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Use of pelvic clocks for physical therapy management of a patient with sacroiliac dysfunction and low back pain: a case report

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USE OF PELVIC CLOCKS FOR PHYSICAL THERAPY MANAGEMENT OF A PATIENT WITH SACROILIAC DYSFUNCTION AND LOW BACK PAIN: A CASE REPORT

by

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Bachelor of Science in Physical Therapy
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This Scholarly Project, submitted by Amber Huener in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

(Graduate School Advisor)

(Chairperson, Physical Therapy)
PERMISSION

Title Use of Pelvic Clocks for Physical Therapy Management of a Patient with Sacroiliac Dysfunction and Low Back Pain: A Case Report

Department Physical Therapy

Degree Doctor of Physical Therapy

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Thank you all.
ABSTRACT

Background and Purpose. This case study describes the evaluation and treatment of a patient with sacroiliac dysfunction and low back pain. The purpose of this case study is to explore the effects of pelvic clocks used as muscle energy techniques in the treatment of sacroiliac dysfunction and low back pain. Description. The patient was a 62-year-old woman with a 5-month history of SI pain who was seen for outpatient physical therapy over a 5-week period. The client presented with decreased strength in hip abduction bilaterally, decreased knee ROM, sacroiliac pain, and referring pain down to the knee on the left. The treatment of this patient included stretching, patient education, pelvic clocks, strengthening, joint mobilization, and McKenzie techniques. Outcomes. Following eight treatments, the patient achieved a decrease in pain, increased strength with back extensors and hip abductors, improved gait mechanics, increased knee ROM, increased walking and sitting tolerances, and improved ability to ambulate stairs as per patient report.

Discussion. This case report suggests, based on the patient’s response to treatment, that pelvic clocks may be effective in treating patients with SI dysfunction and low back pain, especially in the short term relief of SI pain.

Key words: Sacroiliac dysfunction, Low back pain, Muscle energy techniques, Pelvic clocks.
CHAPTER I

BACKGROUND AND PURPOSE

The sacroiliac joint is believed to be a source of pain in 2% to 22.5% of patients with suspected cases of chronic low back pain.\(^1\)\(^-\)\(^2\) Studies have suggested that sacroiliac joint dysfunction (SIJD) can contribute to low back pain, sciatic pain, buttock, and leg pain.\(^3\)-\(^5\) It has also been found that pelvic joints refer pain in addition to producing their own pain, and sacroiliac pain may refer that pain to other locations due to the extensive distribution of nerve innervations.\(^5\)-\(^6\) There is much unknown about the mechanisms of SIJD, making diagnosing and treating this dysfunction a complex issue faced by many clinicians. The list of assessment tests available to the clinician is extensive and no one clinical examination technique or common historical event exists to aid in making a diagnosis.\(^7\)-\(^8\) Furthermore, there currently is no “gold standard” for diagnosing SIJD or pain that originates from the SI joint.\(^7\),\(^9\) In a systematic review,\(^9\) the authors concluded that the specificity and validity of the diagnostic accuracy of sacroiliac joint injections was moderate.

In addition to the lack of effective diagnostic methods, effective interventions for SIJD are not clearly defined. Conservative treatment following the acute stage of the injury can include joint mobilization, muscle energy techniques, sacroiliac joint belt use, strengthening, and leg length discrepancy correction. Research performed by Osterbauer et al,\(^10\) showed some degree of pain relief following manually-assisted, short-lever
mechanical force adjustments in patients with chronic sacroiliac joint syndrome. The use of a sacroiliac joint belt has been shown to enhance pelvic stability and decrease mobility of the SI joints, both of which may lead to a reduction in pain.\textsuperscript{11-12} The role of trunk muscle strengthening has also been shown to improve pain symptoms in patients with chronic low back pain over the age of 40.\textsuperscript{13} Peterson et al\textsuperscript{14} stated that McKenzie treatment and intensive dynamic strengthening training were equally effective in treating patients with chronic or subacute low back pain. Graves et al\textsuperscript{15} also reported the importance of using low back strengthening with pelvic stabilization for the prevention and rehabilitation of low back pain. Leg length discrepancy correction using shoe inserts has been shown to reduce pain levels and disability in patients with chronic low back pain.\textsuperscript{16} There has been no current research on the effects of pelvic clocks used as muscle energy techniques to treat sacroiliac joint dysfunction. The purpose of this case report is to describe the outpatient physical therapy management of a patient who was suggested to have sacroiliac joint dysfunction based on signs and symptoms and also to explain the use of pelvic clocks in her treatments. Pelvic clocks used as a muscle energy technique were shown to give short-term pain relief of the SIJ, and this paper will emphasize this technique’s role on the patient’s outcome.
CHAPTER II

CASE DESCRIPTION

This case study describes the evaluation and treatment of a patient with sacroiliac dysfunction and low back pain. The patient was a 62-year-old woman with a 5-month history of SI pain. She was seen for outpatient physical therapy over a 5-week period. The client presented with bilateral weakness of the hip abductors and decreased knee range of motion. The patient described pain in the sacroiliac region, with the pain coursing to the knee on her left side. The patient also complained of low back pain further along in her treatment once some of her SI pain resolved. Her symptoms limited her sitting and walking tolerances and affected her ability to ambulate stairs.

Examination, Evaluation and Diagnosis

The patient is a 62-year-old female whose chief complaint was SI pain that referred to her left knee for the previous 5 months. The patient did not recall any mechanism of injury, but she did report frequent falls secondary to left lower extremity weakness. The day prior to beginning physical therapy, the patient saw a physician and was referred with orders to evaluate and treat for left sacroiliitis. The patient reported her pain was worse with sitting for long periods of time and when ascending and descending stairs. She also reported having a decrease in pain with Advil, Biofreeze, and when in a recumbent position. Past medical history included a fall approximately 30 years ago that resulted in a fractured left femur and ankle. She also reported landing on her coccyx
during that fall, but indicated no reports of any specific injury such as fracture to her coccyx. The patient did receive physical therapy for her left lower extremity after her fall. The patient had her gallbladder removed in 1997 and her appendix removed at age 6. She denied a previous history of back pain and stated she had a history of depression. The patient was taking Zoloft for depression and Advil for pain relief. The patient was retired and enjoyed walking on her treadmill, which she had been unable to do secondary to her pain. Her home environment had two flights of stairs and steps down to the lake. The patient’s goals were to be able to sit for longer periods of time without pain and to return to using her treadmill on a regular basis. The patient rated her pain as 3.5 on a 0 to 5 pain scale during the first visit, with 0 being no pain and 5 being the highest pain level. Patient stated her highest level of pain was 3.5 and at best was rated 1. Gait screen revealed the patient was guarded and stiff with limited motions in hips bilaterally and had mild compensated Trendelenberg sign bilaterally. The patient was able to do single leg stance on the right lower extremity for 5 seconds and on the left for less than 3 seconds during balance testing. Lower extremity active range of motion was all within normal limits except left knee flexion which was decreased by 50% as compared to the right, tested in prone position. Passive range of motion was all within normal limits except left knee flexion tested in prone position which was decreased by 25% as compared to the right. Although the patient did not have decreased hip range of motion during the examination, she did display decreased motion and strength during hip abduction exercises on her involved side, for which the literature does show a relationship between SI pain and hip mobility.3 Lower extremity strength was assessed using manual muscle testing as described in Reese.17 See Table 1 for results.
Table 1. Initial Lower Extremity Manual Muscle Testing Results

<table>
<thead>
<tr>
<th></th>
<th>Right</th>
<th>Left</th>
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<tbody>
<tr>
<td>Hip Flexion</td>
<td>5/5</td>
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</tr>
<tr>
<td>Hip Extension</td>
<td>5/5</td>
<td>5/5</td>
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<tr>
<td>Hip Internal Rotation</td>
<td>5/5</td>
<td>5/5</td>
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<tr>
<td>Hip External Rotation</td>
<td>5/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Hip Adduction</td>
<td>5/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Knee Flexion</td>
<td>5/5</td>
<td>5/5</td>
</tr>
<tr>
<td>Knee Extension</td>
<td>5/5</td>
<td>5/5</td>
</tr>
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</table>

Initial strength in lower extremities assessed using MMT.

Special tests performed included straight leg raise which was negative bilaterally as the patient did not have increased pain with passive raising of the lower extremity. The Patrick’s/FABER test was mildly positive on the left with decreased ROM and mild positive pelvic pain when the patient was positioned in supine and the tested extremity was positioned into flexion, abduction, and external rotation with the heel resting on the top of the opposite knee. Dreyfuss et al showed the sensitivity for the Patrick’s/FABER test to be 0.69 and the specificity to be 0.16. The Thomas test was also mildly positive on the left as the patient’s lower extremity was raised off the surface of the plinth when the opposite knee was brought toward and held to the chest to the point of beginning lumbar flexion. The posterior superior iliac spine (PSIS) pointing test was positive as the patient pointed to the site of maximal pain and it was within 2 inches of the PSIS. PSIS pointing test was shown to have a sensitivity of 0.76 and specificity of 0.47. The results of the Patrick’s/FABER, PSIS pointing test, and Thomas test were all used to aid in our decision making of the most probable diagnosis and most effective treatment for the patient. The tests are easily performed in the clinic and commonly
performed when assessing patients with possible SIJD. The patient’s symptoms were consistent with sacroiliac joint dysfunction due to the findings of pain with walking; ascending or descending stairs; rising from sitting to standing; standing on involved leg; lumbosacral pain with radiation to buttocks, groin or thigh; and a positive FABER test. Studies have shown that 44% to 58% of patients with SIJD pain have a history of trauma, which was true in this case study. SIJ dysfunction is also more likely to be the source of pain if 3 or more provocation test results are positive, if the pain is unilateral, and if pain increases with rising from sitting, all of which were true with this patient. The patient’s impairments included pain, decreased range of motion, and decreased strength. These impairments led to poor balance and functional limitations in the patient’s gait and in her ability to squat, sit, stand, and stair climb without pain. The patient reported frequent falls, the inability to ride in a car for long distances, difficulty getting into and out of her car, and the discontinuation of using her treadmill for exercise secondary to her pain.

Prognosis and Plan of Care

Goals for this patient consisted of decreasing pain, ambulating stairs without pain, increasing strength, and using the treadmill without pain. The patient’s goals were to sit for longer periods of time without pain and to return to using her treadmill on a regular basis. Interventions were to include but not limited to: therapeutic exercises, ROM, stabilization exercises, modalities, body mechanics/postural education, and soft tissue stretching. The plan of care was to see the patient 1 to 2 times per week for 4 weeks. According to the Guide to Physical Therapy Practice, the patient’s diagnosis was 4D, which is impaired joint mobility, motor function, muscle performance, and range of
motion associated with connective tissue dysfunction with an ICD-9 Code of 719.4- other and unspecified disorders of joint, pain in joint. The patient had good rehabilitation potential and her prognosis was good to return to her prior level of function.

Factors that affected her prognosis included her age, the duration of her pain, and her desire to return to her normal daily activities such as driving and walking on her treadmill without pain. A factor that may have negatively affected the patient’s outcome is her history of depression. On the patient’s seventh visit, she was feeling “very discouraged” and was emotional when explaining her increase in pain since the previous visit. She stated she knew she was having a bad day and following treatment she stated, “I feel much better.” If the patient’s emotional status had not improved during treatment or if she displayed similar behavior during the next session, a psychological referral may have been appropriate. There were no other instances that occurred that may have indicated emotional distress as related to her diagnosis.

Re-examination and re-evaluation occurred on a continual basis with the patient’s pain level changes, strengthening, and reports of functional status. During each session, the patient was asked to rate her pain level on a 0 to 5 pain scale with a description of the scale and she was also asked to indicate if there had been any changes in her symptoms. We also recorded the increase in repetitions and resistance for her strengthening program in order to evaluate her progress. The patient was also asked to describe what changes, if any, she experienced in her functional status related to her activities of daily living and to her tolerance of sitting for long periods of time and ascending and descending stairs.
CHAPTER III
INTERVENTION

The patient was seen for an evaluation and seven 30-minute sessions over a 5-week period. The patient was very compliant with her exercises and in coming to her scheduled treatment appointments. Specific interventions for this patient included stretching of the piriformis and quadriceps muscles, hip abductor strengthening, back extensor strengthening, spine joint mobilization, and McKenzie techniques consisting of prone press-ups and sidelying rotation. We used these interventions, as they have been proven effective in the treatment of low back pain as they promote centralization of symptoms and decrease pain through stabilization exercise training.\textsuperscript{13,18,19} Other interventions included patient education, home exercise program, and pelvic clocks. The patient was instructed to perform bilateral piriformis stretching by positioning herself into the hooklying position with one leg crossed over the other knee and rolling that leg around the arc of motion in order to effectively stretch the muscle. She was also instructed to perform seated quadriceps stretching as described in Appendix 1. Strengthening exercises included “clams” for hip abduction, which are performed in the sidelying position with the knees slightly flexed and active hip abduction on the more superior leg paying attention to keeping the trunk from rolling. Other strengthening exercises included the use of weight machines for torso rotation, leg press, and back extension. A Roman chair, a bench set at an incline with stabilization at the pelvis and at
the calves, was used for active back extension to promote strengthening. We performed spinal joint mobilizations included a posterior-anterior grade 2 mobilization to the 10th, 11th, and 12th lower thoracic vertebrae on the fourth visit. McKenzie techniques performed included prone press-ups as described in Treat Your Own Back. The patient performed 10 repetitions of bilateral sidelying rotation exercises followed by 10 repetitions of prone press-up exercises. To perform sidelying rotations, the patient would be positioned onto her side with knees flexed and then she would rotate her upper body backward. She would then perform press-ups by lying prone and extending her elbows so her upper body was lifted off the table, but her pelvis was still in contact with the surface.

Patient education included instruction for use of towel roll to maintain lumbar lordosis during long car trips, information on her diagnosis, and activities to avoid such as sitting for long periods, stairs, posture, and improper body mechanics. The home exercise program we implemented for the patient included bilateral seated quadriceps stretching, piriformis stretching, clams, pelvic clocks, prone press-ups, and sidelying rotation. She was instructed to perform each exercise 2 times per day with 1 set for the stretches and clocks, 1 set of clams to fatigue, and 2 sets of prone press-ups and sidelying rotation for 10 repetitions, alternating each exercise.

One technique played a significant role in this patient’s intervention plan and appeared to be very effective: pelvic clocks. Pelvic clocks have been described for use with postural back pain as well as for pelvic motion training as they are shown to improve proprioceptive awareness and hip, lumbar spine, and pelvic mobility. There currently is no literature on the effects of pelvic clocks and seated quadriceps stretching
for treatment of sacroiliac joint pain, even though clinical use is quite extensive. This case illustrates the role of pelvic clocks in conjunction with seated quadriceps stretching on the patient’s short term relief of SI pain. A single case report cannot assess the effectiveness, if any, of the use of pelvic clocks as muscle energy techniques and the use of seated quadriceps stretch for treatment of SI pain. However, the decrease in pain immediately after these techniques in this case study does produce some support for this method. Pelvic clocks, as described in Appendix 2, are performed in hooklying, and the patient is to visualize an imaginary clock on the pelvis. The patient is then instructed on the location and movements for the “times” on the clock. Twelve o’clock is located at the umbilicus and 6 o’clock is located at the pubic symphysis. The patient is instructed to move the pelvis to the 12 o’clock position with lumbar flexion, and to the 6 o’clock position with lumbar extension to perform a posterior and anterior pelvic tilt, respectively. The 3 o’clock position is achieved by rotation with a weight shift to the left hip, and rotation with a weight shift to the right hip moves the pelvis into the 9 o’clock position. Once smooth movement from the 12 o’clock and 6 o’clock positions and from 3 o’clock to 9 o’clock is achieved, the pelvic clock is progressed by moving in a clockwise and counterclockwise direction making sure to touch each number on the clock. During this movement pattern, special attention is given to note any areas that may appear restricted or asymmetrical as compared to the other half of the clock. If a limitation is perceived or observed, the patient is to roll 180° opposite of the time of the restriction and hold for 60 seconds. As an example, if a restriction or limitation is experienced at the 7 o’clock position, patient rolls to the 1 o’clock position and holds for 1 minute. Following the sustained hold, the patient repeats a full rotation of the clock.
starting at the 12 o’clock position and moving through each number going in a clockwise or counterclockwise position. The goal is to obtain full symmetrical clockwise and counterclockwise pelvic control. It was also stressed to the patient to maintain relaxed breathing throughout the exercise. Although pelvic clocks with the addition of the hold 180° from any limitations to create a type of muscle energy technique has not been reported in the literature, it was beneficial to this patient with the combined seated quadriceps stretch to relieve pain located in the SIJ.

Interventions performed on the initial visit included bilateral therapist-generated quadriceps stretching with external rotation of hip in prone position, pelvic clock exercises with correction for a 7:30 restriction, instruction for home exercise program for seated quadriceps stretching holding for 15 to 30 seconds, and pelvic clocks performed twice per day.

During the third week of treatment, sessions consisted of continued quadriceps stretching, pelvic clocks, supine piriformis stretch through the arc of motion, prone lumbar extension, and “clam” hip abduction for her home exercise program. Strengthening exercises progressed with the addition of torso rotation and leg press on weight machines. The patient was also instructed to add lumbar rotation in sidelying in conjunction with prone lumbar extension. On the sixth visit the patient verbalized that her pain was no longer located in her SI joint, but she felt a “stiffness” in her low back and demonstrated through pointing to the location. On the seventh visit in the fifth week of treatment, the patient stated she had not had any falls since beginning physical therapy treatments. The patient stated she went on a very long car drive after which her SI pain returned. She reported a 2.5/5 pain level on at the beginning of the session and was
feeling very discouraged due to her increase in pain. The patient performed seated quadriiceps stretching and the pelvic clock exercises with restrictions at 7:30 and 10:00. She required additional verbal cues and assistance to recognize the area of asymmetry in her motion during the pelvic clocks. The patient indicated her pain had decreased from 2.5/5 at the start of the session to 0.5/5 following stretching and pelvic clocks. Her ability to squat and to flex forward was improved as per her report. Strengthening exercises were progressed by increasing the weight from 50 lbs to 60 lbs and by increasing repetitions from 15 to 25 for back extension and from 15 to 20 repetitions for leg press. During this visit, the patient was instructed to use a lumbar towel roll while in the car and while sitting for long periods of time.
CHAPTER IV

OUTCOMES

The patient had no complaints of pain radiating down her left lower extremity following her first visit. After the third visit, gait mechanics improved by approximately 90% with decrease in Trendelenberg sign bilaterally. By the fourth visit, the patient reported 1.5/5 pain level at rest at the beginning of treatment and decreased to 1/5 following treatment. Patient also reported decreased in pain with squats, and stair ambulation was not as difficult as before. In the fifth and final week of treatment, the patient stated she had not experienced any falls since beginning physical therapy treatments. Her balance was reassessed and she was able to do single leg stance on the right lower extremity for 10 seconds and on the left for 9 seconds.

At time of discharge, the patient’s strength, pain, ROM, and functional abilities had all improved. Upon observation, the patient’s gait had no signs of a Trendelenberg gait pattern. The patient’s back extensor strength was increased through the patient’s increase of repetitions on the Roman chair (Figure 1).

The patient’s pain level at the beginning of treatment on her last visit was 0.5/5 and reported being pain-free following that treatment. Knee flexion ROM was WNL bilaterally and manual muscle testing showed hip abduction was 5/5 bilaterally. The Patrick’s/FABER test and Thomas test were negative bilaterally. The patient stated she had been using her treadmill again and she was able to ambulate stairs without
discomfort. She also reported the use of a lumbar towel roll increased her sitting tolerance while in a car. All goals were met at time of discharge and the patient was instructed to continue her home exercise program.
CHAPTER V
DISCUSSION

This case report described a patient who had immediately successful results with pelvic clocks as muscle energy techniques and seated quadriceps stretching to reduce her recurrent SI pain. Pelvic clocks provided this patient a method to decrease her pain through a type of muscle energy technique that emphasized the patient’s involvement in self-management of her symptoms. A single case report cannot assess the relationship, if any, for the use of pelvic clocks as muscle energy techniques and the use of seated quadriceps stretch for treatment of SI pain. We believe that further research is necessary to determine this relationship and also to define the most effective clinical diagnostic assessment and treatment intervention for patients with SIJD. We felt the patient was a good candidate for the use of pelvic clocks as an intervention based on the improvement made following the first trial, the patient’s ability to perform the technique correctly, and the use of this technique to self-manage symptoms in the future if her SIJD should return. Further research is also necessary to examine the cost effectiveness of SIJD treatments, the long-term results of treatments, and the patients’ abilities to perform the interventions at home if recurrent symptoms should arise.

Limitations of this report include the fact that other interventions used during treatment may have also caused the patient’s improved function; however, the decrease in pain immediately after pelvic clocks does produce some support for this specific method.
Additionally, a study performed by Pel et al.\textsuperscript{24} suggests that there may be a possible relationship between relief of SIJ related pain and training of transversus abdominis and pelvic floor muscles. Research to discover which muscles are activated during pelvic clocks would be useful in discovering the mechanisms of this technique and the possible benefits of its use.

**Reflective Practice**

This case study has shown that there is a need for a more standardized way to evaluate and treat SIJD. There is also a need to better understand the complexity of this condition. During the gathering of subjective information from the patient it may have been beneficial to have asked additional questions such as: Have you noticed any discomfort in your hips? Have you changed your exercise routine? What type of shoes do you normally wear? Examination procedures that could have been added included a full assessment of strength of all lower extremity muscles, not just a gross motor assessment; provocation tests for the SI joint such as the shear test; test for a leg length discrepancy, a clinimetric measurement such as the Oswestry Disability Index would have also been helpful to use. We did perform a grade 2 spinal joint mobilizations to the lower thoracic vertebrae as a result of discovering restrictions in the joint play of the 10\textsuperscript{th}, 11\textsuperscript{th}, and 12\textsuperscript{th} thoracic vertebrae on the fourth visit. Whether or not the restrictions in the thoracic spine played a role in the patient’s SIJ pain is unknown; the literature does show that manipulations of the thoracic spine can improve neck pain, so the same may also be true for thoracic spine manipulations to have an effect on SIJ pain, although there is currently no research to support this theory.\textsuperscript{25} Other research does show that manipulations in one area of the body can help improve symptoms of dysfunction in
distal areas of the body. We could have tried to use the traditional muscle energy techniques and SI joint belt used to treat SIJD in addition to pelvic clocks. To our knowledge, there is currently no research to support the effectiveness of traditional muscle energy techniques such as the shotgun; mobilizations to restore rotations; correct counternutation and torsions. It would be very beneficial to have more evidence for the use of pelvic clocks as muscle energy techniques, to have more research on the reliability of SI tests, and to have a more evidence-based method for treating SIJD.
APPENDICES
Appendix 1. Seated Quadriceps Stretch

Sit with 1 buttock on the edge of chair/bed, with body facing parallel to surface. Place outer leg behind body with top of foot resting on surface and heel approximately 6 inches from the body. Keep knee of outer leg pointing straight down to floor. May progress stretch by leaning body back or placing heel further from body. Hold for _____ seconds. Repeat ______ times per day.
Appendix 2. Pelvic Clocks

Lying supine with the hips and knees flexed and feet flat on the floor, the knees and feet are positioned hip width apart.

An imaginary clock is visualized and the pelvis is moved as though following the clock, with 12:00 representing lumbar flexion, 6:00 representing lumbar extension, 3:00 representing pelvic rotation to the left, and 9:00 representing pelvic rotation to the right. An attempt is made to move smoothly from 12:00 to 6:00 and from 3:00 to 9:00. Movement can then be made clockwise and counterclockwise, touching each number on the clock.

While going through the full rotation, pay special attention to any area that may feel restricted or not symmetrical as compared to the other side. If there is a limitation felt, roll 180° opposite of the time of the restriction and hold for 60 seconds. Example: Restriction is felt at 7:00 o’clock, roll to 1:00 o’clock position, and hold. Repeat a full rotation of the clock.

Goal: Obtain full symmetrical clockwise and counterclockwise pelvic control.
REFERENCES


