



# The Effect of Chiropractic Treatment on Reduced Rib Motion in a Patient with Ankylosing Spondylitis

## A Case Report

William E. Morgan, DC, Christina Hall  
National Naval Medical Center, Bethesda, Maryland

### Abstract

We report a 38-year-old man presenting with ankylosing spondylitis (AS) with subsequent reduced respiratory excursions and respiratory tidal volume. He was co-managed by rheumatology and chiropractic for this condition. Over the course of three months his chest excursions returned to within the range of normal<sup>1</sup>. During this period of time his symptoms have reduced, and he is progressing to a program of self-care.

Key words: Ankylosing spondylitis, chiropractic, manipulation

### Introduction

Ankylosing spondylitis has an occurrence rate of 0.5-1.9%<sup>2</sup> in the United States, and the prevalence of the disease increases 20-fold in persons with the HLA-B27 antigen<sup>3</sup>. This chronic inflammatory disease primarily affects males aged 20-40 and may be associated with a family history of ankylosing spondylitis or other seronegative spondyloarthropathy<sup>4</sup>. It is known primarily for affecting the axial skeleton, but it also is associated with an increased incidence of pulmonary disease<sup>5</sup>, particularly restrictive lung diseases<sup>6</sup>. Ankylosing spondylitis commonly contributes to a decrease in thoracoabdominal movement and lung excursion<sup>7</sup> due to ankylosis of the costovertebral joints<sup>8</sup>. With the advancement of the disease, complications of the pulmonary tissue, including chest wall restriction, apical fibroblastic disease, spontaneous pneumothorax, obstructive sleep apnea and pulmonary apical fibrocystic disease<sup>9</sup>, are common. We describe a case of a 38 year old male who was diagnosed with AS by a chiropractor. The chiropractor identified a significant reduction in the patient's chest excursions. Through a collaborative treatment program, the patient's respiratory excursions returned to normal range<sup>1</sup>.

### Manipulative Therapy

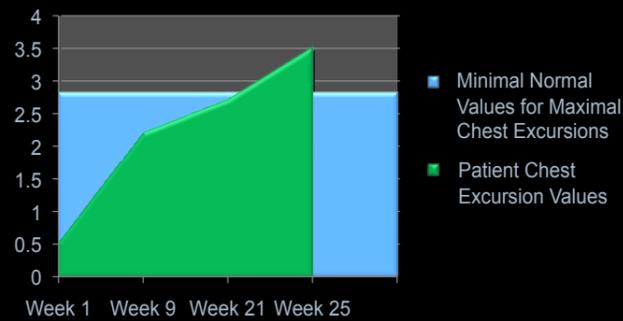
The effects of spinal manipulation on AS patients is not well documented, and we could not find evidence that manipulating an ankylosed joint would restore motion to that joint. Upon conferring with this patient's rheumatologist, we agreed on a trial treatment of chiropractic manipulation to the non-ankylosed vertebrae of the thoracic spine and their adjoining ribs. The patient tolerated this care well, and a treatment plan was established.

### Case Report

A 38-year-old man reported to the chiropractic department of a major medical center with complaints of neck and mid and lower back pain and stiffness. A physical examination revealed severely restricted cervical and lumbar spinal motion in all planes of motion, positive Forestier's sign<sup>10</sup>, reduced spinal joint play upon palpation, and tidal chest excursions limited to minimal motion: 5mm change from maximal exhalation to maximal inhalation, quantified with a cloth tape measure placed circumferentially around the man's chest. Patient presented with an initial pain reading of 2/10 on the VAS. Subsequent lab findings included a positive HLA-B27, and spinal radiographs revealed syndesmophytes in the cervical spine between the posterior body of C2 and C3 and in the lower thoracic spine (T10-T11-T12-L1) as demonstrated in image 1. The sacroiliacs were ankylosed bilaterally (image 1). No evidence of costovertebral ankylosis was visible on thoracic spinal x-rays. He was referred to rheumatology where the diagnosis of AS was confirmed. Additional diagnostic tests were ordered including a pulmonary function test (spirometry/DLCO), which revealed a mildly restrictive ventilatory pattern. Rheumatology began treating the patient with injectable Adalimumab (40 mg/0.8 ML every 14 days). The rheumatologist and chiropractor conferred and agreed to a trial treatment of chiropractic manipulation to mobilize the restricted rib motion. The patient was told of the risks of this line of treatment and the potential benefits. He was able to confer with both the rheumatologist and the chiropractor. He subsequently agreed to this line of treatment and signed a consent-to-treat form.

### Chart 1

Change of Chest Excursions in Circumferential Measurements During Course of Chiropractic Care. Measured in cm.



### Case Report

Chiropractic treatment consisted of a motorized continuous spinal motion table, heat, and interferential electrical current, followed by gentle chiropractic manipulation of the patient's thoracic spine and costovertebral joints. These treatments were repeated an average of once per week for a period of 25 weeks.

The patient was placed on a home program of exercises that included a walking program, oral inflation of a balloon every hour (ten times per day), and the home use of an incentive inhalation spirometer. He was instructed to perform 3 incentive spirometer sessions per day during these sessions. He was to inhale and maintain a constant flow of 600 cc/second for as long as possible. He was encouraged to time his attempt at using the incentive spirometer. Postural molding (lying on a contoured foam buttress that acts like a fulcrum to minimize the progression of thoracic kyphosis) was also utilized.

The patient was evaluated throughout treatment with the use of a cloth tape measure to determine chest excursion improvement<sup>11</sup>. He demonstrated a chest excursion of 0.5 cm upon first visit. The majority of males ages 22-75 demonstrate a normal chest excursion range of 2.81-7.37 cm<sup>11</sup>, with the average mean range of 2-5 cm<sup>1</sup>. At week 9 he was reevaluated and found to have 2.2 cm of chest excursion from maximal exhalation to maximal inhalation. At week 21 his chest excursions had increased to 2.7 cm, and at week 25 his chest excursions had increased to 3.5 cm (chart 1). His spinal pain level remained between 2-3/10 during the course of his care

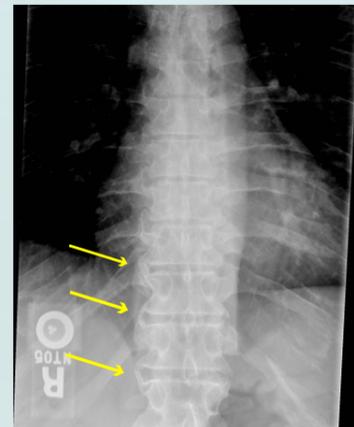


Image 1. Syndesmophytes are seen joining the vertebrae of T10-T11-T12-L1.

### Discussion

The authors recognize the self-evident risks of manipulating ankylosed joints or joints inflamed by rheumatologic disease, and we do not advise the indiscriminate treatment of AS with manipulation. However, this case shows that a coordinated and thoughtful program of care may reverse some of the adverse effects of this disease in joints that have not totally ankylosed. We fully recognize that the positive results that we observed could have resulted from the Adalimumab concurrently given by the rheumatologists, the breathing exercises, the increased activity levels, the stretching over the foam roll, or the natural course of the disease.

### Conclusion

Reduced respiratory excursions and consequent pulmonary disease are some of the more disconcerting effects attributed to AS<sup>12</sup>. Collaborative rheumatology and chiropractic management of patients with AS may be a safe and effective way to restore motion and function to the thoracic spine and ribs, thus reducing the pulmonary impact of this disease. Further investigation would be needed to fully understand the risks and benefits of including chiropractic care into the algorithm of AS care.



Image 2. Ankylosis of the sacroiliac joints bilaterally

### Rib Mechanics During Respiration

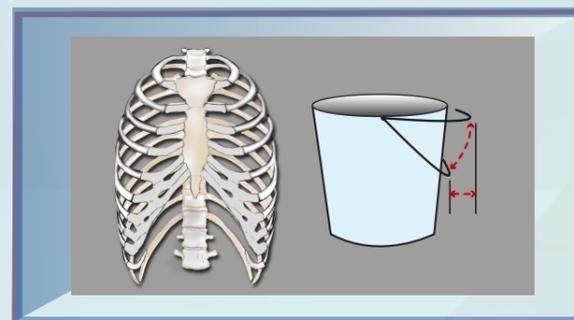


Image 3. Rib motion is an important part of respiration. The ribs move up and down similarly to the motion of a bucket handle. In ankylosing spondylitis this motion can be arrested by the ankylosis of the costovertebral joints. This mechanical impairment to respiration contributes to a high rate of pulmonary disease in patients with ankylosing spondylitis. Finding a treatment to prevent rib ankylosis would be beneficial to these patients.

### Progression of Ankylosis

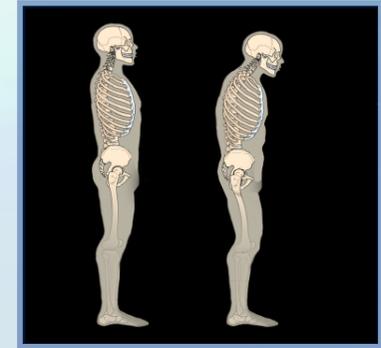


Image 4. As ankylosing spondylitis progresses, the spine typically assumes a bent posture with the spine eventually fusing in a kyphosis. The image on the left depicts the normal contours of the spine; the image on the right reveals fusion of the spine in flexion which is characteristic of ankylosing spondylitis.

### Postural Molding

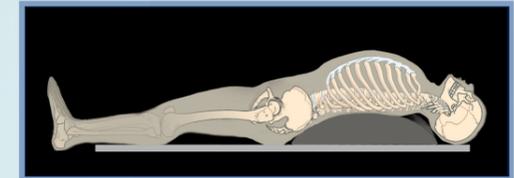


Image 5. Postural molding is a chiropractic technique that uses a foam fulcrum to prevent the formation of an excessive kyphosis. The patient was instructed to lie on the foam roll for at least ten minutes twice a day.

### Cited References

- Bennett PH, Burch TA. Population studies of the rheumatic diseases. Proc 3<sup>rd</sup> International symposium, New York, 1966, ed. P.H. Bennett, PHN Wood, pp305-313
- Braun J, Brandt J, Listing J, et al. Treatment of active ankylosing spondylitis with infliximab: a randomized controlled multicentre trial. *The Lancet*. 2002 Apr; 359(9313): 1187-1193.
- Braun J, Bollow M, Remlinger G, et al. Prevalence of spondyloarthropathies in HLA B27-positive and negative blood donors. *Arthritis & Rheumatism*. 1998 Jan; 41(1): 58-67.
- Sieper J, Braun J, Rudwaleit M, et al. Ankylosing spondylitis: an overview. *Ann Rheum Dis*. 2002 Nov; 61(Suppl III): iii8-iii18.
- Kanathur N, Lee-Chiong T. Pulmonary manifestations of ankylosing spondylitis. *Clin Chest Med*. 2010 Sep; 31(3): 547-54.
- Haslock I. Ankylosing spondylitis. *Baillieres Clinical Rheumatology*. 1993 Feb; 7(1): 99-115.
- Tzelepis, G E et al. Thoracoabdominal motion in ankylosing spondylitis: association with standardized clinical measures and response to therapy. *Ann Rheum Dis*. 2009 July; 68(6): 966-971.
- Pascual E, Castellano JA, Lopez E. Costovertebral joint changes in ankylosing spondylitis with thoracic pain. *British Journal of Rheum*. 1992; 31:413-415
- Kanathur N., Lee-Chiong T. Pulmonary manifestations of ankylosing spondylitis. *Clin Chest Med*. 2010 Sep;31(3): 547-54.
- Masi AT, Sierakowski S, Kim JM. Jacques Forestier's vanished bowstring sign in ankylosing spondylitis: A call to test its validity and possible relation to spinal myofascial hypertonicity. *Clinical and Experimental Rheumatology*. 2005; 23(6): 760-66.
- Moll JMH, Wright V. An objective clinical study of chest expansion. *Ann Rheum Dis*. 1972; 31(1).
- Durmuş D. Effects of two exercise interventions on pulmonary functions in the patients with ankylosing spondylitis. *Joint Bone Spine*. 2009 Mar;76(2): 150-5.

### Acknowledgements

We would like to acknowledge and thank Dr. Clare P. Morgan for her technical advice and proofreading skills. We also would like to thank the Medical Graphic Arts Department of NMSC for their professionalism and skillful assistance.