87 - PHYSIOTHERAPY IN THE MECHANICAL VENTILATION WEANING PROCESS: REVIEW ON BRAZILIAN LITERATURE

THAINE CRISTINA GARLET;
MAURÍCIO PEREIRA BRANCO
Centro Universitário Unifacvest, Lages, SC, Brasil
Universidade do Sul de Santa Catarina, Tubarão, SC, Brasil
thaigarlet@yahoo.com.br

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INTRODUCTION

The mechanical ventilation weaning (MVW) is defined as a moment of transition that goes from the mechanical support to the spontaneous ventilation in patients that remain under MV for a period longer than 24 hours. (JOSÉ, 2013). However, Mont'Alverne, Lino, Bizerri (2008) report that the process of weaning has its beginning when the patient is submitted to mechanical ventilation.

Colombo (2007) emphasizes that the weaning process can be divided in three phases: weaning during ventilation, extubation and supplementary oxygen weaning. Usually, the first phase has its beginning with the gradual decrease of the ventilator support until the patient has reached complete ventilatory independence. The second phase consists in the removal of the oxygen prosthesis with oxygen supplementation when necessary. And the last phase is characterized as a gradual weaning from supplementary oxygen.

In the III Brazilian Consensus Conference on Mechanical Ventilation, the recommendation of physiotherapy in the Mechanical Ventilation Weaning process received grade A. This result is due to studies that attest that a protocol of weaning and a daily screening for the spontaneous ventilation test realized by a physiotherapist result in satisfactory outcome. (JOSÉ, 2013).

Mont'Alverne, Lino and Bizerri (2008), emphasize that the process of weaning when conducted correctly is going to result directly in patient's evolution, for it will promote a decrease in the duration not only of the weaning process, but also in the duration of mechanical ventilation, in a reduction of tracheostomies and reintubation, and, consequently, it will increase the number of lives saved.

Numerous studies on the use of Physiotherapy in mechanical ventilation weaning process have been realized, however these studies do not conclude clearly the techniques and the effects of Physiotherapy used during the process. This review aims to analyze the physiotherapeutic techniques and their effects on the weaning process

METHOD

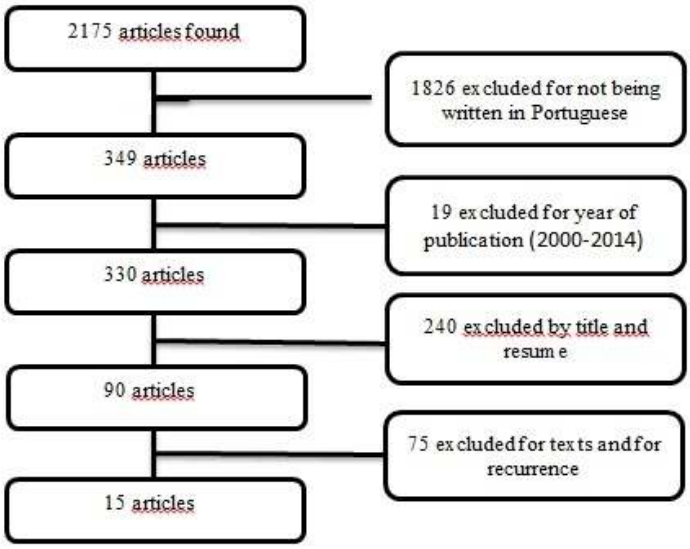
Literature study review, where SciELO and LILACS data bases were consulted, between May and June of 2014, using the key words: “weaning”, “mechanical ventilation” and “Physiotherapy”. As a criterion of inclusion complete and free articles published in Portuguese between January of 2000 and May of 2014 were considered. The key words were combined in different manners to filter recurrent articles.

All articles containing the key words were selected. Then, the articles were sorted out by their original language, and only those published in Portuguese were considered. Posteriorly, the articles were sorted out by year of publication and by titles. Those that did not mention the research topic were excluded. The resumes were the next item for exclusion. At last, the articles were integrally read in order to include the selected.

RESULTS

2175 articles were found, and after the sorting process, only those that addressed themes related to Physiotherapy techniques and their effects on mechanical ventilation weaning were considered. Table 1 shows a flowchart with the researched articles

Picture 1 – Flowchart Articles



Out of the articles found, only 15 served the criterion of inclusion, being considered for this review. Table 1 shows the analysis on the main aspects of the articles.

Table 1 – Analysis on the selected articles

Author/ Year	Objective	Method	Results and Conclusions
Pires et al (2000)	To verify if the RMT contributed for the success on weaning from MV.	Random study with patients on MV for a term longer than a week with weaning considered difficult.	There was an increase in the RMS that contributed for the weaning process and for the decrease in the number of deaths and in the weaning recurrence.
Antunes, Rugolo, Crocci (2003)	To evaluate the effect of prone position on the respiratory stability in preterm infants, during MV weaning and on the evolution of the weaning process.	Clinical prospective and random study realized in neonatal ICU for a term of eleven months.	There was no difference in the RF, HR, OSAT, however desaturation periods were more frequently found in supine position. In prone position group, ventilatory settings decreased and reintubation was less frequent.
José et al (2003)	To evaluate the effects of physiotherapy on MV weaning process.	Transversal and controlled study with adult patients submitted to physiotherapy.	Physiotherapy was associated to the improvement in the result of the weaning process, reduction in the duration of the process, MV and hospitalization in the ICU. There was no difference in the duration of the hospitalization and mortality.
Costa, Rieder, Vieira (2004)	To analyze respiratory variations during the weaning process using T intubation techniques and pressure support and compare them between cardiac and non-cardiac patients	Study with cardiac and non-cardiac patients submitted to two weaning techniques.	There was a better response in the respiratory parameters and in the oxygenation with the use of pressure support, and no significant differences in the cardiovascular parameters.
José et al (2006)	To evaluate the efficiency of NIMV to revert ARI after extubation and promote an increase in success rates in MV weaning process.	A prospective and transversal study. NIMV was applied in patients that showed ARI after extubation.	76% obtained success and posterior intensive therapy service discharge. It was concluded that NIMV applied in patients with ARI was a safe and efficient resource in avoiding reintubation.
Oliveira et al (2006)	To evaluate the effects of the application of a MV weaning protocol in an ICU.	Prospective and case-controlled study evaluating the evolution of MV through a prestabilished protocol.	Success was achieved in 91% of the cases. MV weaning process realized according to the standards promoted improvement in its evolution, keeping a high success rate with low mortality rate.
Colombo et al (2007)	To evaluate the implementation of weaning protocols and compare them to T-tube and pressure support + PEEP.	Prospective and random study applied in 120 patients under MV for a period longer than 48 hours.	Success in extubation was achieved in 90,83% of the cases. The implementation of protocols and standardization reduced reintubation rates in the ICU, decreased duration in the hospitalization and mortality. No statistic differences were found between the methods.
Mendes et al (2008)	To evaluate weaning process and decannulation with interdisciplinary protocol. Relate values in ventilatory measures to the success and to the average time for decannulation	A preliminary descriptive study with an elaborated flowchart exemplifying step-by-step process of decannulation with interdisciplinary intervention.	Weaning and decannulation processes in tracheostomized patients become safer and more efficient when there is interdisciplinary participation; Data on the current study are still preliminary and point out to the necessity of new studies in a larger population.
Mont'Alverne, Lino, Bizerri (2008)	Characterize the variability of methods and criterion used to obtain MV weaning parameters.	Research on surveys applied to physiotherapists in ICU's in six hospitals (three public and three private hospitals).	Tobin index and MIP, were more frequently used in private hospitals, with a percentage of 100% and 89,5%, respectively. In the ventilatory mode, T-tube was the most common whether in private or public hospitals.
Lima et al (2010)	To evaluate the influence of peripheral MS and other indexes on the success of decannulation.	Observational study of the promptuaries of patients hospitalized in an ICU.	Muscular strength and leucocyte count on the day of decannulation influenced on the outcome at the removal of the tracheostome.
Nozawa et al (2011)	To investigate the effects of seated position, in ventilatory and hemodynamic parameters, in patients under MV for a prolonged period.	Clinical and random assay with patients in their post-surgical period from cardiovascular surgery.	There were no differences in hemodynamic and gasometrical variations and in the forced vital capacity, minute volume and air tidal volume. However there was an increase in the MIP in the intervention group. The procedure has proven to be safe.
Berti et al (2012)	To evaluate the effect of MHI combined to ETC in the duration of the hospitalization in the ICU and in the duration of the MV in patients under MV.	Clinical and prospective assay, randomized and controlled with patients in the ICU under MV.	There was positive effect in the duration of the MV, ICU discharge and Murray score. The results showed that the combined use of HM and ETC for 5 days accelerated the weaning process and the ICU discharge.
Ibrahim et al (2012)	To evaluate the use of NIMV in tracheostomized patients with prolonged weaning.	Observational retrospective study, by means of collecting of data from promptuaries.	76,9% had ICU discharge and 53,8% had hospital discharge. The NIMV connected to tracheostomy has shown to be an alternative for the weaning from MV and ICU discharge.
Malagoli et al (2012)	To verify the influence of the position of the preterm NB over RMS, RF and oxygenation.	Transversal study with paired sample of intubed NB in final process of MV weaning.	Lower levels of MIP have been observed, and increased O2 saturation in prone position when compared to supine position. RF did not show variation between the two mentioned positions.
Meireles et al (2012)	Characterize the main strategies and parameters adopted in the MV weaning.	Transversal study with physiotherapists working in three ICU's for adult patients.	Main parameters: reduction in the tidal volume e desaturation in aspiration. 67,9% alternate CPAP and T-tube and 50% reduction of the pressure support as a strategy.

Legend: ICU (Intensive Care Unit), MH (Manual Hyperinflation), ETC (Expiratory Thoracic Compression), PEEP (Positive End-expiratory Pressure), MIP (Maximum Inspiratory Pressure), ARI (Accurate Respiratory Insufficiency), RMS (Respiratory Muscular Strength), NB (Newborn), RF (Respiratory Frequency), MS (Muscular Strength), respiratory muscle training (RMT).

The analysis of the articles has shown varied studies, listing a range of physiotherapeutic techniques applied and resulting in satisfactory outcomes. In his study, José et al (2003), used a sample of 61 patients split in a group of Physiotherapy

that received the protocol of Physiotherapist care, and a control Group, that received usual medical care. The protocol was composed by techniques of abrupt thoracic compression, manual hyperinflation, tracheal and upper airways aspiration, passive and active assisted exercises and monitoring and conduction of the MV weaning process. The results of the study have shown the increase in the number of successful outcomes in the weaning process, reduction in the time of the weaning process, in the duration of use of MV and in the hospitalization in the ICU. In the studies of Berti et al (2012), the effect of manual hyperinflation (MHI) combined to expiratory thoracic compression (ETC) in the duration of the hospitalization in the ICU and in the duration of the MV was evaluated. With sample of 35 patients, sorted in Physiotherapy Groups (PG) and Control Group (CG), it could be noticed that the intervention had positive effect in the duration of the MV and in the number of ICU discharges.

Meireles et al (2012), interviewed 58 patients about the strategies and parameters adopted in the MV weaning process. Amidst the main parameters, a reduction in the tidal volume in 46,4% and desaturation during aspiration in 30,4% were found. As a strategy adopted for the MV weaning process, 67,9% of the physiotherapists confirm the use of CPAP and T-tube and a reduction of 50% in pressure support. Já Mont'Alverne, Lino, Bizerril (2008), questioned 44 physiotherapists about the variability of the methods and the criteria used to obtain the parameters of MV weaning process in six hospitals (three private and three public hospitals). The parameters evaluated have routinely shown differences among the hospitals according to Tobin index and the MIP, as being the most frequently used in private hospitals, with a percentage of 100% and 89,5%, respectively. About the ventilatory modality used to obtain the parameters for the MV weaning, T-tube was the most frequently used in both, private and public hospitals.

Antunes, Rugolo, Crocci (2003), elaborated a study with 42 preterm infants, with weight lower than 2.000g, under MV in their first week of life. The babies were split in two groups: supine and prone position, in the beginning of the weaning process. There was no difference between the groups regarding to the respiratory frequency, heart rate and oxygen saturation. However, in the prone position group, the ventilatory parameters were reduced more quickly and the necessity of reintubation was less frequent. In turn Malagoli et al (2012), observed 45 children with respiratory distress syndrome, all at gestational age inferior to 34 weeks, intubed, in final process of MV weaning and noticed that in prone position, the values of oxygen saturation have shown to be higher and the values of MIP were lower. As for the respiratory frequency, the values were similar in both positions.

The study of Nozawa et al (2012), investigated the seated position in adult patients under a prolonged MV period in relation to the ventilatory and hemodynamic parameters. Hemodynamic, arterial gasometrical, respiratory muscular strength and ventilometry values were measured, in two different moments, with and interval of 30 minutes. In the control group, the evaluations were realized in bed with the head of the bed inclined at 30º. In the intervention group, the first evaluation was realized in bed (30º) and the second one, 30 minutes after changing position to seated position at an angle of 90º. The only difference noticed was in the MIP, where there was a significant increase in the control group.

Costa, Rieder and Vieira (2004), submitted 20 patients to T-tube and pressure support techniques. Oxygenation, elimination of CO2, respiratory and heart frequency, tidal volume and minute volume, blood pressure and electrocardiographic alterations were evaluated. Data were registered at zero, 15 and 30 minutes. Comparing the techniques, a better response was observed in the measure of the respiratory and oxygenation parameters with the use of pressure support, with no significant differences in the measure of cardiovascular parameters. In both modalities of MV weaning, there was a lower occurrence of tachycardia, higher occurrence of alteration in the ST segment and tendency to a higher occurrence of arrhythmia in patients with heart condition.

José et al (2006), applied noninvasive mechanical ventilation (NIMV), in patients with ARI after the extubation, continuously until the signs of ARI had disappeared. The duration of the use of NIMV was of 8 +- 5 hours, PSV used was of 12 +_2 cmH2O, PEEP of 7 +_ 2 cmH2O, FiO2 of 40% +_ 20%, Vte of 462 +_ 100 mL, RF of 26 +_ 5 rpm. Among the patients submitted to NIMV, 76% had successful outcome in the process of weaning and posteriorly received ICU service discharge. The studies of Ibrahim et al (2012), collected data from promptuaries, and observed 26 patients who were ventilated with the spontaneous mode using a NIMV equipment connected to the tracheostomy cannula. After the realization of the tracheostomy, the patients remained, on average, 29,8 days under MV and, after the beginning of the protocol with the tracheostomized patients, 53,5 days in NIMV with noninvasive ventilation portable ventilators connected to the

tracheostomy until the time for the hospital discharge, weaning from the noninvasive ventilation or death during the hospitalization in the ICU or in the hospital.

Mendes et al (2008), analyzed the steps in the weaning and decannulation of tracheostomized patients, following a protocol proposed by a group composed by Physiotherapists and Phonoaudiologists. Ventilatory measures and complications in the weaning process were compared to the success and to the duration of the decannulation. Data from MIP and MEP, vital capacity and peak cough flow were evaluated. The population presented in the beginning of the weaning process, an average value for the peak cough flow of 174,74 l/min, all patients that passed through decannulation presented MIP > -30c0H2O. In the current study, the measures of MIP and MEP have not shown to be effective in the analysis of the data as predictors of success.

Pires et al (2000), in a study with 45 patients under MV for a period longer than one week and difficult weaning process, investigated the difference in the evolution of the parameters for the Maximum Respiratory Pressure (MIP and MEP), tidal volume, minute volume, Tobin index and oxygenation index in patients under MV submitted to a respiratory muscle training (RMT) and compared two types of RMT. Group 1, was submitted to a RMT with adjustment of the sensibility of the ventilator. Group 2, participated in a RMT with the use of the threshold and group 3 was not submitted to RMT. For the RMT a respiratory resistance value of 40% of the MIP was used, obtained in the continued clinical evaluation. The protocol consisted of two sessions a day, for which five series of ten inspirations were realized. Results have shown no difference between groups G-1 and G-2 in most part of the sessions, however these groups differed from G-3. There was an increase in the MIP, MEP, TV, PaO2/FiO2 and MV decreased in G-1, Tobin index decreased in patients from G-1 and G-2 and increased in patients from G-3. With an increase in the RMS, there was a contribution for the weaning process and the reduction in the number of deaths and recurrence.

Lima et al (2010), analyzed promptuaries, and evaluated the influence of the peripheral muscular strength and other indexes over the success in decannulation. Besides collecting personal data, diagnoses, duration and complications in MV, data collected from the evaluation of the respiratory muscle strength (MIP and rapid shallow breathing index) and peripheral (score according to the Medical Research Council – MRC), leucogram and arterial gasometry on the day of decannulation were also evaluated. Out of the 57 patients from the sample, 46 evolved with success, showing a link between peripheral muscle strength and success in the weaning process.

Colombo et al (2007), evaluated the implementation of a protocol of weaning and compared two distinct methods of weaning. In the phase of pre-extubation the patient was evaluated in order to decide whether to start the weaning process. When the patients evolved to weaning, they were divided in two groups that used distinct methods: pressure support + PEEP (PSV) and T-tube method. Similar evolution was found in both groups and by the analysis of the Qui-square test, there are advantages in using weaning protocol. Out of the 120 patients, 109 evolved with success in the extubation, without necessity of NIMV within a

period of 24 hours. Oliveira et al (2006), also analyzed the efficiency of the weaning protocols, observed the use of a protocol of weaning from MV in an ICU during a year, prestabilished by the service. 127 patients were analyzed, out of these 91% obtained success in the weaning from MV. Thus, weaning from MV following standardization has added improvement in the way it is conducted, keeping a high rate of success and low mortality rate.

CONCLUSION

Articles confirm the advantages of using protocols regarding to the choice of the initial moment in the weaning and during the process, because there has been a decrease in the cases of recurrence and also because the chances of success in the weaning process are higher. The techniques found were diversified, with studies in different populations and pathologies, adding more reliable basis to the work.

The actuation of the physiotherapist has been shown to be effective in the mechanical ventilation weaning, presenting techniques that contribute for the bronchial hygiene and muscular strengthening, resulting in a shorter term of use of mechanical ventilation, weaning, a lower number of cases of recidivism of reintubation, shorter term of hospitalization and, at last, lower number of deaths.

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Rua: São Joaquim, 573, apto 404.
Copacabana. Lages/SC. CEP: 88504-011

PHYSIOTHERAPY IN THE MECHANICAL VENTILATION WEANING PROCESS: REVIEW ON BRAZILIAN LITERATURE

ABSTRACT

The mechanical ventilation weaning (MVW) is defined as a moment of transition that goes from the mechanical support to the spontaneous ventilation in patients that remain under MV for a period longer than 24 hours. A strategy that can accelerate the weaning process is the use of physiotherapy, which through weaning techniques and protocols has been showing to succeed in the process. The objective of this study was to realize, based on Brazilian scientific literature, a critical analysis on the intervention and effects of physiotherapy when applied to patients during the MV weaning process. By means of a systematic review, complete and free articles published in Portuguese between January of 2000 and May of 2014, related to the theme were considered for the study. The research included LILACS and SciELO data bases, using as descriptor the words, “physiotherapy”, “weaning” and “mechanical ventilation”. 2175 articles were initially found, however only 16 qualified for the study. These articles showed techniques of physiotherapy and their effects on the mechanical ventilation weaning process. There are several techniques applied in patients during the process that result in a favorable and beneficial outcome for the patient, and that also imply in a shorter term for the use of mechanical ventilation, weaning, decreased rates of recurrence of intubation, shorter term hospitalization and finally, decreased mortality rates.

KEYWORDS: Physiotherapy, weaning, mechanical ventilation.

PHYSIOTHÉRAPIE PENDANT LE SEVRAGE DE LA VENTILATION MÉCANIQUE: ANALYSE DE LA LITTÉRATURE SCIENTIFIQUE BRÉSILIENNE

RÉSUMÉ

Le processus de sevrage de la ventilation mécanique (VM) est défini comme le moment de transition entre la ventilation artificielle et la ventilation spontanée chez les patients qui ont été sous VM pendant plus de 24 heures. Le traitement physiothérapeutique est une stratégie qui peut accélérer le résultat à travers les téchniques et protocoles de sevrage et qui a donné lieu à la réussite du processus. En utilisant la littérature scientifique brésilienne, cette étude a pour objectif la réalisation d'une analyse critique de l'intervention et des effets de la physiothérapie quand appliquée chez des patients en sevrage de ventilation mécanique. Par une analyse systématique, on a procedé a l'admission des articles gratuits et complets, qui étaient liés au thème et qui avaient été publiés en portugais entre janvier 2000 et mai 2014. La recherche a été effectuée dans les bases de données LILACS et SciELO, en utilisant les mots clés "physiothérapie", "sevrage" et "ventilation mécanique". Parmis les 2175 articles trouvés au départ, seulement 16 satisfaisaient aux critères d'inclusion de l'étude. Ces articles présentaient des techniques de physiothérapie et leurs effets chez les patients pendant le sevrage de la ventilation mécanique. Il existe plusieurs techniques utilisées chez les patients pendant le sevrage de la ventilation mécanique et qui ont des répercussions dans une issue favorable et bénéfique pour le patient, provoquant une intubation et une sevrage plus courtes, moins de rechutes d'intubation, hospitalisation plus courte, et enfin, un taux de mortalité plus faible.

MOTS-CLÉS: Physiothérapie, sevrage, ventilation mécanique.

FISIOTERAPIA EN EL DESTETE DE LA VENTILACIÓN MECÁNICA: REVISIÓN DE LITERATURA BRASILEÑA

RESUMEN

El proceso de destete de la ventilación mecánica (VM) se define como el momento de transición de la ventilación artificial a la ventilación espontánea en pacientes que han permanecido en VM por un período superior a 24 horas. Una estrategia que puede acelerar los resultados es el tratamiento fisioterapéutico, que por medio de técnicas y protocolos de destete viene resultando en el éxito del proceso. El objetivo de este estudio ha sido realizar, con base en la literatura científica brasileña, un análisis crítico de la intervención y de los efectos de la fisioterapia cuando se aplica a pacientes en el destete de la VM. Por medio de una revisión sistemática, se admitieron artículos completos y gratuitos publicados en lengua portuguesa, entre enero de 2000 y mayo de 2014, que se relacionaban al tema. La búsqueda abarcó las bases de datos LILACS y SciELO, y se utilizaron los descriptores “fisioterapia”, “destete” y “ventilación mecánica”. Inicialmente se encontraron 2175 artículos, sin embargo, tan solo 16 de ellos se adecuaron a los criterios de inclusión del trabajo. Estos artículos mostraron técnicas fisioterapéuticas y sus efectos en los pacientes en destete de la ventilación mecánica. Hay varias técnicas que se aplican a pacientes durante el destete de la ventilación mecánica, que reflejan un resultado favorable y benéfico para el paciente y que permiten reducir el tiempo de intubación y destete, las recidivas de intubación, el tiempo de internación y, finalmente, la tasa de mortalidad.

PALABRAS CLAVE: Fisioterapia, destete, ventilación mecánica.

FISIOTERAPIA NO DESMAME DA VENTILAÇÃO MECÂNICA: REVISÃO DE LITERATURA BRASILEIRA

RESUMO

O processo de desmame da ventilação mecânica (VM) é definido como o momento de transição da ventilação artificial para a ventilação espontânea em pacientes que permaneceram em VM por um tempo maior de 24 horas. Uma estratégia que pode acelerar os resultados é o tratamento fisioterapêutico, que através de técnicas e protocolos de desmame vem resultando no sucesso do processo. O objetivo deste estudo foi realizar, com base na literatura científica brasileira, uma análise crítica da intervenção e dos efeitos da fisioterapia quando aplicada em pacientes no desmame da VM. Por meio de uma revisão sistemática, foram admitidos artigos completos e gratuitos publicados em língua portuguesa entre janeiro de 2000 e maio de 2014, que se relacionavam ao tema. A busca envolveu as bases de dados LILACS e SciELO, usando os descritores "fisioterapia”, “desmame” e “ventilação mecânica”. Foram encontrados inicialmente 2175 artigos, porém apenas 16 adequaram-se aos critérios de inclusão do trabalho. Estes artigos mostraram técnicas fisioterapêuticas e efeitos destas nos pacientes em desmame da ventilação mecânica. Há várias técnicas aplicadas em pacientes durante o desmame da ventilação mecânica e que repercutem em um desfecho favorável e benéfico para o paciente, acarretando um tempo menor de intubação, de desmame, menor número de recidivas de intubação, menor tempo de internação e, por fim, menor taxa de mortalidade.

PALAVRAS-CHAVE: Fisioterapia, desmame, ventilação mecânica.