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Research Paper Review

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Chest and neck mobilization effects on spirometric responses in healthy subjects

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ABSTRACT

Objectives: *In this observational study, we evaluated the effects of chest and neck mobilization on spirometric parameters in healthy subjects.*

Methods: *We conducted an observational, quantitative, and experimental study in a sample of 100 healthy subjects. We evaluated spirometric parameters before and after pompage mobilization techniques. Three techniques were used, and each technique was performed 6 times.*

Results: *Forced vital capacity (3.4 ± 0.1 L vs 3.5 ± 0.1 L), forced expiratory volume at the first second (3.2 ± 0.09 L vs 3.3 ± 0.09 L), and peak expiratory flow (6.4 ± 0.27 L/s vs 6.6 ± 0.25 L/s) were significantly increased after mobilization (P < .0001), whereas Tiffeneau index (94% ± 1% vs 6% ± 0.2%) was decreased (P < .0001).*

Conclusion: *Chest and neck mobilization techniques used in this study improved spirometric parameters in a group of young and healthy subjects.*

ANALYSIS

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Background Information

In general, mobilization has been shown to bring about muscle relaxation, provide pain relief and increased range of motion. A French mobilization technique called "*pompage*" is specifically designed to

improve osteomyoarticular restrictions that are thought to prevent fascial movement. The technique is also thought to facilitate fascial gliding and inhibit muscle activity via a process of respiratory education, which consists of conscious and oriented expirations by the patient.

The pompage mobilization technique involves 3 steps:
1. Slowly placing tension on the targeted segment, using a slow, regular and gradual stretch;
2. maintenance of the tension; and
3. the gradual return to position, which is slow, regular, and progressive.

These steps are carried out in sync with the patient's conscious and oriented breathing.

A previous study reported that postural rehabilitation can increase maximal respiratory pressures, abdominal mobility, and thoracic expansion in young healthy subjects (2). Another study reported that respiratory muscle strength in patients with cystic fibrosis was improved by myofascial release techniques plus muscle reeducation (3). The authors thought that the findings of these studies pointed to the possibility that thoracic mobilization might yield similar results by influencing the skeletal muscles that are involved in breathing.

It has been suggested that the pompage technique may improve respiratory spirometric parameters, though no study has investigated its effect on lung function. Therefore, the purpose of this study was to evaluate the effects of chest and neck mobilization (pompage) on spirometric parameters in healthy subjects.

PERTINENT RESULTS

One hundred subjects were included in the study, comprised of 50 men and 50 women who were between 17 and 30 years old.

The following significant increases in mean spirometric measurements were observed after the patients received the pompage technique:

- FVC = forced vital capacity (3.360 ± 0.105 L pre vs. 3.460 ± 0.106 L post; $P < .01$),
- FEV1 = forced expiratory volume at the first second (3.212 ± 0.091 L vs. 3.260 ± 0.091 L; $P < .01$), and
- PEF = peak expiratory flow (6.421 ± 0.267 L/s vs. 6.655 ± 0.254 L/s; $P < .01$).

The results were slightly different between men and women, with the males on average experiencing increased FVC, PEF, and FEV1, and decreased Tiffeneau index (described in the Methods section below). Females also experienced increased FVC and FEV1, and decreased Tiffeneau index, but no changes in PEF.

CLINICAL APPLICATION & CONCLUSIONS

This study provides little information that is applicable to clinical practice because the observed differences pre- to post-treatment were quite small and the subjects were healthy. That being said, this study completes a necessary first step that offers direction for future research in this area.
On the other hand, the study may explain some of the mechanisms by which patients with respiratory disorders have shown improvement following manipulation. For instance, Balon et al. (1) reported

improvement in peak expiratory flow PEF, less symptoms and less use of inhalers in children with asthma who received chiropractic manipulation. Nevertheless, patients in the control group did just as well. What is comparable is that all of the patients in the Balon et al. study, including those in the control group, received forces applied to their chest wall while they were inhaling and exhaling, as is typical during thoracic manipulation. For patients in the control group, the clinician's hand contact was on the scapula instead of the vertebral segments in an effort to avoid a therapeutic effect. The authors referred to it as "simulated" manipulation, but if could have had some physiological effects.

Considering the Balon et al. study and the results from the study reviewed here, it seems reasonable that respiratory factors may be influenced by manual interventions. Further research is required to further elucidate details regarding techniques, treatment dosage and target patient populations for such treatment.

STUDY METHODS

This was an observational study involving healthy volunteers from a university population.

Exclusion criteria were as follows:

- Respiratory disorders, such as asthma, emphysema, or chronic obstructive pulmonary disease
- Cognitive alterations
- Musculoskeletal disorders that could impair the subjects' performance
- Use of drugs that could influence spirometric tests, especially benzodiazepines and psychotropic substances
- Unable to perform the experimental procedure
- Refused to participate
- Cardiorespiratory impairments

Participants were asked to perform spirometry testing wherein they were verbally encouraged to maximally inhale and exhale throughout 3 rounds of breathing.

The following measures were taken during expiration:

- Forced vital capacity (FVC, in liters),
- Forced expiratory volume at the first second (FEV1, in liters), and
- Peak expiratory flow (PEF, in liters per second).

The Tiffeneau index was calculated using the results of the above measures (FEV1/vital capacity, percentage).

Participants were then provided 3 types of pompage mobilization. Each technique was performed 6 times while the patients were breathing rhythmically. Brief descriptions of the techniques are as follows:

1. **Fascia global mobilization**: The therapist applied an inferiorly directed force to the supine patient's mid-sternum with one hand while applying a superiorly directed force with the other hand to the patient's occiput with their head turned to one side. Forces were applied mainly at the end of expiration, but also at the end of inspiration by lifting the xiphoid process to elevate the chest.
2. **Scalene muscle mobilization:** The therapist stabilized the supine patient's shoulder with one hand

and then applied stretch to the scalene muscles using an occipital grip with the opposite hand.

3. **Sternocleido-occipital-mastoid muscle mobilization**: The therapist held the base of the patient's skull while their other hand rested on the sternum. Downward pressure was applied to the sternum along with the patient's expiration. The supine patient's head was rotated to the opposite side of the muscle being treated.

Spirometric parameters were then retested following the mobilization techniques.

STUDY STRENGTHS / WEAKNESSES

This was purely an observational study, so one wonders whether similar results would have occurred in a group in which the subjects merely did the breathing, but did not receive mobilization (i.e. a control group). However, the authors pointed to a previous study that they conducted which showed no differences between pre- and postmobilization spirometric tests without intervention (i.e. a placebo condition).

Since there was no control group, patients were not randomized and they were not blinded, this study provides fairly weak evidence for a clinician, particularly when considering a study like Balon et al. described above.

Even though the differences between before and after pompage techniques regarding FVC, FEV1, and PEF reached statistical significance, the differences were small and did not reach a level that could be considered clinically significant. The authors suggested that if a similar study were performed on a group of patients with respiratory disorders, there would be more room for improvement and clinical significance would likely be reached. That is, a ceiling effect may have come into play here – where these healthy subjects would have little room for improvement in the measures taken.

Spirometric measures were only taken right after the manual procedures, so it is not known how long-lasting the effects are.

All of the subjects in this study were healthy, so we do not know whether similar results would be found in people with breathing difficulties, or other musculoskeletal conditions.

Additional References

1. Balon J, et al. A comparison of active and simulated chiropractic manipulation as adjunctive treatment for childhood asthma. NEJM 1998; 339:1013-20.
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