

Increased exercise capacity after a flexibility session in a patient with partial pulmonary lobectomy: case report

Aumento de la capacidad de ejercicio tras una sesión de flexibilidad en paciente con lobectomía pulmonar parcial: reporte de un caso

Santiago Larrateguy^{1,2,3,4}, Nicolas De Carlo^{1,2}, Luis Larrateguy², Johana Dabin^{1,2}, Sebastian Wustten⁵, Noelia Balla¹.

1. Hospital de la Baxada de Paraná, Argentina.

2. Centro Privado de Medicina Respiratoria de Paraná, Argentina.

3. Universidad Adventista Del Plata, Argentina.

4. Universidad de Montemorelos de Mexico.

5. Hospital San Martin de Paraná Argentina.

ABSTRACT

Introduction: Partial lobectomy is one of the surgeries chosen in the early stages of some diseases such as lung cancer. After thoracic surgeries or some respiratory diseases, both hard and soft structures undergo changes that lead to stiffness, lack of mobility, changing the mechanics and the correct respiratory pattern. **Case presentation:** A 75-year-old female patient entered the pulmonary rehabilitation program of the “Hospital de la Baxada” at Paraná, Entre Ríos, Argentina; referred to by a lower left lobectomy due to lung cancer. **Treatment and evolution plan:** The patient attended the pulmonary rehabilitation program, for 6 weeks she trained varying the load. We observed a significant change in recovery, compared at the minute of completing the first test the dyspnea was 4 and in the second test 3, the patient told us that after the flexibility session she felt she was able to breathe normally. **Conclusion:** In the case presented, the application of flexibility techniques increased exercise capacity.

Key-words: Cancer, Flexibility, Pulmonary Rehabilitation.

RESUMEN

Introducción: La lobectomía parcial es una de las operaciones elegida en estadios tempranos de la enfermedad como cáncer del pulmón. Frente a determinadas situaciones como cirugías torácicas o algunas patologías respiratorias, tanto estructuras duras como blandas sufren cambios que llevan a la rigidez, pérdida de movilidad, alterando la mecánica y el correcto patrón respiratorio. **Presentación de caso:** Paciente femenina de 75 años ingresó al programa de rehabilitación pulmonar del Hospital de la Baxada de Paraná, Entre Ríos, Argentina; derivada por una lobectomía inferior izquierda debido a un cáncer pulmonar. **Plan de tratamiento y evolución:** La paciente asistió al programa de rehabilitación pulmonar y durante 6 semanas entrenó variando diversas características de la carga. Observamos un cambio significativo en la recuperación, comparando al minuto de haber finalizado el primer test la disnea era de 4 y en el segundo test una de 3, esto fue acompañado por el relato de la paciente, comentando que luego de la sesión de flexibilidad ella sentía estar con mayor capacidad para tomar aire. **Conclusión:** En el caso presentado, la aplicación de técnicas de flexibilidad aumentó la capacidad de ejercicio.

Palabras clave: Cáncer, Flexibilidad, Rehabilitación Pulmonar.

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Correspondence: Santiago Larrateguy, 25 de Mayo 99, E3103XAF Libertador San Martín, Entre Ríos, Argentina.
E-mail: santilarra@gmail.com.

Introduction

Partial lobectomy is one of the surgeries chosen in the early stages of some diseases, such as lung cancer, which involves removing the affected lung lobe [1].

Facing certain situations such as thoracic surgeries or some respiratory diseases, both hard and soft structures undergo changes that lead to stiffness, lack of mobility, changing the mechanic and the correct respiratory pattern. Among the changes mentioned we can find the retraction of myofascial chains such as the inspiratory, the suspensory and the shoulder anterointernal chain, among others.

Our accessory inspiratory muscles are thorax suspensors, are tonic and have the tendency to retract [2]. This condition creates an increase in expiratory time that ends up in air trap and hyperinflation.

This situation is increases during the exercise and produces a dynamic hyperinflation with a transitory increase of the lung volumes that has important mechanical repercussions. As a consequence, dyspnea is increased and exercise capacity is limited [3,4].

Flexibility training is present in both Argentinian [5] and International Pulmonary Rehabilitation Guidelines [6], but there is no scientific evidence about the changes that the daily training of this one causes in patients with respiratory diseases with exercise capacity. The aim of this case report is to inform the influence of flexibility training into exercise capacity.

Case presentation

A 75 years old female patient was admitted to the pulmonary rehabilitation program of “Hospital de la Baxada” in Paraná, Entre Ríos, Argentina; referred to by a lower left lobectomy due to a lung cancer. The patient had Dyspnea grade 3 according to the modified Medical Research Council Scale (mMRC). The spirometry performed after the surgery showed the following values: Forced Expiratory Volume (VEF1) 1.54L (77%), Forced Vital Capacity (FVC) 1.91L (79%), VEF/FVC 80.6. She performed a 6 Minutes Walking Test (6MWT) according to the American Thoracic Society criteria. She walked 340 meters, with 95% as a lower oxygen saturation value, and a dyspnea grade 4 according to the Borg Modified Scale.

Treatment plan and evolution

The patient attended the pulmonary rehabilitation program for 6 weeks, and trained varying loads. During the next 6 weeks she got through a stagnation period, without being able to increase intensities or improve the timing on her training program due to her dyspnea.

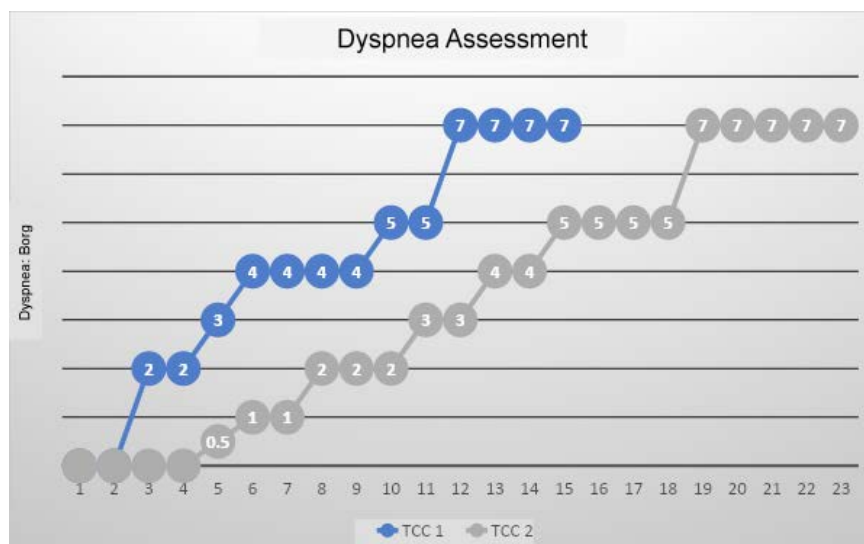
The patient was observed having both shoulders up during the walking march, sign of suspensory chain retraction, and because of that, it was decided to change the treatment strategy applying new techniques previously the training.

The first intervention was to perform a constant work rated exercise test (CWRET) at 3.2 km/h (80% of maximum aerobic speed in the incremental

test). The result was a time limit (Tlim) of 813 seconds, at the end, the patient perceived a dyspnea of 7 measured with the modified Borg scale, SpO₂ of 96% and a heart rate (HR) of 98bpm. A minute after finishing, the patient reported dyspnea 4.

The patient was summoned at 72 hrs for a new CWRET, but after 20 minutes of flexibility work was performed, using the principles of re-education of myofascial chains performing the frog posture to the floor, emphasizing the work of the suspensory, inspiratory and shoulder anterointernal chain. The CWRET was immediately performed at 3.2km/h and ended with a Tlim of 1270 seconds and a dyspnea of 7, a SpO₂ of 97% and a HR of 94 bpm, at the minute of recovery the patient had dyspnea of 3 a SpO₂ of 97% and a HR of 89bpm.

Graph 1 shows how the perception of dyspnea progresses much slower in the second test than in the first, thus achieving a longer test time. If we make a comparison at isotime (last minute elapsed that both CWRET matches), the patient reported a dyspnea of 7 and in the second test a dyspnea of 4. In Figure 1 we can see an improvement in the suspensory chain and alignment of the inspiratory chain correction and shoulder anterointernal chain.



Graph 1. Evolution of dyspnea measured by modified Borg Scale during both Constant Load Test



Figure 1. Postural evaluation

Table I. Behavior of HR, saturation and perception of effort during stress testing

Date 29/11/19				Date 2/12/19			
Time(min)	SpO2	HR(bpm)	Borg	Time	SpO2	HR	BORG
0	97	88	0	0	97	85	0
1	96	92	0	1	96	96	0
2	94	102	2	2	96	100	0
3	95	100	2	3	96	96	0
4	95	97	3	4	97	98	0,5
5	95	95	4	5	96	97	1
6	95	97	4	6	97	100	1
7	96	96	4	7	96	97	2
8	96	100	4	8	97	92	2
9	95	100	5	9	97	99	2
10	96	101	5	10	97	95	3
11	95	102	7	11	96	97	3
12	96	101	7	12	97	100	4
13	96	99	7	13	96	89	4
13.33	96	98	7	14	97	90	5
				15	96	90	5
				16	97	94	5
				17	97	91	5
				18	98	95	7
				19	97	92	7
				20	97	94	7
				21	97	94	7
				21.10	97	94	7
Post 1	97	88	4		97	89	3
Post 2	97	83	3		98	75	1
Post 3	97	85	2		98	74	0
Post 4	98	86	1		98	75	0

Discussion

We observed a significant change in recovery (table I), compared at the minute of having finished the first test the dyspnea was 4 and in the second test was 3. There were no changes in the SpO₂ that are clinically relevant, since the patient did not present any type of alteration in both tests.

The patient managed to walk 457 seconds more, exceeding the clinically meaningful difference of 100 seconds [7], ending with the same dyspnea as in the first test. A possible weakness of the study is not having a continuous walk test CWRET at after a week to see the evolution of the patient. The patient was given an instruction with home exercises to perform daily.

According to our knowledge this is the first report in which flexibility training improves exercise capacity in a patient with partial lobectomy measured by a CWRET. None of the tests were developed with adverse events, and the patient did not have difficulty in treadmill, because she was trained in the use of it. A blind evaluator was present at the study, and the patient was unaware of the objective of the study.

Due to these findings, we should investigate whether these changes continue with these home exercises and for how long. More studies are required to specify the ideal flexibility work times to be applied routinely in pulmonary rehabilitation programs. In addition, randomized clinical studies are necessary so that what we observe here can be proven.

Conclusion

In the case presented, the application of flexibility techniques reduced the subjective perception of effort for the same workload and increased exercise capacity in a patient referred to by a left lower lobectomy due to lung cancer.

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