ORIGINAL RESEARCH PAPER
VOLUME-6 | ISSUE-6 | JUNE-2017 | ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

Autogenic Breathing Technique Compared To Postural Drainage As A Treatment For Mucociliary Clearance

Pulmonary Medicine

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ABSTRACT

Autogenic breathing cycle technique was compared to the usual treatment of postural drainage for mucociliary clearance in cystic fibrosis or bronchiectasis. An evidence based medicine review was performed. Autogenic drainage has the advantage of being performed in a seating position, whereas postural drainage is performed lying in a head down position with the assistance of a caregiver. Results showed only low levels of evidence to support the advantage of autogenic breathing cycle technique over postural drainage.

KEYWORDS:

INTRODUCTION

The purpose of this research was to answer the clinical question of whether autogenic breathing cycle technique is a better method of treatment for mucociliary clearance in cystic fibrosis and bronchiectasis as compared to the usual treatment of postural drainage. Bronchiectasis can be very difficult to treat; there is likely to be long-term damage to the lungs when bronchiectasis occurs. Bronchiectasis may occur alone or as a clinical feature of cystic fibrosis. Mucus clearance as a therapeutic modality is important in the treatment of bronchiectasis and cystic fibrosis.

There are many techniques that are used for mucus clearance and bronchial hygiene. The gold standard in the U.S. for treatment of excess mucus has been postural drainage (Fink, 2002). In Europe and Asia, the autogenic breathing cycle technique is used more often than in the U.S. Often postural drainage is uncomfortable or contraindicated for a patient's condition. This article seeks to show that the clinical outcomes justify recommending increasing the use of autogenic breathing cycle technique in the U.S. in the treatment of bronchiectasis and cystic fibrosis.

The methodology of the search strategy was set up to find if there is an answer to this question in evidence-based literature.

MUCOCILIARY CLEARANCE TECHNIQUES

Studies into the effective means of clearing excess mucus from the airway in the treatment of bronchiectasis and cystic fibrosis have not always shown clear results into the best methodology. Mucus is moved via three mechanisms, slug flow (pushed from behind by air flow), annular flow (transported by cilia or pulled along by expiratory air flow) and mist flow (expired as suspended droplets). For airway clearance to be effective, these pathways should be enhanced (Lapin, 2002). In the U.S. the most accepted means of airway clearance for excess mucus production is postural drainage.

POSTURAL DRAINAGE

Since the 1930's, postural drainage through the use of gravity (head down position greater than 25 degrees) and turning the patient has been thought to increase lung volumes, oxygenation and mobilize secretions (Fink, 2002). Unfortunately, there has been a lack of high-level evidence to support this technique (Hess, 2001). In addition a study by Jones and Rowe in 2000 concluded that the research on bronchopulmonary hygiene physical therapy is inconclusive. There was a small study with 8 participants (Sutton et al., 1985) that showed an increase dry weight of sputum produced with the use of forced expiratory technique (FET) combined with postural drainage as compared to the use of percussion or vibration with postural drainage. However there were no long-term outcomes followed in any of these studies.

AUTOGENIC BREATHING CYCLE TECHNIQUE

Autogenic breathing cycle technique, also known as autogenic drainage is a mucociliary clearance technique using high expiratory flow rates. It occurs in three phases. The first phase is a full expiration. Next there the patient performs a deep inspiration through the nose with a breath hold. Expiration is through the mouth with a high, but not forced, expiratory flow rate. The technique as modified in Germany includes pursed-lip expiration (Prasad & Main, 1998). This technique is often used by physiotherapists in Europe and Asia. The goal is to enhance mucociliary clearance with coughing.

OTHER NON-PHARMACOLOGIC TREATMENTS

There are other nonpharmacologic means of mucociliary clearance such as active cycle of breathing technique (ACBT), percussion, vibration and oscillation both with and without mechanical adjuncts (McCool, Dennis & Rosen, 2006). In addition, in some countries and with some populations, both autogenic drainage and postural drainage have become less popular. A retrospective audit by Farbotko, Wilson, Watter & MacDonald (2005) examined the physiotherapy management of hospitalized children with cystic fibrosis at the Brisbane Royal Children's Hospital in Australia. The years examined were 1998 and 2000. There were 249 males and females over 2 years of age that were studies. The median length of stay was 2 weeks. They found a significant decrease between 1998 and 2000 in two therapies: the use of postural drainage with head down tilt and also the use of autogenic drainage. Positive expiratory pressure (PEP) devices and modified postural drainage with no head done tilt were used more frequently in 2000 as compared to 1998.

One of the reasons given for the decreased use of head down postural drainage in the pediatric cystic fibrosis population was the potential for gastroesophageal reflux disorder (GERD) (Button, Heine, Catto-Smith, Phelan & Olinsky, 1997). Button et al.'s study on infants found a significant increase in the number of reflux episodes per hour during postural drainage with the head down tilt but not with postural drainage without a head down tilt. Regarding the decrease in the use of autogenic drainage in the population studied by Farbotko et al., it may be due to the difficulty involved in learning autogenic drainage therapy and therefore not generally recommended for those under the age of 12 (David, 1991).

Another form of non-pharmacologic treatment for mucociliary clearance is inspiratory muscle training. A randomized study investigated the effects of an 8-week program of high-intensity muscle training on inspiratory muscle function, diaphragm thickness, lung function, physical work capacity and psychosocial status. The 29 participants were adults (age 22 +/- 4.2 years) with cystic fibrosis. They were divided into three groups, one that received no intervention, and two groups that received inspiratory muscle training. One of the intervention groups received training at 80% of maximal effort and the other at 20% of maximal effort. The best results were in the inspiratory muscle training at 80% of maximal effort group; they showed significant ($p < 0.05$) improvement in inspiratory muscle function, diaphragm thickness, increased lung volumes, and improvements in

physical work capacity and psychosocial status. These results were not specific to mucociliary clearance in their patient outcomes, but it might be assumed that improved inspiratory muscle function and lung volumes could lead to better mucociliary clearance for patients with cystic fibrosis.

Airway adjuncts for positive expiratory pressure (PEP) are another means thought to achieve mucociliary clearance. The flutter is a hand held device that is thought to mobilize secretions by means of oscillating positive pressure. A pilot crossover clinical study done in South Africa examined the flutter as compared to the active cycle of breathing technique. There were seven hospitalized adults (mean age 28 years, range 16 - 42 years) with cystic fibrosis in the study. Each technique was performed twice a day for 15 minutes, over 4 days. There was no significant difference between the two techniques in regard to sputum weight or lung function. In addition, there was no patient preference for either technique. This is a small group but it does possibly indicate that there is a place for PEP therapy in the treatment regimen.

This study seeks to look only at two of the more accepted means of treatment: autogenic drainage and postural drainage.

SEARCH STRATEGY

The search strategy included English language articles from 1991 to the present. Studies were reviewed with the emphasis on patient related outcomes (including but not limited to compliance, mortality, morbidity and cost-effectiveness) that were designed as randomized, blinded, placebo controlled trials with later follow up. The preference is towards an adult population and studies that include males and females. In addition, the search will also include review articles and guidelines from systematic reviews.

Sources for literature were the Cochrane Library, MEDLINE, EMBASE, and CINAHL, and CINAHL Plus with full text. In addition to the original strategy the search was expanded to include CINAHL Select, Biomedical Reference Collection: Comprehensive, Nursing & Allied Health Collection: Comprehensive, Cochrane Central Register of Controlled Trials, and the Database of Abstracts of Reviews of Effects.

Criteria were expanded to include articles from 1979 to the present, and trials with children as subjects were included. Search terms included were autogenic breathing, autogenic technique, bronchiectasis, cystic fibrosis, percussion, chest physical therapy, and chest vibration. In addition to the original strategy the terms breathing exercises and mucociliary clearance were added.

RESULTS

There were eight studies that met the criteria for the search strategy of comparing the mucociliary clearance treatment of cystic fibrosis or bronchiectasis via autogenic breathing cycle technique or postural drainage technique. Table 1 summarizes the results of these studies. None of the studies that met the search criteria yielded overwhelming of evidence to support either the autogenic breathing cycle technique or postural drainage technique as the preferred a nonpharmacologic mucociliary clearance treatment for use with of cystic fibrosis or bronchiectasis patients. It is important to note that, one study by Williams et al., (2006) did yield positive results in their randomized control trial of only15 patients during acute exacerbation of cystic fibrosis. Their results showed a reduction in airway obstruction following the use of therapist-assisted active cycle of breathing technique, but because of the small number of patients in the cohort, the results must be considered with caution.

Table 1. Autogenic Breathing Cycle Technique versus Postural Drainage Studies

Author	Type of research	Findings
Sutton, P. P., Vidriero, L., Pavia, D., Newman, S. P., Clay, M. M., Webber, B., Parker, R. A. & Clark, S. W. (1985).	Clinical study	Low level of evidence, increased dry weight of sputum, recommends FET plus postural drainage, but no other patient outcomes to base it on. Note small sample size (n=8)
Miller, S., Hall, D. O., Clayton, C. B., & Nelson, R. (1995)	Randomized cross-over clinical trial (CCTR*)	Low level of evidence, results showed increased rates of clearance of mucus with autogenic drainage in cystic fibrosis patients. Note small sample size (n=18)
Langenderfer, B. (1998).	Meta-analysis	Several studies showed equivalent sputum production with autogenic breathing technique
Jones, A. & Rowe, B. H. (2000).	Systematic review	Due to small size, low quality, and mixed result from the trial, the research on bronchopulmonary hygiene physical therapy is inconclusive.
Hess, D. R. (2001).	Systematic review	No high level evidence to support any particular secretion clearance technique.
Tsang, S. M. H. & Jones, A. Y. M. (2003).	Clinical trial / pilot study	No difference in sputum production or lung function through day 4 measurements. Note small sample size (n=15)
Williams, M. T., Parsons, D. W., Frick, R. A., Ellis, E.R., Martin, A. J., Giles, S. E., et al.	Randomized controlled trial (CCTR*)	During acute exacerbation of CF, there was a reduction in airway obstruction following the therapist-assisted active cycle of breathing techniques. Note small sample size (n=15)
McCool, F., Dennis, F., & Rosen, M. (2006).	Systematic review	No long-term clinical outcomes supporting nonpharmacologic bronchial hygiene techniques.
Note. (CCTR*) indicates studies listed in the Cochrane Controlled Trials Register		

DISCUSSION

The overall review of studies that met the criteria for the search strategy of comparing the mucociliary clearance treatment of cystic fibrosis or bronchiectasis via autogenic breathing cycle technique or postural drainage technique showed only low levels of evidence for supporting the bronchial hygiene techniques of postural drainage or autogenic breathing technique. While the best evidence for support of autogenic drainage can be found in the research by Miller, Hall, Clayton and Nelson (1995), caution must be exercised, as this was a randomized crossover clinical trial using only 18 males, ages 11-35, with cystic fibrosis. While increased rates of mucus clearance were shown with the use of autogenic drainage, no significant difference was seen in FEV1 (forced expiratory volume in 1 sec.) or FVC (forced vital capacity). Additionally, there were no attempts to determine long-term clinical outcomes.

One of the problems associated with performing this type of research reviewed in this study is that it is difficult to remove confounding variables. While patients with bronchiectasis or chronic bronchitis are similar in that the clinical presentation includes excessive mucous production, there is great variability in the level of overall health, hydration, pharmacologic therapy and lung damage. These variables may affect mucociliary clearance and other applicable indicators such as spirometry values. The most frequent noted limitation was the low numbers in the cohorts studied. While there was some mucociliary clearance advantage to autogenic breathing cycle technique over postural drainage, the long-term efficacy in improving clinical remain unknown. As such, it is necessary to continue to look for clear and substantial evidence as to whether postural drainage or autogenic drainage is a better method of nonpharmacologic treatment for mucociliary clearance.

REFERENCES

1. Button, B. Heine, R., Catto-Smith, A., Phelan, P., & Olinsky, A. (1997). Postural drainage and gastro-oesophageal reflux in infants with cystic fibrosis. Archives of Disease in Childhood, 76, 148-150 as cited in Farbotko, K., Wilson, C., Watter, P., MacDonald, J. (2005). Change in physiotherapy management of children with cystic fibrosis in a large urban hospital. Physiotherapy Theory and Practice, 21(1), 13-21.
2. David, A. (1991). Autogenic drainage: The German approach. In: Pryor, J. (ed.). Respiratory Care. Edinburgh: Churchill Livingstone, 65-78 as cited in Farbotko, K., Wilson, C., Watter, P. & MacDonald, J. (2005). Change in physiotherapy management of children with cystic fibrosis in a large urban hospital. Physiotherapy Theory and Practice, 21(1), 13-21.
3. Farbotko, K., Wilson, C., Watter, P., & MacDonald, J. (2005). Change in physiotherapy management of children with cystic fibrosis in a large urban hospital. Physiotherapy Theory and Practice, 21(1), 13-21.
4. Fink, J. B. (2002). Positioning versus postural drainage. Respiratory Care, 47(7), 769-

777.
5. Hess, D. R. (2001). The evidence for secretion clearance techniques. Respiratory Care, 46(11), 1276-1293.
6. Hess, D. R. (2002). The evidence for secretion clearance techniques. Cardiopulmonary Physical Therapy Journal, 13(4), 7-22.
7. Jones, A. & Rowe, B. H. (2000). Bronchopulmonary hygiene physical therapy in bronchiectasis and chronic obstructive pulmonary disease: a systematic review. Heart & Lung: The Journal of Critical Care, 29(2), 125-135.
8. Langenderfer, B. (1998). Alternatives to percussion and postural drainage: a review of mucus clearance therapies: Percussion and postural drainage, autogenic drainage, positive expiratory pressure, flutter valve, intrapulmonary percussive ventilation, and high-frequency chest compression with the ThAIRapy vest. Journal of Cardiopulmonary Rehabilitation, 18(4), 283-289.
9. Lapin, C. D. (2002). Airway physiology, autogenic drainage, and active cycle of breathing. Respiratory Care, 47(7), 778-785. Comment/Conclusion: good evidence article review.
10. McCool, F., Dennis, F., & Rosen, M. (2006). Nonpharmacologic airway clearance therapies: ACCP evidence-based clinical practice guidelines. Chest, 129(1), 250S-259S.
11. Miller, S., Hall, D. O., Clayton, C. B., & Nelson, R. (1995). Chest physiotherapy in cystic fibrosis: a comparative study of autogenic drainage and the active cycle of breathing techniques with postural drainage. Thorax, 50(2), 165-169.
12. Milne, S. M. & Eales, C. J. (2004). A pilot study comparing two physiotherapy techniques in patients with cystic fibrosis [Abstract]. South African Journal of Physiotherapy, 60(2), 3-6, 37-38.
13. Prasad, S. A. & Main, E. (1998). Finding evidence to support airway clearance techniques in cystic fibrosis. Disability & Rehabilitation, 20 (6/7), 235-246.
14. Sutton, P. P., Vidriero, L., Pavia, D., Newman, S. P., Clay, M. M., Webber, B., Parker, R. A. & Clark, S. W. (1985). Assessment of percussion, vibratory-shaking and breathing exercises in chest physiotherapy. European Journal of Respiratory Diseases, 66(2), 147-152.
15. Tsang, S. M. H. & Jones, A. Y. M. (2003). Postural drainage or FLUTTER device in conjunction with breathing and coughing compared to breathing and coughing alone in improving secretion removal and lung function in patients with acute exacerbation of bronchiectasis: A pilot study. Hong Kong Physiotherapy Journal, 21, 29-36.
16. Williams, M. T., Parsons, D. W., Frick, R. A., Ellis, E.R., Martin, A. J., Giles, S. E., et al. (2001). Acute respiratory infection in patients with cystic fibrosis with mild pulmonary impairment: comparison of two physiotherapy regimens. The Australian Journal of Physiotherapy, 47(4), 227-236
17. Wilkins, R. L., Stoller, J. K., & Scanlan, C. L. (2003). Egan's Fundamentals of Respiratory Care (8th ed.). Philadelphia, PA: Mosby.