Manual Therapy, Posturology & Rehabilitation Journal
formerly REVISTA TERAPIA MANUAL

CASE REPORT

http://dx.doi.org/10.17784/mtprehabjournal.2015.13.233

Influence of method Thoracic-Abdominal Rebalance on parameters cardiorespiratory in patients with cystic fibrosis

Influência do método reequilíbrio tóraco-abdominal sobre parâmetros cardiorrespiratórios em pacientes com fibrose cística

Leandro Marques da Silva[1], Elizângela de Sousa Monteiro[1], Bruno Silva Miranda[2], Clesio Rafael Lopes da Silva[3], Anne Shirley Menezes Costa[1]

ABSTRACT

Introduction: Cystic fibrosis (CF) is a genetic, systemic disorder characterized by generalized dysfunction of exocrine glands, with chronic progressive evolution. The Thoracic-Abdominal Rebalancing (TAR) aims to encourage ventilation and promote the removal of pulmonary secretions. **Objective:** To evaluate the influence of TAR on cardiorespiratory parameters in CF patients. **Method:** This is an exploratory retrospective study of case series, which involved eight patients with CF, of both sexes, aged 3-24 years, who underwent TAR. Records of information was extracted on the identification, age, gender, time of diagnosis and general clinical status, as well as the data of the cardiorespiratory parameters: Heart Rate (HR), Respiratory Rate (FR), blood pressure (BP) and Saturation peripheral oxygen (SpO2), before and after each service. To compare the values, we used the parametric Student t test for paired samples, with statistical significance level of p = 0.05. **Results:** Male gender was prevalent in 62.5% of the sample analyzed. The mean age was 12.12 ± 7.20 years. The median time to diagnosis was around 10.11 ± 5.48 years. Comparing the total average values, verified a decrease of BP and HR variables after the completion of the TAR. However, no statistically significant difference, since there was obtained, respectively, p = 0.097 / p = 0.062. However, the RR showed a significant decrease (p = 0.012) and SpO2 (p = 0.030), which showed an increase after the implementation of the method. **Conclusion:** The TAR may influence the cardiorespiratory variables in CF patients, is showing to be a safe technique and of great importance in the treatment of these patients.

Keywords: Physical therapy modalities; Respiratory therapy; Cystic fibrosis. Resumo

RESUMO

Introdução: A fibrose cística (FC) é uma afecção genética, sistêmica, caracterizada por uma disfunção generalizada das glândulas exócrinas, de caráter evolutivo crônico e progressivo. O Reequilíbrio Tóraco-Abdominal (RTA) tem por objetivo incentivar a ventilação pulmonar e promover a remoção de secreções pulmonares. **Objetivo**: Avaliar a influência do RTA sobre os parâmetros cardiorrespiratórios de pacientes com FC. **Método**: Trata-se de um estudo retrospectivo exploratório do tipo série de casos. No qual participaram oito pacientes com FC, de ambos os sexos, na faixa etária de 3 a 24 anos e que realizaram RTA. Foram extraídas informações de prontuários quanto à identificação, idade, gênero, tempo do diagnóstico e quadro clínico geral, assim como os dados dos parâmetros cardiorrespiratórios: Frequência Cardíaca (FC`), Frequência Respiratória (FR), Pressão Arterial Média (PAM) e Saturação Periférica de Oxigênio (SpO2), antes e após cada atendimento. Para a comparação entre os valores, utilizou-se o teste paramétrico de t de Student para amostras pareadas, com nível de significância estatística de p≤0,05. **Resultados**: O gênero masculino foi predominante em 62,5% da amostra analisada. A média de idade foi 12,12±7,20 anos. O tempo médio de diagnóstico foi em torno de 10,11±5,48 anos. Na comparação entre os valores médios totais, verificou-se uma diminuição das variáveis PAM e FC` após a realização do RTA. Contudo, sem diferença estatística significativa, uma vez que se obteve, respectivamente, p=0,097/ p=0,062. Em contrapartida, a FR apresentou uma diminuição significante (p=0,012), assim como a SpO2 (p=0,030), a qual evidenciou um aumento após a execução do método. **Conclusão**: O RTA pode ter influência sobre as variáveis cardiorrespiratórias em pacientes portadores de FC, evidenciando-se como uma técnica segura e de suma importância no tratamento destes pacientes.

Palavras-chave: Modalidades de fisioterapia; Terapia respiratória; Fibrose cística.

Corresponding Author: Leandro Marques da Silva. Avenida Centenário, nº 3267. Bairro Aeroporto. Zip Code: 64006-700, Teresina–PI, Brasil. E-mail: leandromks16@hotmail.com

[1]Universidade Estadual do Piauí (UESPI), Teresina (PI), Brazil.

Full list of author information is available at the end of the article.

Financial support: This study received funding support by the institutional program of cientific initiation scholarship of Universidade Estadual do Piauí (PIBIC-UESPI).

Submission date 13 January 2015; Acceptance date 14 April 2015; Online publication date 24 April 2015

INTRODUCTION

Cystic fibrosis (CF), or mucoviscidosis, is a genetic disease, systemic, monogenic with an autosomal recessive pattern of inheritance.[1] The disease is characterized by generalized dysfunction of the exocrine glands, chronic and progressive evolution, which compromises the functioning of virtually all exocrine organs that produce and excrete secretions.[2]

CF is most common in Caucasians, affecting 1 in 2,500 live births in Caucasian populations.[3] In Brazil, the estimated incidence of the disease to the population of the southern region is closer to the Central European Caucasian population (1/2,000 to 1/5,000 live births), while in other regions this estimate is reduced to 1/10,000 live births.[4]

The gene affects the onset of CF is located on the long arm of chromosome 7, and encodes a protein called the cystic fibrosis transmembrane regulator (CFTR) gene, responsible for chlorine transport into the cell. The presence of two alleles with mutations in the gene causes lack of activity or partial functioning of the CFTR.[5] The diagnosis of CF can be made from an examination suggestive of neonatal screening, immunoreactive trypsin dosage (ITR) positive or presence signs and symptoms of the disease. The gold standard for diagnosis is the sweat test with sodium and chlorine.[6]

The dysfunction of the CFTR protein causes a reduction in chlorine excretion, and consequently, water, and increased electronegativity of the cell. By this process occurs dehydrate mucous secretions and increased viscosity, favoring the obstruction of the ducts of the exocrine glands,[7] contributing to the appearance of chronic obstructive pulmonary disease, high levels of electrolytes in sweat, pancreatic insufficiency with poor digestion/absorption and consequent secondary malnutrition, diabetes mellitus, liver disease and impairment of male and female reproductive system.[8]

Respiratory complications are the leading causes of mortality and morbidity. The involvement of the respiratory system is progressive and variable intensity, showing a decrease in pulmonary function over time. The clinical course is determined by decreased mucociliary clearance and bacterial infections with consequent inflammatory process, predisposing to sinusitis, bronchitis, pneumonia, bronchiectasis, fibrosis and respiratory failure.[9,10] The treatment aims to keep the lungs clear, through aerosols and respiratory therapy, and good nutritional status through supplementation of nutrients.[11]

Children with CF have an altered breathing pattern as excessively using the accessory muscles, such as sternocleidomastoid, scalene, pectoralis, trapezius, and others. Usually they also have tidal volume and vital capacity decreased, perform a shallow breathing and have a higher oxygen consumption and therefore a greater respiratory work. And among the physical therapy resources used in the treatment of these patients is the Thoracic-Abdominal Rebalancing (TAR) method recommends that the dysfunction and respiratory diseases are muscular, postural, occupational and sensorimotor sequelae.[12]

The TAR is a technique that aims to encourage ventilation and promote the removal of pulmonary secretions and upper airways, through the reorganization of respiratory muscle synergism, re-educating the work of breathing that is overloaded in lung diseases. It is based on positioning, mobilization of costovertebral and costochondral joints, muscle stretching, manual support to increase intra-abdominal pressure and myofascial release techniques.[12-14]

Thus it tries to improve justaposicional component between the diaphragm and ribs, improve synergy respiratory and increase the tone and strength of the respiratory muscles. Thus, these muscles can play effectively their inspiratory and expiratory functions with increased tidal volume, improved lung compliance and gas exchange, decreased airway resistance, facilitating the unblocking process and pulmonary re-expansion.[15]

The objective of this study was to evaluate the influence of Thoracic-Abdominal Rebalancing method on cardiorespiratory parameters in patients with Cystic Fibrosis.

METHODS

This is an exploratory retrospective study of case series, which aims to address quantitative aspects of medical records of patients with CF. Data collection was carried out in the respiratory therapy sector of the integrated ambulatory Governador Dirceu Mendes Arcoverde do Hospital Getúlio Vargas (HGV), Teresina-PI.

Patients with confirmed clinical diagnosis of CF were selected by the sweat test and/or heel prick, admitted to the respiratory therapy sector of the integrated ambulatory Governador Dirceu Mendes Arcoverde, from January 2007 to January 2013 period, both gender, aged 3 to 24 years who underwent physical therapy treatment of Thoracic-Abdominal rebalancing in the period. The research were excluded those with any other associated pathology, which contained incomplete data in their records and those who did not meet the inclusion criteria.

We first carried out the analysis of the records to verify the possibility of inclusion in the trial, from the above criteria. After selecting these were extracted information regarding the identification, age, gender, time of diagnosis, the frequency of visits and overall clinical picture. Then appealed to the physiotherapy developments, were selected for further analysis, only those containing complete information for the exclusive service by TAR method. After reviewing the records of physiotherapy developments were extracted data from cardiorespiratory parameters: heart rate (HR), respiratory rate (RR), blood pressure (BP) and Peripheral Oxygen Saturation (SpO2) before and after each service.

The physiotherapists who performed this treatment method were trained in the application of it and had ample practical experience. The handling was oriented by the respiratory pattern, auscultation and postural pattern of each patient. The sessions lasted an average of 50 minutes each, and consisted

primarily of proper positioning, stretching the ilio-costal space, paraspinal muscles and accessories; strengthening global and respiratory muscles, thoracic-abdominal support, lower abdominal support and myofascial maneuvers.

Children were positioned supine in bed and elevated head to 30°, and the physical therapist stood at the bedside, with the base of the enlarged feet and elbows bent at 90° for the implementation of handlings of the TAR. In thoracoabdominal support hands of physiotherapist were imposed on your lower chest and upper abdomen, with part of the fingers reaching the ribs with performing a gentle traction ribs down during exhalation, and kept in inspiration. In abdominal support, pressure was applied to the lower abdomen during inspiration, won by the child's diaphragm without the use of accessory muscles of inspiration. For the ileum-costal support, held up a slight pressure on the lateral aspect of the chest and abdomen, also maintained during inspiration.

The study was guided by the ethical principles involved in research with human beings, and followed the rules of Resolution No. 422/12 of the Conselho Nacional de Saúde (CNS), which are provided for references of autonomy, non-maleficence, beneficence and justice, preserving the identity of the individual participant. The project was approved by the Universidade Estadual do Piauí (Via Plataforma Brasil), as protocol nº 79991. Upon approval, it was requested the release of access to medical records, the medical director of HGV (trustee of the charts), to carry out the data collection.

The data of assessments and evolutions were recorded on a standardized form and transferred to an Excel worksheet. Then were calculated by descriptive statistics, the mean and standard deviation of the variables. To compare the pre and post-service, we used the parametric Student t test for paired samples. In all analyzes, it adopted the level of significance of 5% (p = 0.05).

RESULTS

The sample of this study was composed of eight CF patients. Of these, five (62.5%) were male and three (37.5%) were female, with a mean age of 12.12 ± 7.20 years. They were performed on average 12 attendances, recorded only those containing all complete data. The average time from diagnosis of CF was 10.11 ± 5.48 years.

Table 1 shows the individual cardiorespiratory data, the averages before and after conducting the TAR. It is observed that two patients had an increase in BP after applying the method, five declined and one remained the initial value. Regarding HR, two patients showed increased later to TAR and six decreased. As for RR, a patient showed an increase and seven showed a decrease of this variable. Regarding SpO2, it is noted that parameter was increased from six patients with a diminished and remained with the initial value.

Comparing the overall averages, there was a decrease in BP and HR variables after performing the TAR. However, no statistically significant difference, since there was obtained, respectively, p = 0.097/p = 0.062. In contrast, RR showed a significant decrease (p = 0.012), as well as SpO2 (p = 0.030), which showed an increase after conducting method (Table 2).

Table 1. Individual means of cardiorespiratory parameters before and after the calls by the method TAR.

CASE	BP (mmHg)		HR (bpm)		RR (ipm)		SpO2 (%)	
	Before	After	Before	After	Before	After	Before	After
1	82	83	91	94	28	29	90	92
2	77	74	115	112	25	22	93	91
3	86	86	84	82	25	24	91	94
4	87	85	93	84	26	25	92	94
5	92	94	95	90	23	21	92	92
6	90	89	110	101	21	20	95	97
7	86	84	95	94	23	22	89	91
8	89	87	80	83	22	21	92	93

Subtitle: BP: mean arterial pressure (mmHg / mm of mercury), HR: heart rate (bpm/beat per minute), RR: respiratory rate (ipm/breaths per minute), SpO2: peripheral oxygen saturation (%/percentage). Source: Author data.

Table 2. Descriptive analysis with mean and standard deviation of cardiorespiratory parameters before and after all the care protocol.

	Before	After	p (unilateral)
RR	24.12±2.29	23.00±2.92	0.012*
HR	95.37±11.89	92.50±10.25	0.062
BP	86.12±4.76	85.25±5.70	0.097
SpO2	91.75±1.83	93.00±2.00	0.030*

Subtitle: RR: Respiratory rate; HR: Heart rate; BP: Blood Pressure; SpO2: peripheral oxygen saturation; *Statistical significance analyzed by the Student t test (P <0.05). Source: Author data.

DISCUSSION

The average of the CF diagnosis time of the analyzed patients was much higher than the national average, as data released by the Registro Brasileiro de Mucoviscidose (REBRAM) revealed that the average age of diagnosis in Brazil is around 4.5 years. This contrasts with the reality of developed countries such as Canada, where about one in every 3,600 live births has CF; and 60% of these are already diagnosed in the first year of life.[16]

It shows the gap in the CF diagnostic confirmation in Brazil, especially in this state. And this delay in making the diagnosis may be due to overlapping signs and symptoms of common diseases of our environment, such as chronic diarrhea, malnutrition and lung infections; added to this there is little knowledge of the disease by health professionals and the general population.[16]

The World Health Organization has emphasized the importance of early diagnosis, through the creation of diagnostic and treatment centers for CF with a multidisciplinary team; of neonatal screening to determine the incidence and identification of affected newborns; Implementation laboratories for identification of the CF mutations; establishment of a national registration and disclosure on this condition to health professionals, public authorities and the general population.[16]

These measures are important in order that the early diagnosis is important for prophylaxis of pneumonia, and pancreatic enzyme replacement in the pancreatic insufficient, improving nutrient absorption in order to maintain good nutritional status, reducing the resulting complications disease and increasing survival.[17]

The above results show a decrease in the RR of CF patients after they underwent the TAR. This is due to the improvement of the breathing pattern and ventilation from the performance of the procedures of the method, since this promotes a decrease in tachypnea, respiratory distress and excessive use of accessory muscles of respiration, clinics manifestations common in CF patients.[18]

The maneuvers of the TAR, as the thoraco-abdominal support, ileum-costal and abdominal; by stretching, strengthening and proprioceptive stimulation, increase the tone and strength of respiratory muscles, improve the juxtaposition area between the diaphragm and ribs and the synergism between chest and abdomen.[18] In turn, the maneuver inspiratory aid, consisting in elevation of the rib cage during inspiration increases transpulmonary pressure, and therefore the alveolar tidal volume. There is also the stimulation of the diaphragm breathing pattern by increased abdominal pressure.[13]

In addition to decreasing the RR after the TAR, also obtained decreasing HR. And this is justified by the decrease in CF patients, respiratory overhead after running the method. Evidenced by the improved respiratory pattern after performing the above maneuvers. Thus, there is a lower metabolic rate and lower demand for oxygen and energy substrate from the circulatory system; as well resulting in decreased HR.

In an analytical descriptive study conducted at the neonatal ICU of a public hospital with newborn risk under special care, analyzed the HR, RR and SpO2 before, during and after the maneuvers of the TAR. Data analysis used the descriptive and inferential statistics (ANOVA repeated measures) and adopted the significance level of 5%. Statistically significant differences were found in HR ($p = 0.001$), FR ($p = 0.002$) and Sp02 ($p = 0.001$) before, during and after the maneuver.[19] A statistically significant decrease after application of the RR method TAR, confirms the results found in this study.

There was also a decrease in BP after treatment. With regard to the movement is interesting to note that applied stimuli, either on the heart, it's about the vessels (arterioles), imply the change in blood pressure, since the pressure is determined at every moment, the dynamic balance between input and the arterial blood system output: the entry is regulated by the heart cardiac output (CO) = stroke volume (SV) x heart rate (HR) and the output controlled by the degree of constriction of arterioles (RP) determining arteriolar flow.[20]

Therefore, the blood pressure is determined by the CO and the RP (BP = CO x RP), and thus a decrease in heart rate, with the unchanged peripheral resistance causes a decrease in blood pressure.[20] And that's what probablyIt happened in the present study, in which the reduction of HR after performing the TAR, may have been responsible for the decrease in BP.

Regarding SpO2, it is important first to note that in patients with CF is the distortion of the rib cage during inspiration, and this produces a paradoxical breathing, which leads to increased diaphragmatic work, which needs to contract more to keep ventilation at appropriate levels. During execution of the TAR in turn achieves the ileo-supporting rib, which applies a large pressure loads, without this interfering with bloating during the inspiratory phase. The ileum-costal support is responsible for stimulating the diaphragm, thus improving their performance, with consequent improvement in oxygenation and decreased work of breathing, reflecting directly on increasing SpO2.[21]

In a descriptive study type series of cases, carried out with 10 children with gastroesophageal reflux disease, we evaluated cardiorespiratory parameters, such as the SpO2; before (T1), immediately after (T2) and 15 minutes after (T3), the application of TAR. Upon completion of the technique, SpO2 increased from T1 (95.30 ± 2.71) to T2 (97.70 ± 1.16), with T3 value higher than before the TAR (97.60 ± 1.65). Therefore, the above findings are in line with the results of the study.[22]

The analysis of cardiorespiratory parameters are often used to assess the severity of the respiratory condition, determine pipelines and auxiliary health staff in monitoring the progression of the disease. To better investigate the impact that physical therapy method on cardiorespiratory parameters suggest the clinical trials and randomized controlled, involving

larger samples, to detect the effects of the method not only in CF, but also in other chronic pulmonary diseases.

CONCLUSION

After analyzing all the findings, it appears that the RTA method may influence the cardiorespiratory variables in CF patients, as it decreases the HR, the BP and siginificativamente the RR, as well as increases SpO2.

These findings also suggest that the applied techniques are not harmful to patients, since they did not show cardiorespiratory instability after performing the maneuvers. Thus, the RTA is evident as a method of paramount importance in the treatment of CF patients.

AUTHORS CONTRIBUTION

LMS: Design and development of the project, ESM: Data collection, BSM: Data processing, CRLS: Data Interpretation, ASMC: Supervision and critical analysis.

COMPETING INTERESTS

The authors declare no conflicts of interest.

AUTHOR DETAILS

[2] Universidade Ceuma, São Luís (MA), Brazil. [3] Centro Universitário Uninovafapi, Teresina (PI), Brazil.

REFERENCES

1. Caldrer S, Verzè G, Johansson J, Sorio C, Angiari C, Buffelli M, et al. Challenging the diagnosis of Cystic Fibrosis in a patient carrying the 186-8T/C allelic variant in the CF Transmembrane Conductance Regulator gene. BMC Pulmonary Medicine. 2014;14(44):1-7.
2. Coelho CC, AquinoES, Almeida DC, Oliveira GC, Pinto RC, Rezende IMO, et al. Análise comparativa e reprodutibilidade do teste de caminhada com carga progressiva (modificado) em crianças normais e em portadoras de fibrose cística. J Bras Pneumol. 2007;33(2):168-174.
3. Pizzignacco TP, Mello DF, Lima RG. A experiência da doença na fibrose cística: caminhos para o cuidado integral. Rev Esc Enferm USP. 2011;45(3):638-44.
4. Chaves CRMM, Oliveira CQ, Britto JAA, Elsas MICG. Exercício aeróbico, treinamento de força muscular e testes de aptidão física para adolescentes com fibrose cística: revisão da literatura. Rev Bras SaúdeMatern Infant. 2007;7(3):245-250.
5. Marson FAL, Bertuzzo CS, Ribeiro AF, Ribeiro JD. Polymorphisms in the glutathione pathway modulate cystic fibrosis severity: a cross-sectional study. BMC Medical Genetics. 2014;15(27):1-17.
6. Halpern A, Mancini MC. Tratado de clínica médica. São Paulo: Roca, 2006, 5464p.
7. Gomide LB, Silva CS, Matheus JPC, Torres LAGMM. Atuação da fisioterapia respiratória em pacientes com fibrose cística: uma revisão da literatura. Arq Ciênc Saúde. 2007;14(4):227-33.
8. Rosa FR, Dias FG, Nobre LN, Morais HA. Fibrose cística: uma abordagem clínica e nutricional. Rev Nutr. 2008;21(6):725-737.
9. Morrow BM, Argent AC, Zar HJ, Westwood AT. Improvements in lung function of a pediatric cystic fibrosis population in a developing country. J Pediatr. 2008;84(5): 403-409.
10. Tomaiuolo G, Rusciano G, Caserta S, Carciati A, Carnovale V, Abete P, et al. A New method to improve the clinical evaluation of cystic fibrosis patients by mucus viscoelastic properties. Plos One. 2014;9(1):1-13.
11. Prasad SA, Tannenbaum E, Mikelsons C. Physiotherapy in cystic fibrosis. J R Soc Med. 2000;93(38):27-36.
12. Roussenq KR, Scalco JC, Rosa GJ, Honório GJS, Schivinski CIS. Reequilíbrio tóraco-abdominal em recém-nascidos prematuros: efeitos em parâmetros cardiorrespiratórios, no comportamento, na dor e no desconforto respiratório. Acta Fisiatr. 2013;20(3):118-123.
13. Ruppenthal JB, Groisman S, Azevedo M, Moura M, Hoff F, Lima MP. Técnicas de terapia manual torácica através do método Reequilíbrio Tóraco-Abdominal (RTA) melhoram a ventilação pulmonar em pacientes ventilados mecanicamente. Ter Man. 2011;9(42):102-107.
14. Zanchet RC, Chagas AMA, Melo JS, Watanabe PY, Barbosa AS, Feijó G. Influência do método Reequilíbrio Toracoabdominal sobre a força muscular respiratória de pacientes com fibrose cística. J Bras Pneumol. 2006;32(2):123-9.
15. Ribeiro IF, Melo AP, Davidson J. Fisioterapia em recém-nascidos com persistência do canal arterial e complicações pulmonares. Rev Paul Pediatr. 2008;26(1):77-83.
16. Neto NL. Fibrose Cística Enfoque Multidisciplinar. Florianópolis: Secretaria de Estado da Saúde, 2009, 688p.
17. Pinto ICS, Silva CP, Britto MCA. Perfil nutricional, clínico e socioeconômico de pacientes com fibrose cística atendidos em um centro de referência no nordeste do Brasil. J bras pneumol. 2009;35(2):137-143.
18. Coelho R, Assumpção MS, Gonçalves RM, Mondo JMNS, Schivinski CIS. Lactentes cardiopatas submetidos aos apoios do método Reequilíbrio-Tóraco-Abdominal. Ter Man. 2012;10(48):154-160.
19. Netto ART, Rocha LTS, Gadelha MSN, Lins TC, Silveira LB, Barros SEB, et al. Efeito dos apoios do metodo reequilibrio toracoabdominal sobre os sinais vitais em recem–nascidos de risco. Assobrafir Ciência. 2012;3(supl):1-102.
20. Guyton AC, Hall JE. Tratado de Fisiologia Médica. Rio de Janeiro: Elsevier, 2006, 1115p.
21. Martins R, Silva MEM, Honório GJS, Paulin E, Schivinski CIS. Técnicas de fisioterapia respiratória: efeito nos parâmetros cardiorrespiratórios e na dor do neonato estável em UTIN. Rev Bras Saúde Matern Infant. 2013;13(4):317-327.
22. Anelise ZA, Paloma LFP, Lilian GKR, Schivinski CIS. Efeitos imediatos do reequilíbrio tóraco-abdominal em crianças com doença do refluxo gastroesofágico – relato de série de casos. ConScientiae Saúde. 2012;11(4):607-617