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The Role of Physical Therapy in Interventional Spinal Pain Management

Dear Colleagues:

We hope you are all experiencing a safe and enjoyable summer season! While summer is a down time for us with regard to courses, we’re using the time to ramp up our marketing and promotion campaigns and as always, finding new ways to deliver great content to our colleagues.

Our online and hybrid courses have been a big success, and we look forward to rolling out more content in this fashion starting in 2015. The 2015 course schedule is being framed right now, and we’re excited to start exploring the possibility of offering some great new Dry Needling and TMJ coursework coursework. Stay tuned!

Please enjoy this latest issue of the IAOM-US Connection, which will be available EXCLUSIVELY for Members for six months, and then will be available to everyone so we can share our excellent content.

Thanks for being part of the IAOM-US family, and enjoy the rest of your summer!

Sharon and Andrea
Effect of the Pelvic Compression Belt on the Hip Extensor Activation Patterns of Sacroiliac Joint Pain Patients During One-Leg Standing: A Pilot Study


Abstracted by Pedro Castex, PT, COMT from Santiago, Chile, IAOM-US Fellowship Student & Jean-Michel Brismée, PT, ScD, OCS, FAAOMPT, Fellowship Director.

INTRODUCTION
Sacroiliac joint (SIJ) pain is a fairly common source of symptoms, representing about 13% to 30% of patients complaining of non-specific low back pain.¹ Form closure (shape and orientation of joint surfaces) and force closure (neuromuscular control) have been described as the mechanisms responsible for the stability of this joint; disruption of one or both of these stability systems could compromise SIJ balance and cause local and/or referred symptoms. (Figure 1)

Pain originating from this structure is classically provoked during activities that involve weight bearing on the affected-side lower extremity, as during stance phase of gait cycle. In this situation, an appropriate balance between the different muscles in the lumbopelvic area is essential to contribute to the form and force closure mechanism of this structure. It has been demonstrated that patients with SIJ pain exhibit altered activation patterns of the biceps femoris and gluteus maximus during one leg standing;² in these patients, hamstring muscles activate before gluteus maximus during hip extension. This could be an indicator of impaired force closure mechanism, based on the assumption that gluteus maximus muscle has been established as one of the main SIJ stabilizers due to its transverse orientation in respect to the SIJ, generating joint compression and reducing shearing forces.³ In patients with SIJ pain, using a pelvic compression belt could induce this compressive mechanism, and also increase the proprioceptive feedback to the SIJ stabilizing muscles.⁴

Figure 1. Common referred pain pattern of the Sacroiliac Joint.
Illustration used with permission from OEA (www.oabrochures.com).
THE STUDY
The objective of this pilot study was to compare the effects of the pelvic compression belt on hip extensor muscle activation patterns during one-leg standing in subjects with and without SIJ pain. EMG activation patterns of hip extensor muscles during one-leg standing were measured in thirty-one women (16 subjects with SIJ pain and 15 asymptomatic subjects). Measurements were performed both without any compressive device and wearing a pelvic compression belt.

The results of this study showed significantly greater EMG amplitude of biceps femoris in SIJ pain group subjects compared to participants in the asymptomatic group. However, a reduction of EMG amplitude of the biceps femoris and an increase of EMG amplitude of the gluteus maximus was observed within each group when the pelvic compression belt was worn. There was also a significant reduction in the premotor reaction time (defined as the time between an auditory stimulus just prior to adopting one-leg standing position and the onset of EMG activity) of the gluteus maximus using the pelvic compression belt in the subjects with SIJ pain only. Consistently, premotor biceps femoris reaction time was significantly greater with use of the pelvic compression belt in the SIJ pain group only.

IAOM COMMENTS
During one-leg standing, the pelvis of the supporting leg has the tendency to rotate anteriorly because of a forward torque generated by the contraction of the hip flexors of the contralateral side. This should be controlled by the proper activation of hip extensors. In this regard, Hungerford reported that the pelvis on the side of the supporting limb rotates slightly posterior in subjects without SIJ pain. This supports the concept that posterior pelvic rotation induces SIJ nutation, which is considered the most stable position for this joint. In contrast, patients with SIJ pain showed slight forward position of the pelvis of the supporting limb, thus creating a relative counternutation position, considered unstable. This motor control deterioration may be explained by improper coordination of hip extensors revealed in the reviewed study. Indeed, it is hypothesized that increased premotor reaction time and increased EMG activation of the biceps femoris decreases capacity of gluteus maximus to activate properly during functional activities. A pelvic compression belt seems to increase gluteus maximus activation; possible mechanisms for this improved contraction could be related to increased SIJ stability due to mechanical compression, reduction of SIJ ligament tension (which in turn may reduce neurological inhibition of the gluteus maximus), and increased proprioceptive feedback.

Based on this information, a pelvic compression belt may improve form and force closure mechanisms involved in sacroiliac joint stability. This could be useful not only when suspecting local SIJ involvement, but also when SIJ /pelvic instability contributes to the manifestation of symptoms in patients with other lower quarter problems, for example, as a result of kinetic chain imbalance.

PELVIC COMPRESSION BELT (SI-LOC BELT) PLACEMENT

1. Patient lies supine. Therapist may place a pillow under knees to induce SIJ neutral position. Optionally, belt may be placed in standing position.

2. Belt is positioned around the pelvic area under the level of the Anterior Superior Iliac Spines (ASIS). Belt should not be worn distal to the greater trochanter level.

3. SIJ provocation and Active Straight Leg Raise may be tested before and after placement of the belt in order to assess response to belt placement.
References:


Prearthritic hip disorders are a result of morphological abnormalities of the articulation of the acetabulum and femur. These disorders include: intra-articular chondral and acetabular labral abnormalities. Developmental dysplasia of the hip (DDH) and femoroacetabular impingement (FAI) are widely accepted as a cause of prearthritic hip disorders. DDH results from reduced coverage of the femoral head by the acetabulum; therefore, creating excessive forces across the labrum and articular structures. FAI is caused by morphological abnormalities of the proximal femur and/or the acetabulum that produce excessive forces on the acetabular rim and the femoral head-neck junction. FAI is broadly categorized as cam (femoral-based) and pincer (acetabular-based). Excessive coverage of the femoral head by the acetabulum is a pincer impingement, whereas aspherical femoral head, offset of femoral head neck, thickened femoral neck create a cam affect. These disorders can occur alone or in combination and are a known causative factor in early hip arthritis. (Figures 1 & 2)
There is controversy as to whether labral tears alone are a precursor to osteoarthritis because no study to date has demonstrated that isolated labral tears result in the early onset of hip osteoarthritis.

To date treatment has been limited to surgical outcomes and not comprehensive conservative management. The purpose of this study was to describe characteristics, imaging findings, pain and function pre- and post-conservative management and to compare the former findings in patients who did and did not receive surgery for labral lesions.

Fifty-eight adult volunteers age 18 to 50 years presenting with prearthritic, intra-articular hip disorders were recruited consecutively to participate in the study. Six were lost to follow-up and 52 completed the study. Clinical indicators for inclusion were 1) anterior or lateral hip pain; 2) a history of pain that worsened with activity, pivoting, hip flexion or weight bearing; 3) pain associated mechanical symptoms, including popping, clicking or locking; 4) pain at rest; 5) physical examination findings of reproduction of pain in the groin or lateral hip with the anterior impingement test, FABER test, log roll, or resisted straight leg raise test; and 6) physical examination findings that excluded spine and other lower extremity disorders as a source of dysfunction or pain. Subjects greater than 50 years old, a history of ipsilateral hip surgery, inflammatory arthropathy, hip infection or tumor, current lumbar radiculopathy, existing extra-articular hip disorders, major structural deformity, or moderate to advanced degenerative disease of the hip were excluded.

All subjects were evaluated using standard radiographic imaging of anteroposterior pelvis, frog lateral, cross-table lateral and false profile views of the hip. Subjects were classified into three categories based on radiographic presentation and T onnis grade assessment; 1) no structural abnormalities, 2) mild DDH and 3) mild FAI. A 3-phase treatment protocol was initiated.

Phase I conservative interventions including: education, activity modification, NSAIDs or narcotics and a physical therapy protocol. The physical therapist was asked to follow protocol, but was allowed to individualize the program based on individual findings. The protocol included: no straight leg raise, only pain-free hip range of motion during exercise and functional tasks, avoid loaded rotation of the acetabulum on the femur, avoid hip hyperextension during functional and exercise activities, avoid anterior translation of the femur.

At 3-month follow-up if symptoms continued, phase II was initiated, which included fluoroscopically guided diagnostic intra-articular hip injection. If a positive response was obtained ( > 50 % reduction of pain), an MRA was performed. Phase III was surgical intervention.

Outcomes were measured using the Numeric pain score, short form-12, modified Harris Hip Score, Western Ontario and McMaster Universities Osteoarthritis Index, Nonarthritic Hip Score, and Baecke Questionnaire of Habitual Activity.

The results indicated that 44% of patients were satisfied with conservative care and 56% chose to have surgery. Both groups demonstrated statistically significant improvement (P=.0.3 to P=.0001). Patients who chose to have surgery demonstrated higher baseline activity scores compared with conservative management (p=.02). All patients in this study treated with either conservative management alone or in addition to surgical intervention demonstrated statistically significant improvement of pain and function to a 1-year follow-up. The presence of bony abnormalities of DDH or FAI did not predict failure of conservative management.

Limitations of the study include limitation of confirmation of structural diagnosis with MRA in every patient, poor protocol for physical therapy treatment, small sample size, and surgeon influence of the patient’s decision for surgery.

**IAOM COMMENTS:**

Acetabular labral pathology appears to be a secondary finding of FAI. The cam or pincer type can be found independently or in combination in a pathological hip. FAI has been noted as a pre-cursor to early-onset hip osteoarthritis (Austin et al 2008) and a cause of labral pathology. The acetabular labrum is most often compromised with a gradual onset of repetitive abnormal force. Less commonly, labral pathology can occur as a result of an isolated traumatic onset. Diagnosis is typically made using radiographic images in combination with concordant clinical findings. Clinical examination findings can include: limitation and painful hip internal rotation (IR) in 90° of flexion where IR in prone is WNL and painless, painful quadrant testing (hip flexion + adduction + IR) and positive findings of one
or more of the special tests of the hip. The IAOM advocates a comprehensive basic clinical examination with special tests of the hip in order to make an accurate clinical diagnosis. Labral tests include the quadrant test with posterior overpressure, the quadrant test with internal rotation overpressure and the scour test. In addition, other special tests used to assess labral injuries validated by the literature include the log roll and FABER tests. The labral tests advocated by the IAOM and the authors of this study are sensitive however, not specific, indicating the ability to rule in intra-articular hip problems although unable to determine whether chondral or labral in nature.

A physical therapy protocol with manual therapy plus augmented exercise would be a future topic of study.

Utilizing precautions as a guideline can help determine a more standardized protocol for prearthritic hip treatments. Manual therapy intervention could include indirect or direct hip traction in maximum loose packed position (MLPP) progressing to prepositioned hip movements. Other mobilizations could include prepositioned glides (PPG) or curved glides into flexion to avoid anterior load on the labrum, IR, ER rotation mobilization pain free without load of the joint or capsule. Augmented exercise can consist of self lateral and caudal traction to unload hip joint, motor control training of adduction, flexion, ER and abduction of the affected hip. Casartelli et al. 2010 demonstrated statistically significant weakness in hip adduction>flexion>ER>abduction in those patients with symptomatic FAI.

### SPECIAL TESTS

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
</tr>
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| Impingement Test/Quadrant | If you don’t see the embedded video here ➤ 1. Make sure you are opening this pdf in Acrobat Reader. 2. If you still cannot view or play the video, simply click here to watch the video on the IAOM-US YouTube channel.  
Flex hip to pain or limit, adduction, IR |
| FABER Test | If you don’t see the embedded video here ➤ 1. Make sure you are opening this pdf in Acrobat Reader. 2. If you still cannot view or play the video, simply click here to watch the video on the IAOM-US YouTube channel.  
Flex, abduct, ER hip, measure distance of knee to table and compare sides  
(+) test is reproduction of pain |
<table>
<thead>
<tr>
<th>SPECIAL TESTS con’t.</th>
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<tbody>
<tr>
<td><strong>Log Roll Test</strong></td>
<td>![Log Roll Test Image]</td>
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</tbody>
</table>
| If you don’t see the embedded video here ➔ 1. Make sure you are opening this pdf in Acrobat Reader. 2. If you still cannot view or play the video, simply click here to watch the video on the IAOM-US YouTube channel.  
Neutral hip flexion/extension roll femur to endrange IR to ER | ![Log Roll Test Image] |
| **Scour Test** | ![Scour Test Image] |
| If you don’t see the embedded video here ➔ 1. Make sure you are opening this pdf in Acrobat Reader. 2. If you still cannot view or play the video, simply click here to watch the video on the IAOM-US YouTube channel.  
Place patient’s foot on Therapist stomach, flex, abduct, ER the hip apply parallel load through the femur and sweep hip into more flexion adduction and back to initial positioning  
(+) test is reproduction of pain | ![Scour Test Image] |

<table>
<thead>
<tr>
<th>HIP MOBILIZATION</th>
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<tbody>
<tr>
<td><strong>Indirect traction maximum loose packed position (MLPP)</strong></td>
<td>![HIP MOBILIZATION Image]</td>
</tr>
</tbody>
</table>
| If you don’t see the embedded video here ➔ 1. Make sure you are opening this pdf in Acrobat Reader. 2. If you still cannot view or play the video, simply click here to watch the video on the IAOM-US YouTube channel.  
Patient’s pelvis is stabilized to table with belt across pelvis anterior/posterior direction and caudal/cranial direction. Hip is flexed to approximately 30° flexion, 15° degrees abduction and slight ER. Traction is performed parallel to the femur with hold or oscillations | ![HIP MOBILIZATION Image] |
HIP MOBILIZATION con't.

**Direct hip traction in prepositioned flexion**

If you don’t see the embedded video here ➔
1. Make sure you are opening this pdf in Acrobat Reader.
2. If you still cannot view or play the video, simply click here to watch the video on the IAOM-US YouTube channel.

Flex patient’s hip just short of pain, slight abduction and IR. Traction is performed in a lateral/caudal direction with pull parallel to the femur.

**Prepositioned Glide (PPG) IR**

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1. Make sure you are opening this pdf in Acrobat Reader.
2. If you still cannot view or play the video, simply click here to watch the video on the IAOM-US YouTube channel.

Patient in prone, hip is prepositioned into endrange IR. Glide is performed at a 45° angle in a caudal, dorsal, and medial direction.

**PPG ER**

If you don’t see the embedded video here ➔
1. Make sure you are opening this pdf in Acrobat Reader.
2. If you still cannot view or play the video, simply click here to watch the video on the IAOM-US YouTube channel.

Patient in prone, hip is prepositioned into endrange ER. Glide is performed at a 45° angle in a cranial ventral lateral direction.
### Augmented Exercise

**Lateral Traction**

If you don’t see the embedded video here ➔
1. Make sure you are opening this pdf in Acrobat Reader.
2. If you still cannot view or play the video, simply click here to watch the video on the IAOM-US YouTube channel.

Belt is positioned proximal to affected hip, with tail of belt lateral to hip. The patient stands with close to equal weight on both legs and moves in a slightly medial direction to the belt. This can be performed as a hold or oscillations. The belt can be held or attached to a door.

**Caudal Traction**

If you don’t see the embedded video here ➔
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Patient lies supine with hips and knees flexed, with feet against the wall. Belt is placed proximal to hip with tail end towards the wall. The tail end of belt can be held or attached to a door. Patient moves away from the belt by pushing feet into the wall. This can be performed as a hold or with oscillations.
<table>
<thead>
<tr>
<th><strong>MOTOR CONTROL EXERCISE</strong></th>
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<tbody>
<tr>
<td><strong>Flexion ADDuction</strong></td>
<td><img src="wondershare.png" alt="Image" /></td>
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</tbody>
</table>
| If you don’t see the embedded video here ➔ 1. Make sure you are opening this pdf in Acrobat Reader. 2. If you still cannot view or play the video, simply click here to watch the video on the IAOM-US YouTube channel. | Patient in left sidelying for Left FAI  
Left hip flexion approximately 45° to 60°  
Left hip ADDuction Right hip ABDuction 45° to 60°, straight knee  
Turn toes down (IR) right hip while slightly lifting right leg off the wall  |
| **Squat with ER**            | ![Image](wondershare.png)  |
| If you don’t see the embedded video here ➔ 1. Make sure you are opening this pdf in Acrobat Reader. 2. If you still cannot view or play the video, simply click here to watch the video on the IAOM-US YouTube channel. | Squat against wall with neutral pelvis with hips in submaximal ER |
References:


Palpation Test Versus Impingement Test in Neer Stage I and II Subacromial Impingement Syndrome


Abstracted by Pedro Castex, PT, COMT from Santiago, Chile, IAOM-US Fellowship Student & Jean-Michel Brismée, PT, ScD, OCS, FAAOMPT, Fellowship Director.

Impingement syndrome of the shoulder is one of the most common musculoskeletal conditions physical therapists treat on a daily basis. It is estimated shoulder pain has a yearly prevalence of about 47%, with subacromial impingement syndrome being the most frequent cause1. Multiple tests have been developed attempting to improve diagnostic accuracy of this condition. Two of the most popular tests are the Neer test and Hawkins test, which are widely used by physicians and physical therapists. (Figures 1 and 2) The aim of this study was to measure the diagnostic accuracy of shoulder tendon palpation and compare it with the results of the Neer test and Hawkins test in patients with Neer stage I or II subacromial impingement syndrome.

Sixty-nine patients were included in this study (48 women and 21 men; average age of 48 ± 8.7 years). Diagnostic ultrasound (DUS) was performed to determine structural findings related to impingement syndrome. Average duration of symptoms was between 6 to 12 months. Neer test, Hawkins test and palpation of supraspinatus, infraspinatus, subscapularis and long head of biceps tendons were performed in the symptomatic shoulder of patients, and then the outcomes of these tests were compared with the sonographic findings.

The results of this study revealed a higher average sensitivity of palpation test compared to Hawkins test and Neer test (Table I), especially for the supraspinatus and biceps tendons. However, all the palpation tests demonstrated a low specificity, especially for the supraspinatus tendon in the presence of bursitis.
Other interesting results obtained in this study are:
- The four most common findings from DUS were:
  - Supraspinatus tendinosis (74%)
  - Subacromial/subdeltoid bursitis (35%)
  - Biceps tendon sheath effusion (33%)
  - Supraspinatus partial tear (26%).
- Presence of subacromial/subdeltoid bursitis increased the occurrence of supraspinatus tendinosis 3.4 times and increased the supraspinatus tendon partial tear rate 3.2 times.
- When the Neer test was positive, the incidence of supraspinatus tendinosis was more frequent, while with a positive Hawkins test, supraspinatus partial tendon tear was more frequently encountered.
- No correlation was detected between level of tenderness on palpation test and sonographic findings; in patients with higher tenderness, the incidence of a tear was not higher.
- Supraspinatus tears did not occur in isolation; tendinosis was also present. In the palpation tests, a lack of tenderness indicated no tendinopathy (100% sensitivity). In other words, if tenderness on supraspinatus tendon is absent, tendinopathy or tear are also absent.

**IAOM-US COMMENTS:**
The results of this study provide useful information for the evaluation process of patients presenting with shoulder pain. However, statistical analyses of these tests should be taken in consideration for the decision of when to use these tests in the examination process. Cook et al.\(^2\) suggest that tests with high sensitivity and low negative likelihood ratios must be incorporated at the beginning of the examination process to rule out contending conditions. Once the contenders have been discarded, tests with high sensitivity and high positive likelihood ratios should be used in order to confirm the suspected diagnosis. Based on these recommendations, and the information provided in this study, palpation test for the supraspinatus and long head of biceps tendon could be used to rule out the involvement of these structures. In other words, when these tests are negative, we have a great deal of certainty that these structures are not involved. In fact, the absence of tenderness with palpation test of the supraspinatus tendon was associated with a negative ultrasound examination. (100% sensitivity).

On the other hand, palpation tests demonstrated low specificity, which means we may need to use other diagnostic tests with higher specificity to help confirm the suspected diagnosis. This seems to be true especially in cases when suspecting supraspinatus tendon involvement in the presence of subacromial bursitis. The pull test for bursitis (Figure 3) can be used to help differentiate subacromial bursitis and tendinopathy.

**Table 1**

<table>
<thead>
<tr>
<th>Variable (Test/Palpation)</th>
<th>Sensitivity (95% confidence interval)</th>
<th>Specificity (95% confidence interval)</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neer</td>
<td>80 (67-89)</td>
<td>52 (30-73)</td>
<td>74</td>
</tr>
<tr>
<td>Hawkins</td>
<td>67 (53-78)</td>
<td>47 (26-69)</td>
<td>62</td>
</tr>
<tr>
<td>Supraspinatus</td>
<td>92 (78-95)</td>
<td>41 (18-64)</td>
<td>79</td>
</tr>
<tr>
<td>Infraspinatus</td>
<td>33 (6-79)</td>
<td>66 (54-76)</td>
<td>65</td>
</tr>
<tr>
<td>Subscapularis</td>
<td>60 (23-88)</td>
<td>0 (0-13)</td>
<td>10</td>
</tr>
<tr>
<td>Biceps</td>
<td>85 (67-94)</td>
<td>48 (33-62)</td>
<td>62</td>
</tr>
</tbody>
</table>

**Figure 3. Pull test:** therapist compares strength and pain provocation during resisted abduction (it can also be performed with resisted internal and external rotation) in the standard fashion and also adding axial traction to the shoulder, in an attempt to reduce stress on the subacromial bursa.
IAOM SYSTEMATIC PALPATION PROCESS FOR SUPRASPINATUS AND LONG HEAD OF BICEPS TENDON

The following is the systematic approach for the palpation of the shoulder tendons included in this study, based on IAOM-US guidelines. According to the references in the article, authors used the article of Mattingly et al. as the method for palpation of these structures, which is basically the same method illustrated in the following figures and represents the academy palpation system.⁵

References and Suggested Reading:


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<td>Sat, Sept. 20 - Sun, Sept. 21</td>
<td>Upper CS (Hybrid)</td>
<td>Arlington, VA</td>
</tr>
<tr>
<td>Fri, Sept. 26 - Sun, Sept. 28</td>
<td>Wrist and Thumb</td>
<td>Lubbock, TX</td>
</tr>
<tr>
<td>Fri, Sept. 26 - Sun, Sept. 28</td>
<td>Foot and Ankle</td>
<td>St. Paul, MN</td>
</tr>
<tr>
<td>Fri, Oct. 3 - Sun, Oct. 5</td>
<td>Shoulder</td>
<td>Kansas City, MO</td>
</tr>
<tr>
<td>Fri, Oct. 3 - Sun, Oct. 5</td>
<td>Knee</td>
<td>Tomball, TX</td>
</tr>
<tr>
<td>Sat, Oct. 4 - Sun, Oct. 5</td>
<td>Tspine &amp; Ribs (Hybrid)</td>
<td>Tulsa, OK</td>
</tr>
<tr>
<td>Sat, Oct. 4 - Sun, Oct. 5</td>
<td>SenMoCOR™ UE</td>
<td>Appleton, WI</td>
</tr>
<tr>
<td>Sat, Oct. 11 - Sun, Oct. 12</td>
<td>TOS/CTJ (Hybrid)</td>
<td>Little Rock, AR</td>
</tr>
<tr>
<td>Sat, Oct. 25 - Sun, Oct. 26</td>
<td>Acute Lumbar (Hybrid)</td>
<td>Shreveport, LA</td>
</tr>
<tr>
<td>Fri, Nov. 7 - Sun, Nov. 9</td>
<td>Recurrent and Chronic Lumbar</td>
<td>Kenosha, WI</td>
</tr>
<tr>
<td>Wednesday, Nov. 12</td>
<td>Certification Testing</td>
<td>Lubbock, TX</td>
</tr>
<tr>
<td>Fri, Nov. 14 - Sun, Nov. 16</td>
<td>Elbow</td>
<td>Denver, CO</td>
</tr>
<tr>
<td>Sat, Nov. 15 - Sun, Nov. 16</td>
<td>UE Elbow</td>
<td>West Palm Beach, FL</td>
</tr>
</tbody>
</table>

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