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Case Study

Reversing thoracic hyperkyphosis: a case report featuring mirror image® thoracic extension rehabilitation

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Abstract. [Purpose] To present a case of non-surgical reduction of thoracic hyperkyphosis utilizing a multimodal rehabilitation program emphasizing the mirror image® concept. [Subject and Methods] A 15-year-old female presented to a rehabilitation office suffering from back and neck pains and headaches. The patient was treated sporadically over a period of 13-months. Treatment consisted of anterior thoracic translation and thoracic extension exercises, spinal traction and spinal manipulation. [Results] After 13-months of treatment the patient displayed a significant reduction in hyperkyphosis and a dramatic correction of her overall posture and spine alignment corresponding to the reduction in back/neck pains, headaches and the simultaneous improvement of various other health issues. [Conclusion] Thoracic hyperkyphosis can be reduced through a multimodal rehabilitation program emphasizing mirror image thoracic extension procedures.
Key words: Hyperkyphosis, Posture, Rehabilitation

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INTRODUCTION

Thoracic hyperkyphosis is associated with the incidence of compression fractures[1, 2)], reduced mobility[1, 2)], reduced quality of life[3, 4)], as well as decreased longevity[5–10)]. In younger adolescent patients it has been determined the greater the kyphosis curvature, the stronger the negative association to total pain, general self-image, general function, and overall level of activity[11)].

Thoracic hyperkyphosis is difficult to treat clinically, and has unique considerations regarding its treatment[12)]. Harrison et al.[13)] demonstrated that one cause of thoracic hyperkyphosis is the normal spinal coupling pattern resulting from a posterior thoracic translation postural shift. They also demonstrated that an anterior thoracic translation postural shift produces the opposite postural pattern, a flattening of the thoracic kyphosis[13)].

The logical treatment for those with thoracic hyperkyphosis with accompanying posterior thoracic translation posture is the so-called 'mirror image®' approach, a term coined by Dr. Don Harrison[14)]. Examples of the mirror image approach can include the prescription of thoracic extension postural exercises and spinal traction.

Because of its serious potential/future health impact, the diagnosis of thoracic hyperkyphosis in younger patients deserves serious attention and treatment aimed at reducing the deformity to prevent future undesirable consequences[15)]. This case presents the successful reduction of a hyperkyphotic thoracic posture in a 15-year-old suffering from back pains as well as several other health issues.

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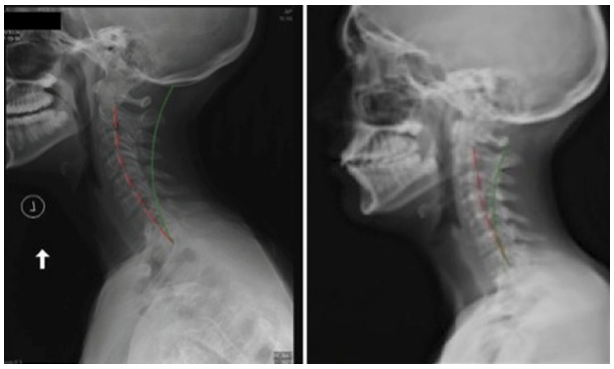

Fig. 1. Cervical spine radiographs
Left: Initial taken 9/30/2011; Right: Follow-up taken 10/30/2012. Patient has visible anterior head translation (35.6 mm vs. normal <15mm[19]).

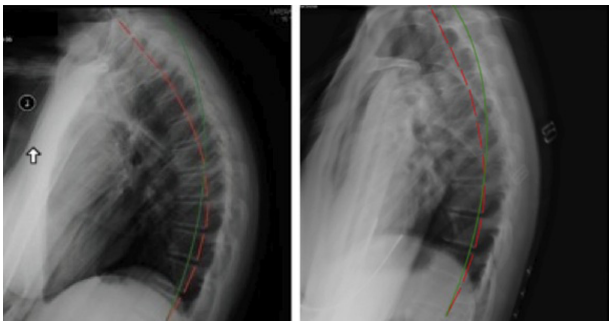

Fig. 2. Thoracic spine radiographs
Left: Initial taken 9/30/2011; Right: Follow-up taken 10/30/2012. Patient has visible hyper-kyphosis (T1–T12 = 71.3° vs. normal = 43.7°[20]).

SUBJECT AND METHODS

A 15-year-old female was brought by her parents to one of our rehabilitation clinics suffering from back and neck pains as well as headaches. Upon visual inspection, it was obvious she had a pronounced thoracic hyperkyphosis.

The patient reported her pains were rated as 3–5/10 for her neck (0= no pain; 10= worst pain ever), 5–10/10 for migraine headaches, 4–8/10 for chronic low back pain, 2–5/10 for mid back pain, and 2–4/10 for pain into the ribs and chest. She also reported to suffer from dizziness, visual disturbances, numbness and tingling into the hands, weakness and coldness in the left hand, heartburn, heart palpitations, shortness of breath, involuntary breathing patterns, as well as muscle cramps in the hips, thighs and calves bilaterally.

Full spine radiographs were taken and biomechanically analyzed using the PostureRay® Software (Posture Co. Inc., Trinity, FL, USA). This system uses the Harrison posterior tangent method for lateral spine images[16, 17] and the modified Riser-Ferguson method for AP spine images[17]. These measurement methods are repeatable and reliable[16–18].

The patient had several postural faults, the larger and notable ones included a forward head posture (35.6 mm vs. <15 mm normal[19]), Fig. 1), thoracic hyperkyphosis (T1–T12= 71.3° vs. 43.7° normal[20]), Fig. 2), and posterior thoracic translation posture (−59.2 mm vs. 0 mm normal[13]), Fig. 3).

The patient was treated with a multimodal rehabilitation program[14, 21, 22] including mirror image corrective exercises, spinal traction, and spinal manipulation. Since the patient had a large posterior thoracic translation, the prescribed mirror image corrective exercises included an anterior thoracic translation exercise as well as a prone back extension exercise on a PowerPlate® (Northbrook, IL, USA) which intensifies the muscular demand[23].

The spinal traction was an anterior thoracic position performed for up to 20 minutes in both a supine position (for first 20 treatments) and then progressed to a standing position utilizing the SRBrace™ (Circular traction, Huntington Beach, CA, USA) on the PowerPlate (Fig. 4). This positions the thoracic spine into its mirror image (hypo-kyphosis), as well as positions the posterior thoracic posture into its mirror image (anterior translation). Spinal manipulation was also applied for pain relief. The patient received 94 treatments over a period of 13-months. The patient and parents consented to the publication of these results.

RESULTS

Upon radiographic re-assessment, the patient's forward head posture reduced (28.8 mm vs. 35.6 mm), the thoracic hyper-kyphosis reduced (54.3° vs. 71.3°), and the posterior thoracic translation posture corrected (−59.2 mm vs. +4.9 mm). The patient reported to be 80–100% improved in all of the initial health complaints. The low back pain improved and was rated as 2–4/10, and the mid back and rib and chest pains a 1–2/10.

DISCUSSION

This case illustrates the successful application of Harrison's mirror image approach to reduce thoracic hyperkyphosis deformity and improve posture in a 15 year old with back pains and various other health issues.

There is limited clinical evidence within the manual therapies literature of successful non-surgical treatments for the reduction of pathologic thoracic hyperkyphosis[1, 24]. Although many non-surgical approaches may show promise including exercise, manual therapy, spinal orthosis, 'practiced normal posture,' and taping, the clinical trials used to study these

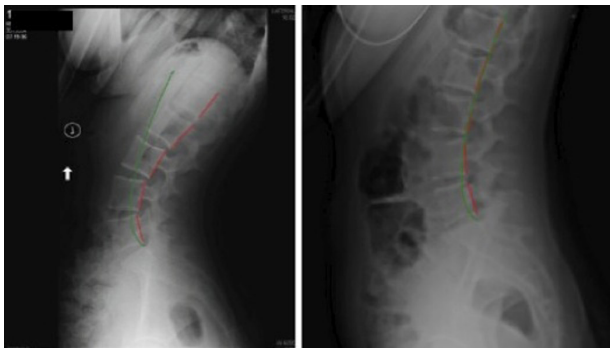

Fig. 3. Lumbar spine radiograph
Left: Initial taken 9/30/2011; Right: Follow-up taken 10/30/2012. Patient has visible posterior translation of thoracic cage (−59.2 mm vs. normal = 0mm[13]).

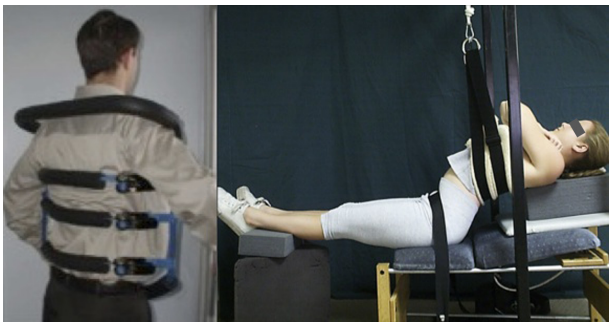

Fig. 4. Patient in simultaneous anterior thoracic translation and thoracic extension traction
Left: Standing anterior thoracic translation traction in the 'spinal remodeling brace' (Circular traction Supply, Inc., Huntington Beach, CA, USA). Right: Supine anterior thoracic translation traction.

procedures have been criticized by being small in scale and short in duration[24].

The only other documentation of using thoracic mirror image, extension traction in the treatment of thoracic hyperkyphosis is a case by Jaeger et al.[15] This case reported a 23° reduction in thoracic hyperkyphosis in a 24-year-old receiving 48 posture-based treatments (mirror image traction and exercises) over a 7-month period. The patient also performed the two exercises as described in our case. An 8.5-month follow-up showed the patients spine had remained stable and the patient had remained well.

Postural fault is frequently found in the adolescent population[25]. In screening 2,075 pupils aged 10–17 years, Nitzschke and Hildenbrand[26] determined the rate of hyperkyphosis to be 15% and 12% for males and females, respectively. Poor posture alignment in the sagittal plane creates a non-ergonomic disequilibrium about the gravity line[27] that in turn, changes trunk muscle length-tension relationships[28] that eventually lead to stress-strain nociceptive tendencies in the associated tissues (i.e. muscles, discs, facet joints etc.) that can be reversed with the correction of posture[29].

We believe that recognition of the coupled posterior translation posture and thoracic hyperkyphosis is essential to successfully treat patients presenting with this pattern of postural fault. Thoracic hyperkyphosis can be reduced through a multimodal rehabilitation program emphasizing mirror image thoracic extension procedures.

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