

SCIENTIFIC

PHYSICAL THERAPY

Forces Acting on the Patellofemoral Joint with Closed Chain Exercises

By
Louise J. Wood, DPT

Purpose

The purpose of this study was to answer two questions by reviewing the literature relevant to them: (1) what biomechanical forces affect the patellofemoral joint during closed chain exercise; and (2) can a clear set of guidelines be synthesized for closed chain exercise in the rehabilitation of the patellofemoral joint.

Methodology

The research design for this study was an inductive analysis of the literature that addressed the forces exerted on the patellofemoral joint during closed chain exercises and the literature that addressed guidelines for rehabilitation of the patellofemoral joint. This inductive analysis was facilitated by primary, secondary, and tertiary questions that pertained to these two topics.

Sources of data included the database of the National Library of Medicine, PubMed, the Cumulative index to Nursing and Allied Health Literature, and the reference lists from the 1999 Cincinnati Sports Medicine "Advances in the Knee and Shoulder" conference. Kinds of data included editorials, opinion and theoretical articles, literature reviews, and empirical studies.

Data analysis involved allocating articles found through the literature search to the questions that they fit best, composing synopses of these articles that featured the information needed in order to answer the question, making notes on the synopses that pertained to the questions, plus synthesizing the information in the notes and composing an answer to each question.

Abstracts:

- **Forces Acting on the Patellofemoral Joint with Closed Chain Exercises**
By Louise J. Wood, DPT
- **Diagnosis of Intermittent Vascular Claudication in a Patient with a Diagnosis of Sciatica: A Case Report**
By John C. Gray, DPT
- **Case Report: OGI Residency Program**
By Matt Hatscher, PT
- **Effectiveness of Lumbar Manipulation on Weight Distribution and Pain in Subjects with Low Back Pain versus a Control Group**
By Peter Zepelak, DPT

Findings

Regarding the factors contributing to patellofemoral stress, three categories were induced: (1) cartilage properties; (2) motor recruitment/ torque issues; and (3) alignment variables. Two factors were induced that are important determinants in range of motion guidelines in closed chain exercise: (1) the location of patellofemoral lesions; and (2) the influence of flexion angle on motor recruitment.

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Conclusion

While there was agreement on the forces creating patellofemoral stress, the literature was not consistent on the best ways to minimize this stress. Further, while the literature included guidelines for the rehabilitation of the patellofemoral joint, these guidelines were also inconsistent with each other. Thus, recommendations for further research include topics that address both these inconsistencies and gaps in the literature pertaining to such issues as the material properties of articular cartilage in combination with articular geometry and closed chain geometry in the deeper ranges of flexion.

Diagnosis of Intermittent Vascular Claudication in a Patient with a Diagnosis of Sciatica: A Case Report

By

John C. Gray, DPT

Purpose

The Purpose of this study was to illustrate the importance of a detailed history, a comprehensive medical screening questionnaire and a thorough objective examination to differentiate musculoskeletal sources of sciatica from other diseases.

Methodology

The research design utilized in this study was a retrospective case report. The subject presented to physical therapy with a diagnosis of sciatica from her primary care physician, but findings from initial and subsequent evaluations seemed to indicate that a different diagnosis may be more accurate.

Sources of data was a 41-year-old female. Kinds of data included an extensive history, medical screening,

physical therapist who evaluated the subject initially, and a follow up phone conversation with the subject by the second physical therapist (researcher).

Analysis of the data involved clinical reasoning to correlate the subject's history, medical screening questionnaire, and physical examination data. The known signs and symptoms of musculoskeletal sciatica were compared with the presenting signs and symptoms of the subject. The differential diagnoses associated with sciatica were considered and compared to the signs, symptoms, history, physical examination data, and the medical screening questionnaire. The known symptoms of intermittent vascular claudication and the signs of occlusive vascular disease were also compared with the presenting signs and symptoms of the subject.

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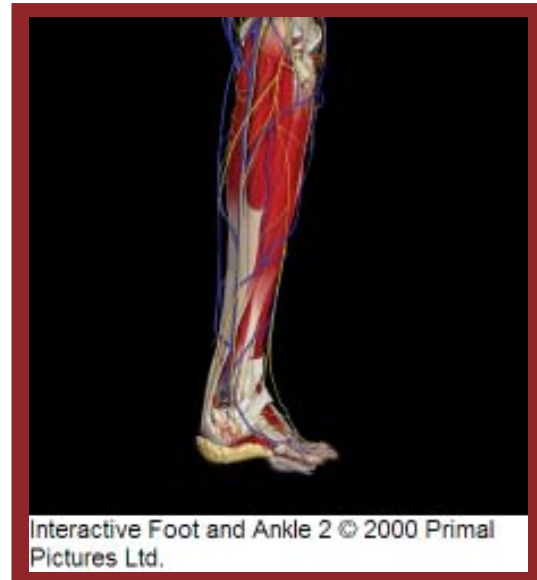
Findings

Findings

Vascular claudication was considered the most likely diagnosis due to several factors including, among others: the subject's history of smoking, strong family history of cardiovascular disease, symptoms of lower extremity weakness when walking the exact distance each time, and symptoms aggravated only by walking and not by a change in body positioning or posture.

Conclusions

The subject exhibited several signs and symptoms that were consistent with the findings of other researchers who had studied occlusive vascular disease. Recommendations for further research include a research design that utilizes three groups of subjects: a control group with no diagnoses of musculoskeletal sciatica but not vascular disease; and subjects with known vascular disease but no musculoskeletal sciatica; and further research on the specificity and sensitivity of van Gelderen's bicycle test.



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OGI Residency Program

By

Matt Hatscher, PT

Chief Complaint: L lower back and medial thigh pain. Also, L anterior hip pain when bringing knee towards chest.

History

C.J. is a 54 y.o. female who works at Bellevue Community College managing labs. She reports a 3 year history of lower back pain that included an episode in December 2002 in which she lost her L patellar reflex. She was put on bed rest at that time for 1 month. She describes the pain as "pulling" in her L lower back, medial thigh, and her knee. Hip and pelvic bone feel sore and her L leg

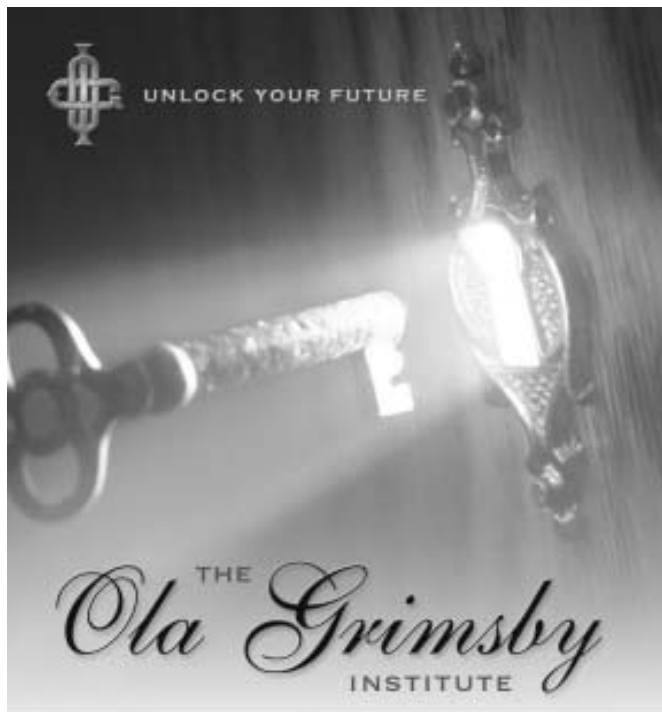
feels weak in the morning. There is currently no numbness or tingling in her leg. The pain increases with extended periods of sitting and feels better with standing and laying on her R side. She went to the neurologist 1 year ago and MRI showed bulging L4-L5 with DDD. She is currently taking ibuprofen as needed and would like to return to exercising. Previous medical history includes L patellar dislocation 2 years ago.

Systems Review

Performed by her physician. Intake assessment reviewed with the patient.



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TESTS AND MEASURES

Structural inspection: WNL

AROM: Lumbar

Flexion: WNL but painful (tension) in L L5-S1 region

Extension: WNL

R SB: WNL

L SB: WNL with catching pain at L L5-S1

R rotation: WNL

L rotation: WNL

SI joint: WNL

Hip: WNL except "pinching" with end range flexion

Flex/R rot: WNL

Flex/L rot: WNL

Ext/R rot: WNL

Ext/L rot: Painful on L

PROM: Lumbar

Flexion: WNL but painful on L

Extension: WNL

R SB: WNL

L SB: WNL

R rotation: WNL but painful on L

L rotation: WNL

SI joint: WNL

Hip: Same as active

Resisted tests:

Lumbar planes all 4+/5 without pain

Hip abduction and extension 4+/5 bilaterally

Flex/R rot: WNL

Flex/L rot: WNL but painful on L

Ext/R rot: WNL

Ext/L rot: WNL

Palpation: Tenderness and guarding in L lumbar multifidi and iliopsoas.

L L4-L5 facet joint also tender to palpation.

Neurology: Myotomes: R WNL

L L2: 4+/5, L L3: 5-/5, L L5: 5-/5

Dermatomes: WNL

DTR's: WNL

(+) skin rolling test B at L2-L4 along spine

Special tests: All compression test (-)

SLR (-)

Slump (-)

Cram's (-)

Prone knee bending (-)

Shearing (+) at L3-4 and L4-L5

Reduced recruitment of TrA

Joint mobility: 4/6 at L3-L4 and L4-L5 in R rotation

2/6 at L1-L2 and L2-L3 in FB

Evaluation And Diagnosis

Medical diagnosis: L L4-L5 disc protrusion

PT diagnosis: L3-L4 and L4-L5 discogenic pain

Treatment results were best for stabilizing group. 17% reduction in clinical overall score for stabilizing group and 10% increase in mobilization group.

Literature Review

Snook et al., 2002

Treatment group (30 people) instructed to restrict bending activities in the early morning showed 23% reduction in pain compared to control group of 30 subjects (2%) which was not instructed to avoid bending activities. In a 3-year follow-up, 31 subjects continued to restrict forward bending and experienced a further reduction of 10.1 pain days per month (51%). Lie et al., 1999

27 subjects with a mean duration of low back pain of 7.4 years. 12 were randomized to mobilization group and 15 were placed in a stabilizing program for eight-week period.

Adams et al., 2000

Purpose was to investigate whether or not backward bending in the lumbar spine can reduce compressive stresses within degenerated lumbar intervertebral discs. 19 donor lumbar spines were placed in 4 positions: moderate lumbar flexion, 2 degrees of extension, 4 degrees of extension, and neutral position variable. Author hypothesizes that the posterior annulus may be stress shielded by the neural arch in extended postures, thus relieving low back pain in some patients.

Recommendations

STM to the Lumbar multifidi to reduce guarding using passive and active pump. Strain/ counterstrain techniques to the L iliopsoas to reduce guarding and inhibiting pain. Additional manual treatment includes L1-L2 and L2-L3 FB joint mobs for plastic deformity and pain inhibition using end range oscillations. Clinical exercise will use STEP principles emphasizing improving mobility of lower thoracic and upper lumbar spine, improved recruitment and coordination of multifidi, erector spinae, and transverse abdominus, and using rotation to provide compression/decompression and modified tension along the lines of stress in the discs. Expect to have reduction in guarding with improved recruitment and coordination in 2 weeks.

Treatment Interventions and Progressions

Stage 1 (Weeks 1-2): STM and joint mobilizations as stated above. Exercises including LTR to the L 3x25 at 60% to provide optimal stimulus to the disc in a NWB position. Prone hip extension (3x10) for improved recruitment, coordination, and stability using

TrA. Primary goal is to improve endurance and coordination in pertinent muscles (multifidi, TrA, erector spinae, gluts). Also proving compression/ decompression with modified tension in the line of stress to the disc.

Stage 2 (Weeks 2-4): Continue manual treatment as necessary. Progress to standing rotational exercises at 3x25 at 60% then to 3x15 at 85% for strength training. Begin

hip strengthening with side lunges at 3x25 with 5# weights and vigor gym squats. Progress abdominal strengthening with sit ups 3x15 on slant board. Initiate diagonal patterns with pulleys at 3x25 at 60% for coordination.

Stage 3 (Weeks 5-7): Progress pulley diagonals to 3x15 at 85% fir strength training. Also, may add quick reversal for eccentric training. Continue closed chain activity for LE strengthening progressing to step ups. Progress abdominal training.

Discussion/Conclusion

Pt has responded well to treatment thus far. After 2 treatments she reported elimination of morning stiffness and anterior thigh pain. She was scheduled to receive cortisone injection on 3/2/04 but canceled her appointment secondary to her significant decrease in pain. She is no longer experiencing lower back pain and will likely be discharged following her next visit.

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Effectiveness of Lumbar Manipulation on Weight Distribution and Pain in Subjects with Low Back Pain versus a Control Group

by
Peter Zepelak, DPT

Purpose

The purpose of this study was to determine the effect of manipulation of hypomobile lumbar vertebrae on weight distribution in human subjects with low back pain when compared to a control group of subjects without low back pain.

Methodology

The research design employed to test the first hypothesis was a simple two groups experimental design with repeated measures.

The research design utilized to test the remainder of the hypotheses was a single group experimental design with repeated measures. The road in life has turned.

Subjects were selected and assigned to their respective groups based on the presence or absence of low back and on their compatibility with other inclusion/exclusion criteria.

Median balance scores associated with hypothesis 1 were analyzed statistically using the Mann Whitney Test, while the median balances scores associated with hypotheses 2 and 3 were analyzed statistically utilizing the Wilcoxin signed ranks test. The Wilcoxin signed ranks test was also used to analyze differences in verbal reports of low back pain in hypothesis 4.

Results

Analysis of the median weight distribution differences between the two groups (hypothesis 1) revealed that they were not statistically significant. Analysis of the median weight distribution differences prior to and following manipulation for the low back pain group (hypothesis 2) revealed that they were not statistically significant.

Analysis of the median weight distribution differences initially and subsequently for the no pain group (hypothesis 3) revealed that they were not statistically significant.

Analysis of the differences in verbal response pain scores for the low back pain group (hypothesis 4) revealed that they were statistically significant.

Conclusions

The findings of the study were generally consistent with the literature cited, but recommendations for further research focus on the need for more validity/reliability studies on the clinical uses of manipulation, more inter-rater reliability studies on segmental mobility testing, and more studies on the control center(s) of weight distribution and posture.



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