration of 30 seconds of execution for 30 seconds of pause, positive a significant improvement in the locomotor system, showing improvement of the flexibility, strength, and increase of conditioning. In addition to such muscle benefits, stretching shows positive responses in the circulatory system[16]. The capillaries over the years tend to become more sinuous, making it difficult to oxygenate the periphery, leading to an early increase in fatigue, as well as in the levels of a sedentary lifestyle in the elderly[16]. Such alterations can be benefited by stretching, through stretching this capillary sinuosity tends to reduce, facilitating peripheral oxygenation and decreasing fatigue, improving oxygenation, stabilizing saturation, and decreasing sedentary lifestyle.

METHODS

The research was carried out using a cross-sectional descriptive methodology, which covers the area of clinical health and physical activity, to analyze the case report and the possible effects of active static stretching in patients with COPD aggravated after COVID-19.

This is a case report, approved by the Ethics Committee for Research on Human Beings of EACH/USP, 46001221.0.0000.5390.

The literary search was carried out through digital sources of scientific databases, including: SciELO, ScienceDirect, Bireme and Google Scholar.

The participant agreed and signed the Free and Informed Consent Term (ICF), certifying that he/she is in agreement with all the experimental procedures adopted in the present study and being ready to practice stretching.

Sample

The participant was selected in a non-randomized way, which consists of a retired elderly person, active and independent in their daily activities, a former smoker for 17 years, not dependent on Oxy, with no history of physical activity, only manual services of a locksmith, for initiation of physical activity.

After leaving the Hospital, the medical orientation was to practice physical activity, accompanied by a Physical Education Professional. The professional explained to the elderly person how the exercises would be applied, and he reported continuous discomfort in the knees and shoulders, weakness in standing up, difficulties in breathing, even with oxygen, difficulties in speaking, and very difficult mobility. During the interview, his saturation was constantly being monitored by a portable digital oximeter device Contec and ranged from 72, 75 to 77%, depending on his movement and speech[13].

Considering the scenario, a program of active static stretching exercises with some adaptations was proposed, for five consecutive days at nine o'clock. The five exercises were adapted and organized so that the elderly remained seated most of the time and only one foot could be adapted. As a pre-intervention, the timed up and go test to assess their mobility, Borg scale for perception, effort, and monitoring of saturation daily pre and post, assisted intervention and after 12 hours unassisted, every 2 hours[12,14,16-18] until 20:00 hours so as not to disturb your sleep routine. The measurement was performed on the index finger of the left arm resting on the thigh and the same always in the sitting position.

The active static stretching exercises applied were:

1. Triceps: the participant in the sitting position, raising the arm, flexing the elbow behind the head with the other hand supporting the flexed elbow, performing traction;
2. Shoulder adduction: the participant in the sitting position, performing adduction of the extended arm, horizontally in front of the body, with the support of the other hand on the extended elbow, performing traction;
3. Hip: the participant in the sitting position, crosses one leg over the other, supporting the foot on the other thigh and with the support of the hands on the knee, pulling towards the body;
4. Posterior thigh: the seated participant supports one of the legs extended on a chair and projects the body forward;
5. Quadriceps: the participant in the initial standing position, raises the leg supporting the foot on the chair and with the hand parallel to the leg, pulls the leg.

Exercises number 4 and 5 in this case undergo minor adaptations, requesting the help of a chair as support for their execution. Therefore, in the first session, it was not possible to perform exercise number 5 (five) due to difficulties in staying bipedal, being only possible from the second session onwards, since the

timed up and go test to assess their motor functional capacity was not possible, their physical conditions did not allow for a zero score. The participant, even with the help of Oxi, was feeling tired, his pre-intervention saturation was 81% and post-intervention 91% positive.

The planning of the program and protocol was carried out according to their physical conditions, which were too weak for the application of other types of activities, such as walking and other strength exercises. Therefore, five active static stretching exercises were applied to the main joints most used in daily life, such as shoulders, hips, and knees (which reflect on the ankles), with a conventional protocol of 3 sets of 30 seconds of tension per follow-up, with 30 seconds of pause, justified protocol model[15].

The intervention program was carried out from Tuesday to Saturday on the balcony of the elderly person's house, its saturation was measured pre and post-training and during the day every 2 hours until 20:00, during the program, the perception of effort was measured, and to assess mobility and agility the timed up and go test.

All exercises were applied at the volunteer's residence for your convenience.

RESULTS

After one week of data collection, a basic descriptive statistical analysis was performed, comparing the data between the beginning and the end of the intervention.

At the end of the study, the results were positive with saturation stabilization, in addition to a 1.75% increase in saturation, when compared to the beginning of the program, and with a reduction in the use of Oxy, which is considered a significant improvement for the participant. which reduced the logistics of getting around with the devices and without feeling short of breath during locomotion. Despite this evolution being minimal, it managed to "wean" from oxygen.

The timed up and go test at the end of the program was 12.52 seconds, slightly above the ideal rate, the average for ages 70 to 79 under normal conditions is 9.2 seconds[17], but much better when compared at the beginning of the program, remaining with a score of 0 (zero) for not having the physical conditions to perform the test and due to the logistics of the Oxi equipment and physical conditions.

The effort scale was initially used with maximum difficulty scores and throughout the week with a positive progression of decline in the scale, with an average of 6.4.

Its saturation remained stable near the end of the program as shown in Figure 1, that is, the program managed to stabilize the saturation and reduce the use of Oxi throughout the week, with an average saturation between 89/90% without the use of the Oxi as shown in Figure 2, improving musculoskeletal and respiratory function, quality of life and health.

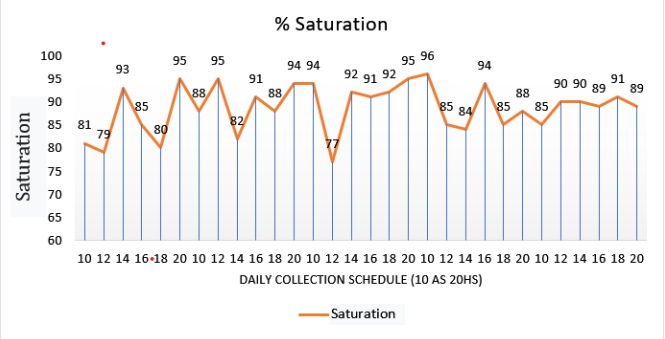

Figure 1. Behavior of saturation, in the post-intervention period, collected every 2 hours (10 am to 8 pm) of each day.

The daily saturation line by time shows us that from the beginning, in the middle of the program, the saturation showed a large oscillation with a minimum of 77% and a maximum of 95%, reaching the end of the program showing a positive improvement, with a minimum oscillation of 84% and a maximum of 96%.

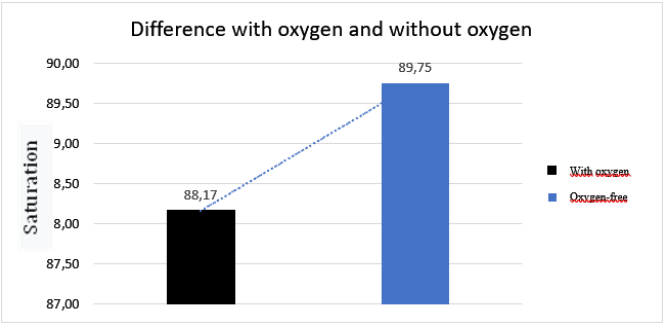

Figure 2. Comparative response of the mean difference of the period with oxygen and without oxygen, with a trend line showing an increase

The participant's saturation levels. Periods of collection by oximeter, always comparing a previous time to the next, where the use or non-use of Oxy was observed. A positive response is observed with a trend line projecting a strong rise with most post-intervention periods without Oxy. The collections were carried out based on daily measurements by period and analysis of lower saturation with Oxy in relation to without Oxy at the end of the study. The mean saturation with oxygen therapy was 88.17% and without oxygen therapy it was 89.75%.

DISCUSSION

The above report describes a current and common situation of people recovered from covid-19 and suffering from serious complications of COPD, mainly smokers and ex-smokers according to our participant. The observations carried out show that active static stretching brings positive benefits to patients with severe Oxy-dependent COPD due to its ease. Stretching is a very important tool for severe cases of Oxy-dependent COPD, with the need to practice physical activity to accelerate recovery. Stretching exercises are simple exercises, without locomotion complications, coordinating, adaptive, with zero cost, facilitating adherence to the practice, bringing a positive response of increasing the response of the circulatory system, and increasing saturation.

Saturation is an indicator of circulatory health of oxygenation, indicating that there is no obstruction of the respiratory system, circulating oxygen to the peripheral ends of the body. When saturation is low, the arrival of oxygen limits mobility, reduces aerobic resistance and strength, increasing sedentary lifestyle due to physical disability and reducing the quality of life of the affected person. With advancing age and physical inactivity, the capillaries may present stiffening and sinuosity, making it difficult and increasing the strength of projection, circulation, and oxygenation in the extremes of the body.

According to Kruse[16] and collaborators (2017), stretching has an internal action of stretching not only the musculature, tendon, and joint, resulting in improved joint flexibility, but also in the stretching of the capillaries, reducing the sinuosity, facilitating the circulation and oxygenation of the extreme parts of the body. body by raising saturation, and placing stretching as a key exercise in aiding against disease. In one week of stretching, the participant obtained an improvement in saturation. A possible explanation for the improvement obtained by the participant of the present study, after a week of stretching, the capillaries reduced their sinuosity, facilitating peripheral oxygenation, and increasing saturation.

The study by Donrawee et al. (2009)[19], the only real sample with COPD and the need for respiratory assistance by machines, identified respiratory benefits by keeping their saturation stable at 85%, and concluded that exercise was efficient, but they were unable to wean from ventilatory devices. Differently from the study presented above, more extensive stretching exercises were performed, involving the whole body and during one week there was the stabilization of saturation, which no longer required oxygen.

According to Barros et al. (2017)[18], 28 samples of former smokers of both sexes and over 40 years of age, all with COPD were divided into two groups, intervention with chest respiratory physiotherapy with chest stretching of the muscles of direct aid in breathing such as trapezius, sternocleidomastoid, scalene, pectoralis major and intercostals for 20 min and a control group. At the end of the study, the intervention was positive in just one session, improving respiratory capacity and saturation of the intervention group when compared to the control.

In the present study, despite only 1 (one) ex-smoker participant, the physical conditions were more debilitating, a situation aggravated by COVID-19 with severe COPD, the same, after a week of stretching, obtained significant improvements in saturation, stopping using Oxi and going back to performing their previously impossible home activities, showing that stretching brings positive benefits, but what would be interesting would be a greater number of participants.
Unlike the studies mentioned above with respiratory physiotherapy, Lottermann et al. (2017)[15], carried out a systematic review that, within their inclusion and exclusion criteria, raised 13 articles.

The 13 related articles showed the following modalities: 1 exercise bike article, 1 mixed circuit (walking, bike and resistance), 2 Tai chi qigong, 1 resistance training, 1 tai chi chuan, 1 mixed training (aerobic and resistance exercises), 2 mixed training (aerobic + resistance plus respiratory physiotherapy), 1 walking, 1 interval, 1 aquatic and 1 a mixed (land and aquatic aerobic).

Within the related articles, all stated that a physical exercise program, whatever it is, can improve the quality of life and reduce the symptoms of the disease. Regardless of the exercise, all are beneficial, but there are cases and cases that in many of them, there are no conditions for the practice, as shown in the case report presented above, making it necessary to seek alternative and efficient activities, as an example of the present study, stretching active static was very efficient in the response to saturation and mobility of patients in severe stages.

In summary, Donrawee et al. (2009)[19] and Lottermann et al. (2017)[15] state that the practice of any physical exercise can benefit people with COPD, reducing symptoms and improving the quality of life of patients with the disease.

CONCLUSION

The study concluded that active static stretching was efficient in respiratory recovery, stabilizing its saturation and improving mobility, even with saturation below the 95% threshold, it increased when compared to the beginning of the study and remained stable, reducing thus the use of Oxy, with the participant performing their ADL without the use of Oxy and performing most of the IADL, with only one daily stretching intervention for five days.

The improvement in saturation, although small, around 1.75%, reaching 89.79% without the help of Oxi, is enough to reduce dyspnea, weaning from Oxi, improving their mobility and quality of life.

We can also conclude that stretching goes far beyond muscle joint flexibility, and can be recommended for people with mild to severe COPD, as an initial activity for those affected who need to practice physical activity without physical mobility conditions.

The report was limited only to stretching, but a longitudinal follow-up would be interesting to analyze its progression and behavior to other types of activities and with a greater number of participants.

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