



Characterization of Somatic Dysfunction and Clinical Presentation in Acute Concussion Cases

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INTRODUCTION

- Concussion is a growing clinical problem that presents multiple challenges for a provider including accurate assessments, diagnoses, and treatment plans.
- While advancements are being made in identifying acute concussions, current clinical treatment primarily focuses on monitoring and symptomatic-based rehabilitation.
- Although Osteopathic Manipulative Treatment (OMT) is safe and effective^{2,3,4} for the management of persons with concussions, the specific indications for its use have never been determined.
- Using a structural examination to characterize specific somatic dysfunctions in persons with concussions could greatly enhance diagnosis and treatment; resulting in a more rapid recovery and decrease the likelihood of chronic sequelae.

OBJECTIVE

- The objective of this study is to describe somatic dysfunction and its association with clinical symptoms in patients with acute concussion.

METHODS

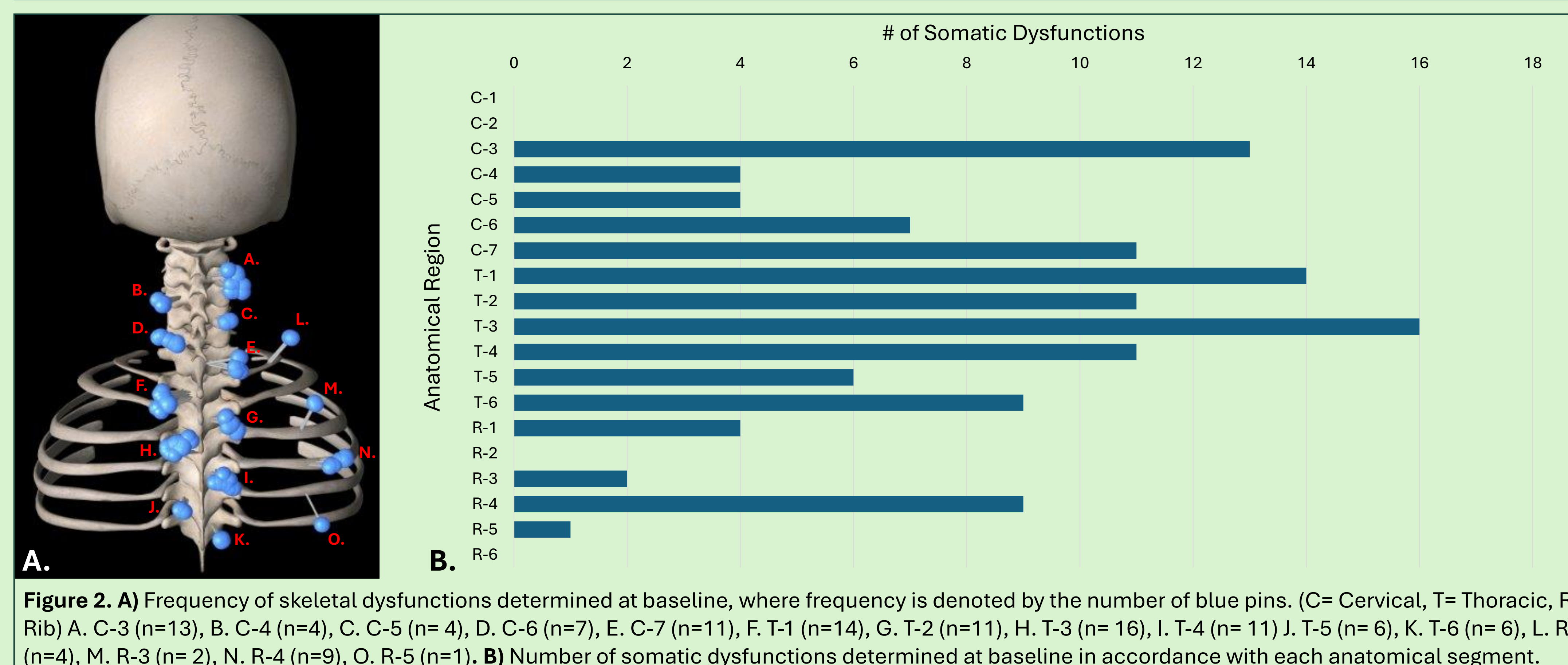
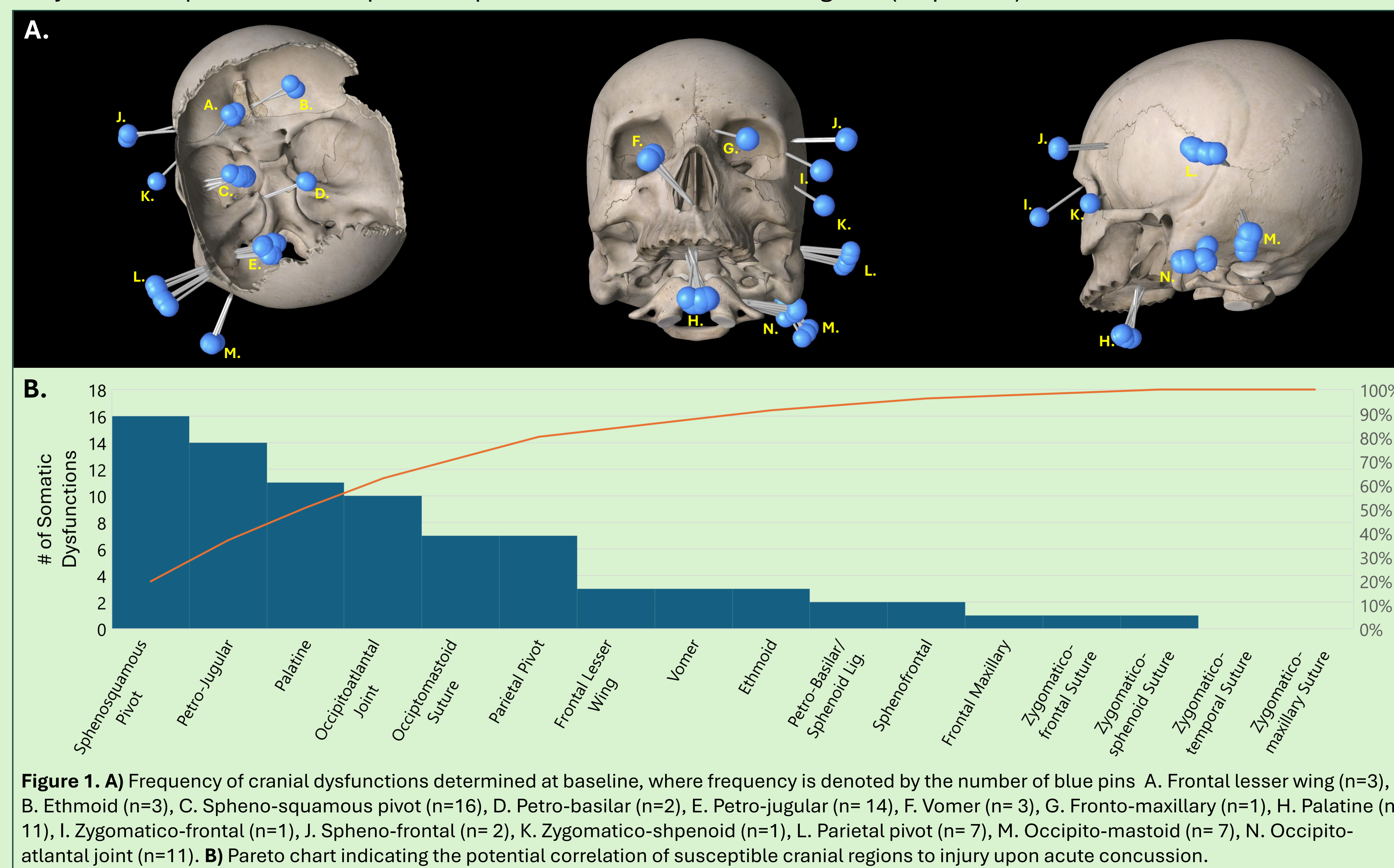
- **Study Design:** Secondary analysis of 2-arm parallel design randomized controlled trial investigating the effects of OMT in participants with concussion.
- **Participants:** 15 females and 9 males (age 18.5± 5.6 years) diagnosed with a concussion
- **Assessments:** Osteopathic structural exam at baseline to determine dysfunctional regions of the cranium, the cervical spine, the first 6 thoracic segments and their corresponding ribs. One primary and one supplemental provider, both specializing in Osteopathic Neuromusculoskeletal Medicine, provided these assessments.
- Sports Concussion Assessment Tool 5th edition (SCAT5) was used to record and quantify symptoms at baseline.
- **Analysis:** Descriptive statistics were used to determine the frequency of somatic dysfunction by body region.
- Comparisons of symptoms between groups with and without somatic dysfunction identified in the cranium and cervical spine were made using the Mann-Whitney U test, with statistical significance set at p<0.05.

RESULTS

- Osteopathic structural exam and baseline SCAT5 were assessed at baseline (7.1±3.5 days from their injury).
- SCAT5 Symptom Severity Score was 35.3±26.6, with the average number of symptoms being 13.6±6.6.

RESULTS

- The most frequent somatic dysfunction (i.e., accounting for ~80% of findings by region) identified in the study population were: (1) Cranial sutures: Spheno-squamous pivot (19.8%), Petro-jugular (17.3%), Palatine (13.6%), Occipito-atlantal joint (12.4%), Occipito-mastoid suture (8.6%), and Parietal pivot (8.6%); (2) Cervical Spine: C3 (33.3%), C7 (28.2%), C6 (18.0%); (3) Thoracic Spine: T3 (23.9%), T1 (20.9%), T2 (16.4%), T4 (16.4%); (4) Ribs: Rib4 (56.3%), Rib1 (25.0%) (Figures 1-2).
- Participants diagnosed with the petro-jugular somatic dysfunction (n=14) presented with significantly higher symptom scores for headache (p=0.03) and head pressure (p=0.04).
- There were no statistically significant differences in symptom scores between participants with and without somatic dysfunction present in the spheno-squamous suture or cervical regions (all p>0.05).



DISCUSSION

- The clinical relevance of this study is significant as it further adds to the complex picture of acute concussions by identifying regions of somatic dysfunction commonly found in patients diagnosed with an acute concussion.
- Individuals with petro-jugular dysfunction, a common region of identified dysfunction, reported worse headache and head pressure symptoms.
- While prior studies have supported the safety and potential efficacy^{2,3,5} of utilizing OMM as adjunct therapy, there is limited data on where the organic disease of a concussion may physically manifest.
- Future work investigating clusters of somatic dysfunction and correlation with symptoms may help guide clinicians to effectively treat acute concussions and to prevent chronic sequelae.

OSTEOPATHIC RELEVANCE

- Based on two osteopathic tenets, the body is capable of self-healing and self-regulation, but this function is reciprocally interrelated to the nature of the structure. In other words, a dysfunctional structure may impede the body's ability to heal. By documenting the expected incidence of concussion-related somatic dysfunctions and potential cranial strain patterns⁵, a clinician's ability to provide a more focused treatment via the use of Osteopathic Manipulative Medicine (OMM) may be improved.
- Improving strategies to identify dysfunctional regions may be necessary when considering the treatment of concussion. For instance, utilizing the osteopathic exam in conjunction with specialized imaging modalities such as fMRI¹, may provide a promising approach when considering the use of OMT in patients diagnosed with concussion.

REFERENCES

- [1] Danielli, E., Simard, N., DeMatteo, C. A., Kumbhare, D., Ulmer, S., & Noseworthy, M. D. (2023). *Frontiers in Neurology*, 14. [2] Esterov, D., Thomas, A., & Weiss, K. (2021). *Journal of Osteopathic Medicine*, 121(7), 651–656. [3] Mancini, J. D., Angelo, N., Abu-Sbaih, R., Kooyman, P., & Yao, S. (2022). *Journal of Osteopathic Medicine*, 123(1), 31–38. [4] Patel, K. G., & Sabini, R. C. (2018). *Journal of Osteopathic Medicine*, 118(6), 403–409. [5] Schwartzberg, L., Aslanyan, L., Angelo, N., Mancini, J., Kooyman, P. S., Abu-Sbaih, R., Zwibel, H., & Yao, S. C. (2020). *Journal of Osteopathic Medicine*, 120(9), 601–606.

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