Efficacy of Osteopathic Manipulation as an Immediate Treatment to Improve Breathing Mechanics in a Healthy Population: A Randomized Controlled Study

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Introduction

Breathing mechanics are heavily influenced by various musculoskeletal structures, including the spine, thoracic cage, ribs, diaphragm, and intercostal muscles [1,2]. The presence of somatic dysfunction (SD) that alter normal anatomy and physiology of any of these structures can restrict chest wall excursion and impede overall respiratory function [2]. Several studies have already proven the therapeutic effects of OMT in various populations with a number of lung diseases [3,4]. However, only some studies have discussed the significance of chest wall mobility on breathing mechanics [5,6]. Furthermore, in the scope of research addressing the relation of OMT and respiratory function, it is notable that no studies have demonstrated the immediate effect of OMT on chest wall excursion.

Hence, this study aimed to:

1. Prove the immediate impact of OMT in altering breathing mechanics in a healthy population by measuring chest wall expansion.
2. Provide a way to objectively measure improvements to rib and/or thoracic somatic dysfunctions.

Methods

- Eligible participants were randomly assigned to the control group or the OMT group, using a pre-defined exclusion principle.
- Each participant underwent baseline evaluations, including but not limited to upper and lower chest expansion measurements at the manubrium (M1) and xiphoid process (M2), respectively, as well as spirometer-based pulmonary function testing.
- The OMT group then received a preset number of osteopathic treatments based on the presence of thoracic and/or rib somatic dysfunctions, whereas the control group received a sham treatment of light-touch techniques.
- Subsequently, both groups repeated the baseline evaluations.
- In total, 48 total volunteers were eligible, of which n=26 were assigned to the OMT group and n=22 to the control group. From the OMT group, n=22 were analyzed for end results and n=19 from the control group based on exclusion criteria

Results

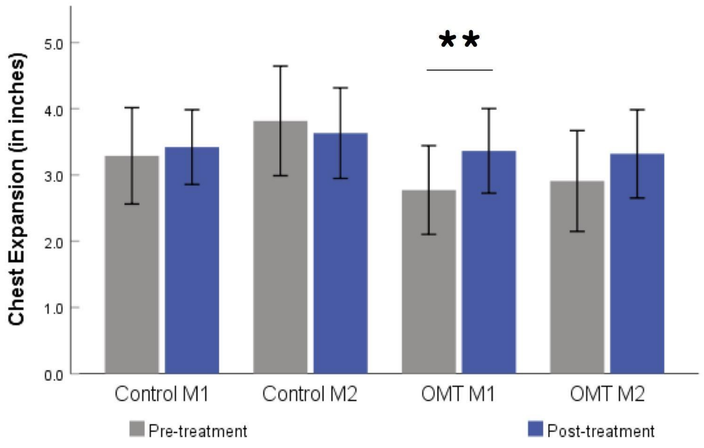

Fig 1: Compared to the control group, the M1 and M2 measurements for the OMT group showed an evident increase in post-treatment values relative to the pre-treatment values. There was a significant difference in the chest excursion within the OMT group in the M1 measurements pre- and post- treatment ($p<.01$).

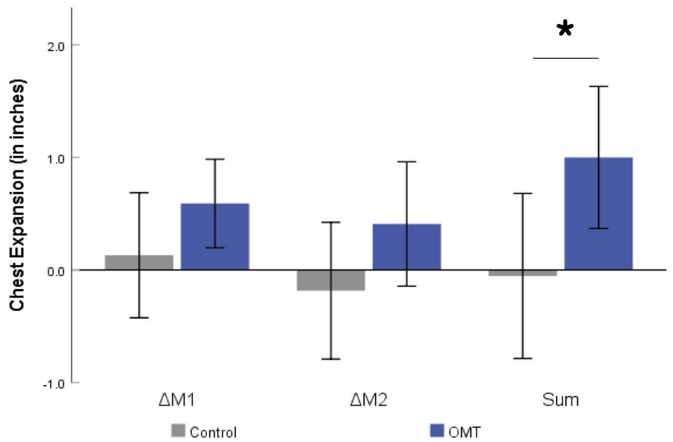

Fig 2: While there was no statistical significance in $\Delta M1$ and $\Delta M2$ calculated, there was a clear increase in chest excursion in the OMT group relative to the control group. Moreover, there was a statistically significant difference in the chest excursion in the SUM group ($p<.05$), representing the sum of the net change in M1 and M2 post-treatment that was measured in the control and OMT groups.

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Discussion

As the five models of osteopathic medicine include biomechanical and respiratory-circulatory models, the intricate interaction between structure and function is directly assessed in this study.

Our results indicate a significant improvement in chest wall excursion immediately following thoracic and/or rib OMT in a healthy population. This was seen in the overall chest excursion improvement quantified in the SUM group ($p < 0.05$) when compared with the control group. Furthermore, there was an increase in chest excursion measurements after OMT, seen in M1 ($p < 0.01$) that was not observed in M2. It is possible that the chest excursion measured at the manubrium (M1) was more greatly affected than the xiphoid process (M2) since the M1 measurement directly correlates with the movement of the first rib due to its attachment to the manubrium [2]. One of the techniques performed, rib raising is well known to directly affect the first rib hence having a bigger effect on M1.

Our study showed no statistically significant changes in FEV1/FVC values with post-treatment assessment following a single OMT session. The insignificance in FEV1/FVC values may be due to the lack of a necessary lag period to implement the cascade of physiological changes in multiple body systems produced by OMT, unlike chest wall excursion that can be measured immediately following the treatment of thoracic and/or rib SD.

Incorporation of additional parameters such as anterior-posterior diameter measurements and lateral diameter measurements via imaging may be considered in the future studies and may help to establish further evidence on the efficacy of OMT on breathing mechanics. Comparative analysis may also be sought between the types of treatments to determine which had the greatest effect.

Conclusion

Our results indicate a statistically significant improvement in chest wall expansion immediately following thoracic and/or rib-directed OMT in a healthy population. These results carry potential clinical significance for patients with limited respiratory function due to decreased chest mobility or chest wall/rib cage deformity.

References

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