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Adult Scoliosis And Chronic Low Back Pain With Land And Aquatic Based Physical Therapy: A Case Report

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PTH 608/708: Case Report Template

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Treatment of Adult Scoliosis and Chronic Low Back Pain with Land and Aquatic Based Physical Therapy: A Case Report

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The patient signed an informed consent allowing the use of medical information and photographs for this report and received information on the institution's policies regarding the Health Insurance Portability and Accountability Act.

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ABSTRACT

Background and Purpose

Scoliosis is commonly an idiopathic condition that occurs in approximately 2-3% of the population and is defined by a lateral spinal curvature of greater than 10 degrees.[1,2] Common symptoms associated with scoliosis include decreased pulmonary function and chronic spinal pain.[1] Depending on the degree of curvature bracing or surgery may be required.[2] The purpose of this case study is to evaluate the effects of an aquatic and land based exercise program on an adult with severe, untreated, early onset scoliosis.

Case Description

The patient was a 55-year-old female with a history of scoliosis and recent onset of low back pain. The chief complaint was severe back pain, which limited her ability to function at her job and impaired her ability to sleep. X-ray results showed severe scoliosis in the lumbar spine with lateral subluxations at L3 on L4. The plan of care consisted of aquatic based therapy for lumbar stabilization and decompression and land based therapy for soft tissue manipulation and lumbar stabilization.

Outcomes

Throughout this plan of care, the patient's pain decreased from 4/10 to 0/10 at rest, 10/10 to 4/10 with prolonged activity, and 6/10 to 1-2/10 on average. The patient also demonstrated a significant change in Oswestry Disability Index score from 28% to 10%.

Discussion

This case report suggested that aquatic and land based therapy that was focused on transverse abdominis activation for lumbar stabilization, spinal decompression, and soft tissue manipulation decreased our patient's low back pain and improved her functional mobility as evident by

improved pain scores and Oswestry Disability Index scores. Further research is suggested to assess the long-term effects of aquatic and land based intervention.

Word count: 2,293

BACKGROUND and PURPOSE

Scoliosis refers to a lateral curvature of the spine and is diagnosed when there is greater than 10 degrees of spinal angulation in the frontal plane with spinal torsion.[1,2] Most frequently the cause of scoliosis is idiopathic, however, potential other etiologies may include neuromuscular, congenital, neurofibromatosis, or syndrome related.[1,2] The incidence of idiopathic scoliosis is 2 – 3%, with the incidence of curvatures greater than 40˚ being less than 0.1%.[2] Although scoliosis does not affect a large population, it can be debilitating to those it impacts.

Patients with idiopathic scoliosis may present with no symptoms, however, in more severe cases symptoms include decreased pulmonary function and spinal pain. Due to the severity of these symptoms, the purpose of conservative treatment is to decrease the progression of the curvature. Depending on the degree of curvature, outpatient physical therapy with focus on targeted exercise and a home exercise program may be appropriate. In adolescents with a Cobb angle of greater than 25 degrees, physical therapy and bracing may be required to prevent a further progression of the curvature.[2] At the time of this case report there was limited research that showed long term effects of physical therapy intervention for patients with idiopathic scoliosis.

Surgery may be required when conservative therapy does not cease the progression of scoliosis. Surgery is typically indicated if the patient presents with a Cobb angle of greater than 45 degrees.[3] Typical surgical intervention includes posterior fusion of associated spinal levels.[3] The current limitations with surgical intervention is the need for repeated surgeries to lengthen the placed rods as a child grows. In recent cases of early onset scoliosis, magnetic controlled growth rods have been implemented (MCGRs).[4] MCGRs are surgically placed and do not require repetitive surgeries to lengthen as a child grows resulting in less complications secondary to surgery. [4]

Currently, much of the research for the treatment of scoliosis is in relation to adolescent's. However, as our population ages, more adult and elderly patients are presenting with scoliosis that was not treated when they were adolescents. Due to patient age and possible comorbidities, surgical correction is not always an option, leaving individuals of this population with chronic back pain and possible respiratory impairments. The purpose of this case study is to evaluate the effects of an aquatic and land based exercise program on an adult that presented with severe, untreated, early onset scoliosis.

CASE DESCRIPTION

Patient History and Systems Review

The patient was a 55-year-old female with a history of scoliosis and recent onset of low back pain. Her chief complaint was severe back pain, which limited her ability to function at her job and impaired her ability to sleep at night. The patient attended a pain clinic where she was given muscle relaxers and had an x-ray. The x-ray results showed severe dextroconvex scoliosis at L2, right lateral subluxations of L3 on L4, lower thoracic ankyloses, severe mid lumbar disc

space narrowing with associated degenerative sclerosis with moderate upper and lower disc space narrowing. She was then referred to outpatient physical therapy to be evaluated and treated for low back pain. A history of severe scoliosis and use of Milwaukie brace during childhood and adolescence was reported by the patient. The pain at evaluation was described by the patient as, “constant in my low back and tends to increase throughout the day and progress as a burning sensation in my hips and legs by the end of the day.” The patient further reported a history of gastroesophageal reflux disease that was treated with medication. The patient had no other past medical history. The patient’s goals were to be able to work throughout the day with tolerable to no low back pain and to be able to sleep throughout the night without back pain. See table 1 for full systems review. The patient signed a consent form to participate in this case report.

CLINICAL IMPRESSION 1

Based on the patient’s subjective history and system review it was expected that the patient would present with low back pain, radicular pain in lower extremities, and muscle weakness. Furthermore, it was expected that the severity of the patient’s scoliosis would limit her ability to stand for an extended period of time, ambulate on uneven surfaces, and work an eight-hour shift at her job as a sales associate at a hardware store. Examination goals included objective measures such as, the SLUMP test,[5] range of motion (ROM),[5] manual muscle testing (MMT),[5] postural assessment,[5] numerical pain rating scale (NPRS),[6] and Oswestry Disability Index (ODI).[5]

This patient was a good candidate for a case report due to the complexity and severity of her condition. In similar patient situations, the common approach was surgery, however this patient had elected to not receive such intervention. Because surgery is the common approach to

this patient population there was limited research on physical therapy intervention for severe adult idiopathic scoliosis.

EXAMINATION – TESTS AND MEASURES

The NPRS is performed by asking the patient to rate their pain on a 0-10 scale with 0 indicating no pain and 10 indicating severe pain.[6] The minimal detectable change (MDC) for this assessment was 3 points (27%) and the minimally clinically important difference (MCID) was 1 point. This assessment has also been shown to have excellent interrater/intrarater reliability (100%), criterion validity (r=.86 when compared to visual analogue scale), and construct validity (r=.94 when compared to visual analogue scale).[7] The patient reported pain on the NPRS as a 4/10 at rest, 10/10 with prolonged activity, and 6/10 on average.

The ODI was performed to assess the impact of the patient's low back pain on their daily function. The ODI has a MDC of 12.72 for patients with chronic low back pain as well as MCID of 12.8. The ODI was also found to have a specificity of 85% and sensitivity of 88%.[8] Results from the ODI were 28% at evaluation.

Active range of motion (AROM) of the spine was assessed in standing.[5] The patient performed forward flexion, extension, and lateral flexion. AROM assessment showed significant decrease in range of motion with extension, and lateral flexion and only minor decrease in forward flexion. Numerical ranges were not assessed at evaluation due to lack of required equipment. Due to no numerical measurements being taken, there was no reported statistical reliability or validity, however, range of motion assessment is considered a standard practice for physical therapists.

Manual muscle testing (MMT) was performed to assess the strength of bilateral hip flexion, knee flexion, knee extension, plantar flexion, and dorsiflexion as described in Magee[5]. The above MMTs were found to be within functional ranges. Abdominal strength was not assessed due to patient's pain and inability to lay supine. MMT has been shown to have strong interrater reliability with an intraclass correlation coefficient (ICC) of 0.94.[9]

Postural assessment showed significant deformities secondary to scoliosis as well as severe thoracic kyphosis, significant cervical extension, a right lateral lean, elevated left iliac crest, and elevated left scapula. Despite significant postural deformities, the patient did not present with a leg length discrepancy or antalgic gait pattern. Although there is limited statistical evidence to support an observational postural assessment, it is considered a standard assessment of physical therapists as described in Magee.[5]

The SLUMP test was used to assess for any nerve root compression. The SLUMP test has strong inter-tester reliability, kappa coefficient of .71, sensitivity of 100% and specificity of 83%.[10] Results from the SLUMP test indicated no nerve root compression. Refer to Table 2 for complete results of tests and measures.

CLINICAL IMPRESSION 2

Based on the examination data, signs and symptoms were consistent with the initial impression of severe scoliosis and chronic low back pain. The patient continued to be appropriate for this case report due to the complexity of her diagnosis, motivation and adherence to previous physical therapy, duration of current condition, and age. The patient was given a medical diagnosis of scoliosis (ICD-10: M41.9) and chronic low back pain without sciatica (ICD -10: M54.5).[11]

Based on clinical experience, the prognosis for this patient was favorable for reducing symptoms of low back pain, however, physical therapy intervention for idiopathic scoliosis in adults had not been thoroughly research at the time of this case report. This patient had a favorable prognosis for reducing symptoms due to their previous level of function, history of positive results from physical therapy intervention, and motivation to improve current condition.

The plan for this patient was to alternate between aquatic and land based therapy for 45 minute sessions, twice a week, for ten weeks. If no progress was made, the plan was to refer to a surgeon to assess and provide possible surgical options to correct the scoliosis. No further assessment was required at this time. The patient was to receive re-examinations every 5-weeks to assess progress using the ODI and NPRS. The plan for intervention included aquatic therapy with a focus on deep water traction, and water resisted exercise. The plan for land based intervention included soft tissue manipulation and lumbar stabilization exercises. Refer to table 3 for short term and long term goals.

INTERVENTIONS

Coordination, Communication, Documentation

Patient communication included development and instruction of home exercise program (HEP), education on plan of care, and on clinical examination findings. The patient's HEP was reviewed or updated at every physical therapy session. The patient's evaluation and treatment notes were documented on an electronic medical record system (EMR) that was shared with the referring physician.

Patient Related Instruction

The patient was educated on their impairments and their plan of care. A HEP, given to the patient on the first day (Appendix 1), included pictures of each exercise as well as written instructions on exercise performance, duration, and frequency. The patient verbally and physically demonstrated good understanding and adherence to the HEP throughout the entire duration of physical therapy.

Treatments

Physical therapy interventions consisted of 45-minute sessions twice per week for 10 weeks. It was determined that sessions would be split between aquatic and land based therapy. Due to patient progression, aquatic therapy was performed twice per week for 4 weeks. Table 4 provides details on each treatment session. Aquatic therapy was chosen based on evidence that supports aquatic therapy in the treatment of low back pain.[13,14] A typical progression for aquatic based sessions were:

1. Subjective assessment of the patient's pain and progression since the previous session.
2. Shallow end ambulation for 3 minutes.
3. Shallow end side steps for 3 minutes.
4. Shallow end hip flexion (marching motion) for 3 minutes.
5. Deep end hang for 3 minutes.
6. Deep end hip flexion (marching motion) for 2 to 3 minutes.
7. Deep end walk for 3 minutes.
8. Deep end straight leg hip flexion/extension (scissor kick) for 3 minutes.
9. Repeat once.

Deep end exercises were performed with the use of foam floatation tubes in 6 feet of water.

A plan was developed after 8 consecutive aquatic treatment sessions to progress patient back to land based treatment sessions. This decision was based on research that supported TA activation and soft tissue mobilization for the treatment of low back pain.[12,15] Exercise progression was limited due to the patient's inability to lay supine and frequent aggravation of their low back pain. A typical progression for land based sessions were:

1. Subjective assessment of the patient's pain and progression since the previous session.
2. NuStep (NuStep LLC, Ann Arbor, MI) at level 4 resistance, for 10 minutes.
3. Soft tissue manipulation (STM) of bilateral lumbar paraspinals from L1 to L5 for 15 minutes.
4. Seated hip flexion with bilateral shoulder flexion with cues on TA activation for 10 repetitions.
5. Bilateral standing row with red resistance band for 15 repetitions.
6. Seated hamstring stretch with two 30 second holds.

OUTCOME

Test and measures were performed by the same therapist at discharge and initial examination (Table 2). Upon completion of physical therapy, the patient had improved functional capability as shown by a change in ODI score from 28% at initial evaluation to 24% at week 5 to 10% at discharge. She also demonstrated decreased pain according NPRS with change in average pain from 6/10 to 1-2/10. Lumbar range of motion and lower extremity strength remained unchanged throughout physical therapy. Furthermore, there was no change in the patient's posture upon re-exam or discharge. The patient reported significant increase in daily

activities such as gardening, playing with her granddaughter, and her ability to work an eight-hour shift with only mild back pain.

DISCUSSION

This case report described the physical therapy management of an adult patient with severe idiopathic scoliosis. The patient performed an aquatic and land based exercise program in conjunction with deep water traction and soft tissue manipulation. These interventions were based on the current literature and clinical reasoning. Results from this case report suggest that although physical therapy intervention may not change the degree of scoliosis, it may be able to improve a patient's lumbar pain and functional mobility.

The outcomes of this case report were consistent with the initial hypothesis that lumbar stabilization exercises and aquatic lumbar traction would decrease the patients low back pain. This was based on research that supported the use of aquatic therapy,[13,14] soft tissue manipulation, and lumbar stabilization for the treatment of low back pain.[12,15] Although this case report had positive outcomes, it is unclear which interventions most contributed to the positive results. Further research on adult patients with scoliosis is important because current studies are primarily based on young children and adolescent populations. This is a problem because there are many adult patients with low back pain, secondary to scoliosis, that were never treated when they were a child. Further research would help determine best practice for this patient population, and develop intervention protocols for adult patients with low back pain secondary to scoliosis.

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TABLES and FIGURES

Table 1. Systems Review

Systems Review	
Cardiovascular/Pulmonary	Unimpaired
Musculoskeletal	Significant decreased lumbar and thoracic lateral flexion, extension, and rotation. Minimal decrease in lumbar and thoracic flexion. Gross upper and lower extremity strength within functional limits.
Neuromuscular	Bilateral burning sensation through buttock and posterior thigh
Integumentary	Unimpaired
Communication	Unimpaired
Affect, Cognition, Language, Learning Style	Unimpaired

Table 2. Tests and Measures

TESTS & MEASURES	INITIAL EVALUATION	RE-EXAM	DISCHARGE
Lower Extremity Manual Muscle Test	Within Functional Limits	Within Functional Limits	Within Functional Limits
Active Range of Motion: Lumbar/Thoracic Spine	Decreased flexion, extension, and lateral flexion	Decreased flexion, extension, and lateral flexion	Decreased flexion, extension, and lateral flexion
Numerical Pain Rating Scale			
Resting:	4/10	2/10	0/10
Highest:	10/10	6/10	6/10
Average:	6/10	4/10	1-2/10
Postural Assessment	Spinal deformity secondary to scoliosis, thoracic kyphosis, cervical extension, elevated left iliac crest and left scapula.	Spinal deformity secondary to scoliosis, thoracic kyphosis, cervical extension, elevated left iliac crest and left scapula.	Spinal deformity secondary to scoliosis, thoracic kyphosis, cervical extension, elevated left iliac crest and left scapula.
Oswestry Disability Index	28%	24%	10%
Slump Test	Negative	Negative	Negative

Table 3: Short Term and Long Term Goals

Short term goals: 1. Patient will decrease average low back pain to 3/10 on the NPRS in 4 weeks. 2. Patient will improve ODI score to less than 25% in 4 weeks. 3. Patient will improve body mechanics in order to safely lift objects at work without causing increased back pain in 4 weeks.
Long term goals: 1. Patient will decrease worst low back pain to 5/10 on the NPRS in 8 weeks. 2. Patient will improve ODI score to less than 15% in 8 weeks. 3. Patient will be able to work through an entire 8-hour shift with tolerable low back pain in 8 weeks.

383 **Table 4. Treatment Session Timeline**
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Intervention:	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5
Seated hip flexion with TA activation	3 sets 10 reps		3 sets 10 reps		
Standing row with red resistance band	3 sets 10 reps		3 sets 10 reps		
Seated hamstring stretch	2 sets 20 sec hold		2 sets 20 sec hold		
STM to lumbar paraspinal L1-L5	10 min		10 min		
NuStep	2 resistance 10 min		2 resistance 10 min		
Shallow end ambulation		3 min x 4		3 min x 3	3 min x 2
Shallow end side step		3 min x 3		3 min x 2	3 min x 2
Shallow end hip flexion				3 min x 2	3 min x 2
Deep end hang		3 min x 5		3 min x 4	3 min x 4
Deep end scissor kick				3 min x 2	3 min x 2
Deep end hip flexion		3 min x 3		3 min x 2	3 min x 2
Deep end walk					3 min x 2
Intervention:	**Treatment 6**	**Treatment 7**	**Treatment 8**	**Treatment 9**	**Treatment 10**
Seated hip flexion with TA activation					

Standing row with red resistance band					
Seated hamstring stretch					
STM to lumbar paraspinal L1-L5					
NuStep					
Shallow end ambulation	**3 min x 2**	**3 min x 3**	**3 min x 2**	**3 min x 2**	**3 min x 2**
Shallow end side step	**3 min x 2**	**3 min x 2**	**3 min x 2**	**3 min x 2**	**3 min x 3**
Shallow end hip flexion	**3 min x 2**	**3 min x 2**	**3 min x 2**	**3 min x 2**	**3 min x 2**
Deep end hang	**3 min x 4**	**3 min x 3**	**3 min x 3**	**3 min x 3**	**3 min x 3**
Deep end scissor kick	**3 min x 2**	**3 min x 2**	**3 min x 2**	**3 min x 2**	**3 min x 2**
Deep end hip flexion	**3 min x 2**	**3 min x 2**	**3 min x 2**	**3 min x 2**	**3 min x 2**
Deep end walk	**3 min x 2**	**3 min x 2**	**3 min x 3**	**3 min x 2**	**3 min x 2**
Intervention:	**Treatment 11**	**Treatment 12**	**Treatment 13**	**Treatment 14**	**Treatment 15**
Seated hip flexion with TA activation			**3 sets 10 reps**		
Standing row with red resistance band			**3 sets 10 reps**		
Seated hamstring stretch			**2 sets 20 sec hold**		
STM to lumbar paraspinal L1-L5			**10 min**		
NuStep			**3 resistance**		

			10 min		
Shallow end ambulation	3 min x 2	3 min x 2		3 min x 3	3 min x 2
Shallow end side step	3 min x 2	3 min x 2		3 min x 2	3 min x 2
Shallow end hip flexion	3 min x 2	3 min x 2		3 min x 2	3 min x 2
Deep end hang	3 min x 4	3 min x 4		3 min x 4	3 min x 4
Deep end scissor kick	3 min x 2	3 min x 2		3 min x 2	3 min x 2
Deep end hip flexion	3 min x 2	3 min x 2		3 min x 2	3 min x 2
Deep end walk	3 min x 2	3 min x 2			3 min x 2
Intervention:	**Treatment 16**	**Treatment 17**	**Treatment 18**	**Treatment 19**	**Treatment 20**
Seated hip flexion with TA activation		4 sets 10 reps		4 sets 10 reps	
Standing row with red resistance band		4 sets 10 reps		4 sets 10 reps	
Seated hamstring stretch		2 sets 20 sec hold		2 sets 20 sec hold	
STM to lumbar paraspinal L1-L5		10 min		10 min	
NuStep		4 resistance 10 min		4 resistance 10 min	
Shallow end ambulation	3 min x 2		3 min x 2		3 min x 2
Shallow end side step	3 min x 2		3 min x 2		3 min x 3
Shallow end hip flexion	3 min x 2		3 min x 2		3 min x 2
Deep end hang	3 min x 4		3 min x 3		3 min x 3
Deep end scissor kick	3 min x 2		3 min x 2		3 min x 2

Deep end hip flexion	**3 min x 2**		**3 min x 2**		**3 min x 2**
Deep end walk	**3 min x 2**		**3 min x 3**		**3 min x 2**

Key: STM = soft tissue manipulation, TA = transverse abdominus, min = minute, sec = seconds

APPENDICES

Appendix 1. Home Exercise Program

HIP / KNEE - 21
Strengthening: Hip Abduction (Side-Lying)

Tighten muscles on front of RIGHT / LEFT thigh, then lift leg ___ inches from surface, keeping knee locked.

Repeat 15 times per set. Do 1 sets per session.

Do 1 sessions per day.

HIP / KNEE - 77
Functional Quadriceps
Sit to Stand

Sit on edge of chair, feet flat on floor. Stand upright, extending knees fully.

Repeat 10 times per set.

Do 1 sets per session.

Do 2 sessions per day.

BACK - 43 Bilateral Scapular Retraction

Wrap tubing around both fists. Pull arms back while bringing shoulder blades together as if rowing a boat.

Repeat 15 Repetitions/set.

Do 1 Sets/session.

Do 1 Sessions/day.

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