Oral Intervention and the Scoliotic Spine

Could the Dentist hold a key to unlocking Scoliosis?

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Introduction

The relationship between occlusion and the body is well researched but under appreciated(5,7). Scoliosis of the spine has a direct relationship to cranial scoliosis as well as palatal scoliosis and this can lead to cross bite configurations(1,2,3,4).The following case illuminates the powerful interplay between two professions and a startling outcome that can benefit our patients.

Problem

- 14 year old female presented to integrative dental/physical therapy for treatment of a 43-degree thoracic dextroscoliotic spinal curvature.
- Her Risser score was below 3 and likely below 2 when she first presented to non-interdisciplinary PT at age 10. At that time she was also issued a Boston brace to wear 23 hours per day, which is standard for a non-surgical approach to treating scoliosis. (Non-interdisciplinary PT involves stretching and strengthening activities that are designed to aid the patient in reduction of curvature).
- At the beginning of her two year treatment with non-interdisciplinary PT, she was also placed in orthodontia for improvement in her bite configuration.
- During the 2 years of treatment, she showed no measurable improvement in her thoracic curvature.

Hypothesis

1. Heavier gauges of various orthodontic wires may have an effect on palatal and cranial movement that prevents adequate cervical alternating rhythm.
2. There is a relationship between palatal/cranial movement and spinal curvature
3. By removing orthodontia, we can achieve reduction of spinal curvature.

Methods

1. On initiation of interdisciplinary care (June 9th, 2022), the patient presented with orthodontia in place. She brought in a spine x-ray (AP View) that was taken April 13th, 2022, showing a Cobb angle of 43 degrees thoracic dextroscoliotic curvature.
2. Full-body physical exam (with orthodontia in place) was conducted and significant limitations in cervical, thoracic and pelvic regions was noted.
3. Exam was followed with removal of orthodontic wire on June 9th, 2022.
4. Immediate improvement in cervical, thoracic and pelvic exam findings was noted after removal of orthodontia.
5. She was assigned breathing exercises designed to reduce her spinal curves(6).
6. She was placed into an activated light wire functional (ALF).
7. Initial mounted models taken on June 20th, 2022
8. Patient continued with Boston brace wear schedule.
9. Patient had another spinal x-ray taken September 7th, 2022, revealing a Cobb angle of 26 degrees.
10. Mounted models taken on January 24th, 2024

The only variables changed between the two x-rays taken were the removal of her orthodontia and addition of breathing exercises.

References

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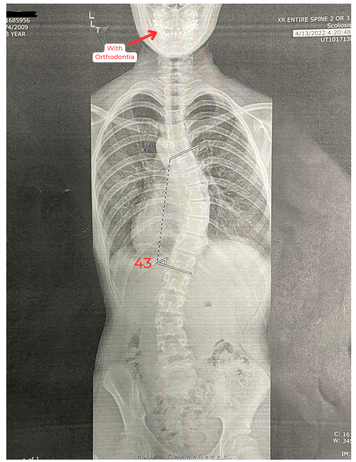
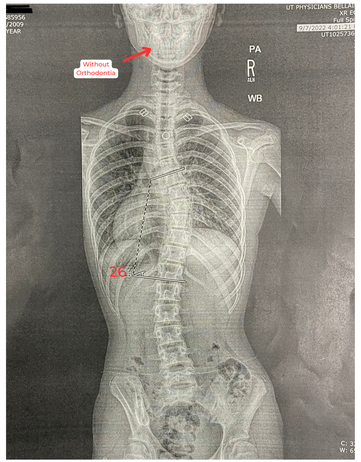
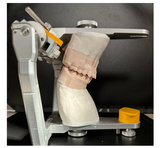
Mounted Models taken 9/20/2022



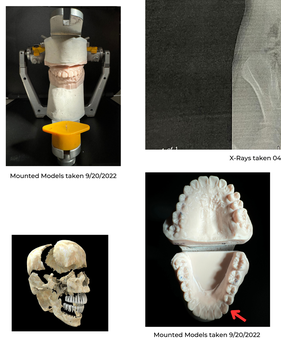
X-Rays taken 04-13-2022 with a Cobb angle = 43 degree



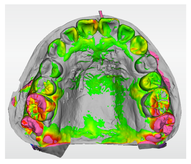
X-Rays taken 09-7-2022 with a Cobb angle = 26 degre degreee



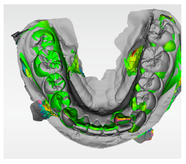
Mounted Models taken 1/24/2024



Mounted Models taken 9/20/2022

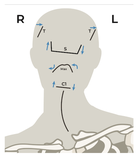


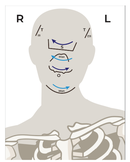
Densply Sirona OraCheck comparing models scanned of 9/20/2023 & 1/24/2024 - Color shows change/movement in maxilla

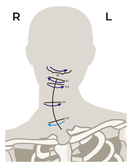


Mounted Models taken 1/24/2024

Example of a Nordstrom Design ALF (Activated Lightwire Functional Appliance)







Results

1. The patient demonstrated poor body movement ability (as evidenced by static and dynamic testing) on initial evaluation.
2. She demonstrated good movement ability after removal of orthodontia.
3. There was a statistically significant decrease in Cobb angle between the two x-rays taken with a reduction of 17 degrees in her thoracic curvature in only 90 days.
4. The only variables changed were the introduction of new breathing exercises and the removal of her brackets and wires.
5. After a year of wearing an ALF and modest PT compliance, patient's thoracic curvature increased by only 6 degrees.
6. Since not being in orthodontia, tooth #23 has moved lingually 3-4mm and #22 has rotated counterclockwise.

Conclusion

There are significant changes when comparing the patient's mounted models scans using Dentsply oracheck and visual movement of tooth #23 moving 3-4 mm lingually and tooth #22 rotating counterclockwise. While differing wire gauges are designed to create various intended movements of the teeth, we conclude that heavier gauges may restrict palatal excursion and subsequent cranial movement. This restriction limits cervical alternating rhythm as noted on our physical exam both with and without her orthodontia.

Comparing the patients models while we allowed her teeth to freely move as she continued to reduce her curvature through diaphragmatic exercises, we can summarize that her teeth have attempted to return to an anterior crossbite. Research suggests, there is a correlation between patients who develop unilateral crossbites and a scoliotic curve(1,2,3,4,5). Therefore, we can conclude with significant evidence that: There is indeed, a relationship between palatal/cranial movement and spinal curvature

There was a statistically significant decrease in Cobb angle between the two x-rays taken with a reduction of 17 degrees in her thoracic curvature with the only variables being the introduction of diaphragmatic exercise done over the span of 2 months in conjunction with the removal of orthodontia. Therefore we can conclude the following: Removing orthodontia likely plays a role in reduction of spinal curvature.

Clinical Significance

This successful, interdisciplinary approach of dentistry combined with physical therapy is a bellwether moment for caregivers in both disciplines that illuminates the powerful effect that dentistry has on the body and vice versa. It also validates the frequent need for combined management of patients. It is well documented that there is a proprioceptive nature to teeth(7). The palate can and does move rhythmically, which allows for cranial, cervical and body rotation and alternation of center of mass(8). Clinicians with knowledge of research supporting respiratory exercises for the control of spinal curvature and that orthodontia may derail well-intended scoliosis programs are likely to have more successful outcomes(6).

A solid interdisciplinary model of PT's and dentists working together should be the standard of care as we continue to redefine terms like Centric Relation (CR), Lateralization, Occupancy and Occlusion. So, once the body is free to move, unencumbered by brackets and wires, the teeth will be fee to move and will naturally follow the cranial-body drive. This "unlocked" body allows the PT to design a program for the patient that follows the patient through to skeletal maturity. Then the dentist can organize the occlusal scheme, turn this "occlusal key", and stabilize the spine in its new, corrected position.

When each half of the maxilla is restricted from alternating motion with orthodontia, facial and neck muscle activity increases as evidenced by objective measurement of cervical spine ROM testing both with and without ortho. Increased C-spine muscle activity reduces lordosis and restricts normal rotation. Simultaneously, the genetic predisposition for scoliosis already restricts normal alternating respiration(9,10). If the neck muscle activity is increased and the ribcage alternating activity is decreased then there is a propensity for increasing "patterning" of both the spine/rib cage and the palate. By "freeing" the palate, the neck becomes more mobile and therapies can become more effective on the spine by teaching proper, alternating airflow.

Free spinal mobility transfers to the palate and teeth as well. We suspect that this is why there is a correlation between scoliosis and crossbite. The scoliosis transfers all the way from the spine up to the palate. Once the scoliotic spine is minimized, then the orthodontist can begin lighter wire control of the teeth and become a participant in management of the patients' scoliosis. Future studies may suggest that initiation of orthodontia should be held until after risser scores reach 4 or 5/5 indicating approximation of skeletal maturity.