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The effects of massage chronic pain associated with spondyloepimetaphyseal dysplasia

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The Effect of Massage Therapy on Chronic Pain Associated with Spondyloepimetaphyseal Dysplasia

Abstract

Objective:

This study was used to explore and provide insight into the use of massage therapy on congenital skeletal dysplasias. It was specifically aimed at symptomatic relief of chronic pain of soft tissues and affected bony structures associated with spondyloepimetaphyseal dysplasia.

Methods:

Five treatments of one-hour duration over the course of eighteen days took place with a 15-year-old female highschool student. Identical protocol was followed in each treatment, focusing specifically on Swedish techniques, diaphragmatic breathing, grade one joint mobilizations, passive range of motion, and passive stretching. The focus was on musculature of the posterior thorax, particularly in the concavities of scoliotic curves, as well as the lower extremities.

Results:

The subject experienced a significant decrease in full body pain over the course of the study. Costal expansion of the lower ribs increased by 3/8". The left leg pre-study was measured at 24" and was measured at 25 ¼" at the completion of the study. Right leg remained consistent at 25". Following the study the patient was no longer using a wheelchair as primary transportation while at school for the first time since 2006.

Conclusion:

Massage therapy is an effective treatment option for symptomatic relief related to skeletal dysplasias. When used in conjunction with vital medical and surgical interventions massage may be of most benefit, providing SEMD patients with the optimal amount of relief in their daily lives.

Keywords: Skeletal dysplasia, spondyloepimetaphyseal dysplasia, scoliosis, chronic pain, Swedish massage.

Introduction

Spondyloepimetaphyseal dysplasia (SEMD) is a hereditary skeletal disorder (Merck 2008) and is among the most common causes of short stature (Sayler & Shamie, 2007). This skeletal dysplasia is caused by a type II collagen variation, specifically involving the COL2A1 gene, thereby causing laxity of ligamentous and capsular structures. In childhood, x-rays give confirmation to bony changes noticeable at the epiphyses and the metaphyses (Blanchford, 2002). Common physical attributes among affected patients include prenatal growth deficiency, as well as continuing after birth to present as a dwarfism (an adult height ranging on average from 36-67"), delayed axial skeletal ossification, ovoid vertebral bodies eventually becoming platyspondyly, femoral coxa vara, scoliosis, kyphoscoliosis, hyperlordosis of the lumbar spine, atlanto-axial instability due to hypoplastic odontoid process (risking spinal cord damage), delayed femoral head, pubic bone, and heel ossification, hypotonia, muscle weakness, muscle stiffness, underdevelopment of abdominal musculature, barrel chest, pectus carinatum, clubfoot, retinal detachment, and hearing impairment (rare). Abnormal gait may occur as a result of scoliosis and musculature imbalances. The physical intricacies of skeletal dysplasias can be quite complex and are highly individualized to each case. Medical and operative care is vital and necessary but often leaves patients with discomfort and chronic pain. De Smet (1985) explains that it is common for scoliosis to form in patients presenting with congenital abnormalities of bone tissue. These are often the most difficult to treat, as well as the most severe. Scoliosis in children that is of a pathological origin may manifest with constant pain, particularly in the evenings, noted Robin in 1990 (as cited in Rattray & Ludwig, 2005). While still quite lacking in research, complementary alternative

medicine is gaining ground as a means for symptomatic relief for these individuals (Frontera et al., 2008). Since chronic pain is a common complaint of severe skeletal variations, it can be assumed that a non-invasive and safe therapeutic approach through massage therapy (Hertling & Kessler, 2006) would be extremely beneficial to these patients. Braun & Simonson (2008) support this theory by explaining that massage therapy can provide effective relief of pain and stress arising from spinal changes. Since there is a lack of information for these patients regarding alternative and post-operative long term care, this study was aimed to provide insight into the usage of manual modalities for patients of such conditions by conceptually applying the known effects of massage therapy. It was specifically aimed at decreasing chronic low back pain associated with spondyloepimetaphyseal dysplasia through the use of Swedish massage techniques, diaphragmatic breathing, grade one joint play, and passive stretching.

Case History

The subject in this study was a 15-year-old female presenting with a skeletal dysplasia most closely resembling spondyloepimetaphyseal dysplasia (SEMD). That is, she is missing some typical qualities included in the diagnostic criterion while possessing some unique characteristics. Her parents first discovered a scoliotic curve in the thoracic region when the subject began sitting up at 8 months old. Upon MRI investigation bony irregularities were discovered throughout her entire body. The curvature that was first discovered as an infant rapidly progressed and is now a major contributing factor to her short stature, with the subject measuring 45” when standing. The most current presentation is two right thoracic curves (T1-T4 at 20°, and T10-T12 at 28°) with a compensatory curve between them, and a left lumbar curve (L1-L2 at 50°), as well as one

kyphoscoliosis measuring close to 78°. In regards to possible compromise of heart and lung functioning her orthopedic surgeon expressed that if an individual were to have four vertebral curves, this patient has them in the exact right places. Consequently, her breathing and digestive functioning are normal. As a child the subject wore a thoraco-lumbar-sacral-orthosis (TLSO) body brace 23 hours per day for seven years, from ages two to nine. Insertion of rods and plates in the lateral and posterior neck fused to the occiput provide atlanto axial stability due to a hypoplastic odontoid process. This procedure left the patient with trace range of motion of the cervical spine, of which there is absolutely no rotation. A spinal fusion of T12-L3 from a bone graft taken from her right posterior ilium was done at age seven. At age eleven rods and screws were inserted bilaterally into the distal half of the femurs above the lateral condyles, following a right femoral fracture as a means to increase stability. At the same time plates were inserted bilaterally in the distal third of the fibula after an osteotomy was performed to remove 2 cm of bone immediately proximal to the lateral malleolus to realign the subject's feet.

The patient experiences general pain in all joints and described that she feels a cracking-like sensation around her joints. Most of the patient's pain presents in her lumbar spine in the area of the sacroiliac joint bilaterally. It is described as a constant ache that gets worse with lifting and bending, but never goes away. The patient has utilized a wheelchair for mobility since September 2005. In March 2006 she began using a motorized chair, which is now her primary mode of transportation at school.

Assessment

To test the efficacy of massage therapy's ability to achieve the proposed results in this subject, baseline assessment was first ascertained using postural observation, palpation, gait assessment, lumbar and hip range of motion, and included a variety of functional and special tests focused on the lumbar, sacroiliac, and hip regions.

Most notable from the postural observation was the right acetabulofemoral joint presenting with a coxa vara, leading to a genu valgum of the right knee. A left acetabulofemoral coxa valga and left knee genu varum was also present. Rather than appearing as bowlegged or knock kneed, the patient's lower extremities lie in congruence with each other, forming a C shaped curve to the left. The patient was also observed constantly shifting, and leaning against the wall or table when not actively being tested. Palpation of involved structures revealed hypertonicity of the quadratus lumborum bilaterally as well as the erector spinae group, specifically in the concavities of the lateral curvatures. An assessment of the subject's gait revealed hip hike and circumduction of the left lower extremity in swing phase with rotation to the left of the trunk on right swing phase. Gait exhibited a wobbling and unsteady quality, with a bilateral Trendelenburg presentation. Slight forward flexion of the trunk helps to induce the gait cycle. Functional testing noted an unsteady squat and rise and difficulty performing the test, resulting in approximately 40° of knee flexion. When asked to touch her toes the subject's results were within normal limits, as the distal phalanges were able to touch the floor. Standard range of motion assessment was used, revealing restricted abduction and hypermobile adduction bilaterally. Lumbar range of motion had a significant decrease in rotation. There was also a weakness of resisted range of motion in the lower extremities

bilaterally. All actions were graded a 3+ on the right and a 4 on the left, in reference to Muscle Test Grading (Magee, 2008).

A Supine to Sit Test revealed the left lower extremity moving from short to long, indicating a posterior rotation of the left innominate. Leg Length was measured with the right at 25" and the left leg at 24". A positive result was observed only on the right side with the Trendelenburg Sign. Thomas Test, Yeoman's Test, Straight Leg Raise, Sacral Apex Pressure Test, and Gillet's Test were also administered, all with negative results. Costal expansion was measured pre and post treatments as well.

Treatment Plan

Five treatments of a one-hour duration were administered over the course of eighteen days. The study was intended to follow a strict yet flexible approach in regard to specific protocol and modalities used. Altering protocol if required was crucial with such a unique case and truly unknown reaction to therapy. Each treatment ended up following an identical protocol due to positive and successful reaction by the subject and targeted structures. Modalities used were diaphragmatic breathing exercises pre and post treatment, myofascial techniques along scar tissue on the posterior thorax, Swedish effleurage and petrissage techniques to compressed tissues, compressing, jostling, and picking up of the lower extremity musculature, lumbosacral decompression, grade one joint mobilizations to the acetabulofemoral joints, muscle setting, and passive stretching of the quadratus lumborum bilaterally.

Remedial exercise included a diaphragmatic breathing exercise and a passive (via the use of gravity) stretch for the quadratus lumborum muscle twice daily.

Results

Overall the treatments proved to be successful, with the most improved result over the duration of treatments being a decrease in the pain level experienced throughout daily life. A leg length change was noted between the first assessment and follow up after the last treatment. The subject's left leg initially measured at 24" showed an increase of 1 ¼", to be measured at 25 ¼" at the completion of the study. The right leg remained at 25". Costal expansion increased at thoracic vertebrae 4, and more significantly at thoracic vertebrae 9. Long-term results within the following month were very positive, and perhaps the most significant for the subject and the study. During her first week back at school the patient felt good and was continuing to use her wheelchair as usual, though she noticed that she was able to stand for longer periods of time without pain in her knees and back. The last treatment of this study took place at the end of her first week of school. The patient decided she wanted to try using her wheelchair less, as she was feeling more stable and her legs felt stronger. The more the patient walked, the stronger she got, and is now not using the wheelchair at all for the first time in three and a half years at school.

Discussion

A detailed postural and gait analysis was helpful in determining where the subjects primary concerns were developing from and how she was compensating for them. Particularly relevant is the concept of a positive feedback system (Tortora & Derickson, 2006) with her gait compensations; through compensatory mechanisms acting on the congenital laxity of her ligaments, the compensation must keep increasing, exacerbating the joints and further stretching the ligaments. When the patient was asked to touch her

toes, she did so within normal limits, but given strictly her skeletal structure this should not be possible. The lumbar spine remained with almost the same lordosis, exhibiting no flattening or rounding whatsoever. Since the lumbar vertebrae's facets are built and positioned to perform flexion it is apparent that there is some hypomobilty in the lumbar spine and hypermobility in the sacroiliac joints. The decreased ability to perform lumbar rotation could be related to the varied vertebral alignment, and also due to potentially atrophied multifidi, as suggested by Hertling & Kessler (2006).

The chosen modalities were probably beneficial as they targeted commonly contractile tissue in spinal misalignment of the erector spinae and quadratus lumborum (Hertling & Kessler, 2006). Since the patient was further engaging them to lift her lower extremities, as well as their shortened positioning, they were especially key to work with. Circulatory and general Swedish techniques were beneficial to the lack of use her legs were getting in her wheelchair. Providing joint nutrition to the acetabulofemoral, sacroiliac, and lumbar vertebral joints was vital to intervene on the positive feedback loop occurring with her attempts to walk.

When looking at leg length measurements, it is important to keep in mind with patients of severe scoliosis and pelvic involvement that the only accurate way to comparatively measure the extremities is by use of an x-ray, then measuring the image (De Smet, 1985; Neuwirth & Osborn, (2001). Manual measurement is still useful in determining possible pelvic rotations involved. The increase in the subject's left leg length could be likened to a decrease or shifting of pelvic rotations over the course of treatment.

Other notable changes were improvements in lower costal expansion measurements. The subject's thoracic structure is by nature restrictive to normal costal ranges of motion, but over the study the measurement increased by 3/8". This could be in part to the subject's participation in swimming and singing, both requiring an awareness of breath; particularly singing targeting the caliper action of the lower five ribs (Magee, 2008).

In regards to the subjects decrease in wheelchair use, this was probably an outcome of all targeted structures combined. By increasing joint movement and stimulation to muscles not being engaged on a consistent basis, increased circulation and joint nutrition were able to aid in the subject's ability to use the lower extremities with less fatigue. Increasing muscular strength and proper functioning around the joints was key in promoting stability of the acetabulofemoral joints exhibiting laxity.

If further treatment were to be issued, it would be beneficial to introduce therapy on musculature of the anterior thorax, particularly iliopsoas, external and internal abdominal obliques, and transverse abdominis. This would work more specifically with oblique groupings, more effectively targeting pelvic crossed syndrome (Hertling & Kessler, 2006; Magee, 2008). The initial treatments of this study aimed to introduce the subject to massage therapy, working and remaining within her comfort level, while gaining trust with the decrease of symptoms. Treatment of any deep or anterior trunk structures was avoided, as it was vital to monitor the subject's physical and emotional reactions to more superficial work first.

Conclusion

The treatment protocol in this study was successful for this particular subject. In terms of notable positive outcomes using massage therapy on other SEMD patients, treatments must be symptom and individually based, as presentation of the condition is unique in all subjects. Even within the same patient, skeletal structures shift and may appear altered from month to month. Therefore what is effective for one individual may not be for another, and consistent re-assessment and communication is vital for monitoring variations in patients. It is impossible to conclude undoubtedly that this treatment would be beneficial for all patients with SEMD, but it offers a good probability of providing at least some relief, as we cannot permanently alter any skeletal configurations causing the issues but are able to ease the symptoms and increase patients' kinetic functioning (Rattray, & Ludwig, 2006). Massage therapy used in conjunction with vital medical and surgical interventions would be of most benefit, providing SEMD patients with the optimal amount of relief in their daily lives.

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