

performed a lateral step, a distance of 160% of his/her shoulder width until a single limb stance was assumed. The trailing limb followed with hip adduction to reproduce the starting position. The lateral step exercise procedure was repeated 3 times in succession for each of the 3 hip position conditions. Data were analyzed with 2-way repeated-measures ANOVA ($\alpha = .05$) with Bonferroni adjustments for multiple comparisons when main effects were significant.

RESULTS: Gluteus medius average EMG activation was greater ($P = .001$) for the stance limb ($52\% \pm 18\%$ MVIC) than abducting limb ($35\% \pm 16\%$ MVIC). Gluteus maximus EMG activation was greater ($P = .002$) for the stance limb ($19\% \pm 13\%$ MVIC) than abducting limb ($13\% \pm 9\%$ MVIC). Erector spinae activation was greater ($P = .007$) in hip internal rotation ($30\% \pm 13\%$ MVIC) than neutral rotation ($26\% \pm 10\%$ MVIC) and the abducting side ($31\% \pm 15\%$ MVIC) was greater ($P = .039$) than the stance side ($23\% \pm 11\%$ MVIC).

CONCLUSIONS: Gluteus medius and maximus muscle activation was greater on the stance limb than abducting limb during resisted lateral band walking.

CLINICAL RELEVANCE: Clinicians may wish to consider using the involved extremity as the stance limb during resisted lateral band walking exercise.

OP03138

USE OF AN ILIUM BELT TO TREAT ILIOINGUINAL NERVE IRRITATION AND TRANSVERSE ABDOMINUS WEAKNESS ASSOCIATED WITH PSOAS AND ILIACUS PAIN IN A FEMALE TRIATHLETE: A CASE STUDY REPORT

Lwin JM, Patla C, Johnson L

University of St Augustine for Health Sciences, San Marcos, CA

BACKGROUND & PURPOSE: Tension on the ilioinguinal nerve may inhibit transverse abdominus contraction. Without adequate strength of transverse abdominus as an important core stabilizer, compensating global muscles such as psoas and iliacus may become overworked and painful, especially in high-level athletes. This study investigates the effectiveness of an ilium belt in decreasing ilioinguinal nerve tension to facilitate transverse abdominus contraction, therefore decreasing psoas and iliacus muscle pain in a female triathlete.

CASE DESCRIPTION: A 24-year-old female triathlete reported 3-year history of persistent bilateral psoas and iliacus pain and tightness aggravated by running. After 2 miles, patient was forced to stop running with complaints of 8/10 cramping pain in psoas and iliacus on VAS pain scale. Conventional soft tissue mobilization and stretching to musculature provided only temporary relief. On initial examination, contraction strength of transverse abdominus was "trace." Bilateral psoas and iliacus muscles were exquisitely tender to palpation. To inflame the ilium and decrease tension on the ilioinguinal nerve, the patient wore a belt around the ilium 16 hours/day for 2 weeks. During this time, 10 second isometric transverse abdominus contractions were performed 100 times/day. Psoas and iliacus were treated with soft tissue mobilization and stretching.

OUTCOMES: After treatment to psoas and iliacus and use of the belt for 2 weeks, patient demonstrated "fair" contraction strength of transverse abdominus. She was able to run 9 miles with 2/10 psoas and iliacus muscle pain at worst. After 7 weeks of treatment and use of the ilium belt, transverse abdominus contraction strength was "good" and the patient was able to run 13 miles with only intermittent 1/10 muscle pain. Lower Extremity Functional Scale score increased 9 points from initial evaluation.

DISCUSSION: Core strength, especially provided by transverse abdominus, is crucial for high-level athletes to participate in their activities. This study shows that ilioinguinal nerve tension and related weakness in transverse abdominus may contribute to overuse pain in compensating global core muscles such as psoas and iliacus. The use of an ilium belt effectively reduced tension on the ilioinguinal nerve thus improving contraction of transverse abdominus. A subsequent decrease in psoas and iliacus pain allowed patient to run further with less discomfort. These results demonstrate the value of using an ilium belt to reduce ilioinguinal

nerve tension and improve transverse abdominus contraction therefore alleviating psoas and iliacus pain.

OP03139

HIP ABDUCTOR MUSCLE FUNCTION IN PATIENTS WITH FEMOROACETABULAR IMPINGEMENT

Ellison J, McGaugh JM, Davenport C

Physical Therapy, University of Texas Medical Branch, Galveston, TX; Rehabilitation Services, University of Texas Medical Branch, Galveston, TX

PURPOSE/HYPOTHESIS: Patients with femoroacetabular impingement (FAI) have been shown to demonstrate hip abductor muscle weakness. The purpose of the study is to compare strength and endurance measures of the tensor fascia lata (TFL) and the gluteus (GM) in subjects with FAI to determine if endurance measures are more sensitive in identifying muscle dysfunction when compared to isometric strength measures before and after 6 weeks of exercise intervention.

NUMBER OF SUBJECTS: Two female subjects, ages 25 and 32 years, with femoroacetabular impingement and no evidence of labral tear on contrast MRI participated in a pilot study.

MATERIALS/METHODS: Muscle strength was assessed using a handheld dynamometer (HHD) with the subjects in sidelying. TFL was tested in slight flexion, abduction and medial rotation of the hip. GM was tested in slight abduction with neutral rotation. The pelvis was stabilized manually and the HHD placed just above the lateral malleolus. After strength assessment for the TFL, the subject was asked to complete 20 repetitions of abduction in the TFL test position. The number of repetitions and the perceived level of exertion on a scale of 1 to 10 were recorded. Immediately the TFL strength was retested. The opposite TFL was tested in the same manner. After a brief rest, the strength of the GM was assessed with HHD, followed by up to 20 repetitions of straight plane abduction. Perceived exertion was recorded and strength was reassessed. Subjects underwent additional hip tests and measures and were instructed in an exercise program for identified hip impairments and functional activities. They were seen once weekly for exercise progression and then remeasured after 6 weeks.

RESULTS: At initial assessment, both subjects exhibited slightly less GM and TFL strength on the involved side than uninvolved side. Strength ranged from 8.4 to 11 lb. One subject was unable to complete 20 repetitions of GM or TFL motions during the endurance test and had perceived exertion scores of 7 to 10. The other subject could complete 16 to 20 repetitions of both motions, but also had perceived exertion scores of 7 to 10. Strength testing after the endurance repetition test showed a decline in strength of both muscle groups; force ranged from 0 to 7.1 lb. After 6 weeks of exercise progression, both subjects had improved strength and endurance and decreased perceived exertion for both muscle groups. TFL and GM postintervention strength measures ranged from 9.9 to 13.8 lb. Both subjects could complete 20 repetitions of both muscle motions; 1 subject reported 0 to 2 perceived exertion and the other reported 4 to 8 perceived exertion; and final strength measures ranged from 8.1 to 13.9 lb.

CONCLUSIONS: Strength measures before and after a repeated motion endurance test along with a perceived exertion score identified a greater level of muscle impairment than strength testing alone.

CLINICAL RELEVANCE: The combination strength/endurance test of the hip demonstrated an improved ability to demonstrate muscle function improvement before and after an exercise intervention than strength testing alone.

OP03140

EFFECT OF 3.5% MENTHOL GEL ON KNEE PAIN AND FUNCTIONING IN PATIENTS WITH KNEE OSTEOARTHRITIS

Brosky JA, Pieschel D, Topp RV

Physical Therapy, Bellarmine University, Louisville, KY; University of Louisville, Louisville, KY

PURPOSE/HYPOTHESIS: Knee pain attributable to OA is commonly managed pharmacologically with NSAIDs, analgesics, and/or narcotics. However, protracted oral pharmacological management of knee OA is associated with side effects resulting in gastrointestinal, renal, and neurological dysfunction. Topical applications containing menthol have been applied to OA-affected knees to relieve pain and improve functioning. The purpose of this clinical trial is to compare knee pain and performance of selected functional tasks in patients with knee OA under 2 different treatment conditions: application of topical ointment consisting of 3.5% menthol gel and a commercially available placebo gel lubricating ointment.

NUMBER OF SUBJECTS: Twenty adults over the age of 40 years diagnosed with knee OA.

MATERIALS/METHODS: Participants who met inclusion criteria were scheduled for 2 visits separated by approximately 1 week in which a pretest and posttest protocol was administered. The protocol consisted of performance of functional tasks and self-reports of knee pain. The functional tasks included a 6-minute walk (6MW), the timed get up and go (TUG), 30-second timed chair stand (TCS) and the time required to ascend and descend a flight of 19 stairs. Level of knee pain was reported immediately following performance of each functional task using a 100-mm visual analog scale (0 as no pain and 100 as the worst pain possible). Assessments of self-reported knee pain and functioning were assessed immediately following performance of the functional tasks without any intervention (baseline) and again during the same visit after application of 5 mL of 3.5% menthol ointment or 5 mL of commercially available gel ointment to the affected knee.

RESULTS: Univariate repeated measures (paired *t* tests) compared the participants performance and pain to determine changes under the treatment conditions ($\alpha < .05$). Analyses indicated no significant difference in functional performance between the 2 conditions. The participants self-reported pain levels, however decreased with the menthol application. The analysis indicated the menthol intervention resulted in average reductions in self-reported pain during the TUG (7 versus 4 points), TCS (13 versus 3 points), stair ascent (11 versus 6 points) and stair descent (11 versus 2 points) tasks.

CONCLUSIONS: These preliminary findings appear to support the use of a 3.5% menthol gel to temporarily reduce pain among patients with knee OA. Though self-reported pain levels also improved slightly with the placebo intervention, the menthol application resulted in a greater magnitude of changes in the posttest condition. Additional controlled trials are needed with larger samples to further support the use of menthol over placebo topically applied ointments.

CLINICAL RELEVANCE: The use of topically applied 3.5% menthol ointment may provide temporarily pain relief and help improve tolerance and compliance with activity in patients with knee OA.

OPO3141

A NOVEL METHOD FOR MEASURING 1- AND 2-JOINT HIP FLEXORS IN THE MODIFIED THOMAS TEST

Moistio K, Forshee J, Kunkler C, Matsel L, Singer J

Northwestern University, Chicago, IL

PURPOSE/HYPOTHESIS: Decreased passive hip extension range of motion (ROM) is a problem in various patient populations, including low back pain and hip and knee osteoarthritis. Passive hip extension ROM can be assessed with the modified Thomas Test (modTT). Shortness of the 1- and 2-joint hip flexors is determined by bringing the hip into extension while monitoring the pelvis for motion (position 1). Extension of the knee (position 2) and abduction of the hip (position 3) are also performed and passive hip extension ROM is recorded with a goniometer at each of these 3 positions. The gold standard for measuring ROM in the modTT is goniometry; however, location of bony landmarks, alignment of the goniometer, and intertester reliability are noted limitations. Therefore, we propose a novel method for measuring passive hip extension using an in-

clinometer affixed to the distal femur while performing the modTT. The objectives of our study were to (1) measure passive hip extension ROM in the modTT using 2 different measurement tools (goniometer and inclinometer) and to compare measurements from these tools and (2) determine if 1- or 2-joint hip flexor muscles contributed most to limitations in passive hip extension ROM in a young healthy population.

NUMBER OF SUBJECTS: Forty-five healthy normal subjects (M = 8, F = 37; mean \pm SD age, height, and weight were 24.2 \pm 2.8 years, 1.7 \pm 0.1 m, and 66.5 \pm 10.3 kg, respectively).

MATERIALS/METHODS: Passive length of the 1- and 2-joint hip flexors was measured bilaterally in the modTT using a goniometer at the hip joint and (2) an inclinometer affixed with Velcro to the distal femur. Passive hip extension ROM was recorded at 3 positions: (1) hip extended with knee flexed to 80°, (2) hip extended with knee extended to 0°, and (3) hip extended, abducted with knee extended. All tests were done by 2 testers. Linear regression was used to compare measurements between goniometer and inclinometer. To determine how much the limb moved from one position to the next, displacement was calculated as the difference between positions 1 and 2, and positions 2 and 3.

RESULTS: When comparing goniometer and inclinometer measurements for the 3 positions, the R^2 values ranged from 0.49 to 0.67 for tester 1, and 0.44 to 0.56 for tester 2. The displacement measurements for inclinometer from position 1 to 2 and 2 to 3 were 14.6° and 7.0° and for goniometer were 10.1° and 9.1°. The mean passive hip ROM with the goniometer at position 1, 2, and 3 was 11.5° (\pm 7.39°), 1.4° (\pm 6.6°), and -7.1° (\pm 6.7°), respectively.

CONCLUSIONS: Inclinometer and goniometer measurements were similar when measuring passive hip extension ROM in the modTT. Results demonstrated that 2-joint hip flexors, such as the rectus femoris, contributed most to limitations in passive hip extension ROM in young healthy individuals.

CLINICAL RELEVANCE: Using an inclinometer to measure passive hip extension ROM provides another objective tool for the therapist in the clinic. Knowledge of which hip flexor muscles contribute to a lack of passive hip extension ROM is important for direct and effective treatment.

OPO3142

LUMBOPELVIC STABILITY DEFICITS IN A PATIENT WITH SURGICAL TREATMENT OF FEMOROACETABULAR IMPINGEMENT

Marinko L, Lewis CL

Physical Therapy and Athletic Training, Boston University, Boston, MA

BACKGROUND & PURPOSE: Outcomes following hip surgery for femoroacetabular impingement (FAI) in the young adult have been variable. While some patients quickly return to full participation in athletics, others experience continued pain and limited function. At this time, we do not have a clear understanding of what factors contribute to the continued problem or what interventions might be helpful in resolving the patient's pain. Regional interdependence in musculoskeletal disorders implies that impairments in remote anatomical regions may be associated with the primary complaint or functional deficit in another region. At the hip specifically, this includes the lumbar spine. The purpose of this case study is to illustrate the importance of evaluating the lumbopelvic region in patients with hip pain.

CASE DESCRIPTION: A 19-year-old collegiate rower who failed conservative management of hip pain underwent arthroscopic debridement of the right acetabular labrum, femoral osteotomy and acetabular chondroplasty. She was referred to Physical Therapy for a secondary consult at 11 months postoperatively due to increased episodes of pain, limited ambulation and inability to achieve progress per the postoperative protocol. Examination revealed significant pain with right hip motion specifically into flexion, adduction, and internal rotation consistent with impingement, weakness in her right hip abductors and extensors, antalgic gait and pain with single limb stance on the right. She also presented with a positive straight leg raise, positive prone instability test and poor endurance.