Conservative Management of Possible Meniscal Derangement Using the Mulligan Concept: A Case Report

Belinda J. Sanchez, DAT, ATC,^a and Russell T. Baker, DAT, ATC^b

ABSTRACT

Objective: The purpose of this case study was to report on the immediate effects of the combined use of mobilizations with movement and the “squeeze” technique on a patient with knee stiffness, popping, and swelling.

Clinical Features: The patient presented with right knee stiffness, swelling, and a popping sensation of insidious onset. Clinical examination revealed pain with terminal knee extension and flexion, joint line tenderness, a positive Apley’s compression test, and a positive Thessaly’s test at 20° of knee flexion. A working diagnosis was established of a meniscal pathology with the differential diagnoses of meniscal derangement and synovial plica.

Intervention and Outcome: The patient received 3 total treatments using the Mulligan concept over the course of 11 days. The treatments included the application of a tibia internal rotation mobilization with movement and the “squeeze” technique to the affected knee. Patient outcomes, including the Disablement in the Physically Active Scale, the Patient-Specific Functional Scale, and the Numeric Rating Scale for pain, were collected throughout the course of treatment. The patient reported a minimal clinically important difference on the Numeric Rating Scale for pain after each treatment and on all outcomes after the third treatment. The patient reported improvement on her follow-up visit 4 days after the third treatment; the results of a clinical exam and patient outcomes supported a complete discharge after 3 treatments.

Conclusion: This patient responded favorably to use of the Mulligan concept as a manual therapy technique for the treatment of symptoms related to possible meniscal derangement. (J Chiropr Med 2017;16:308-315)

Key Indexing Terms: *Musculoskeletal Manipulations; Knee Injuries; Osteoarthritis*

INTRODUCTION

Meniscal tears are a common pathology among adolescents, athletes, and the general population and are the most common knee injury in adults.^{1,2} Depending on the onset, tears are classified as either acute/traumatic or chronic/degenerative.^{3,4} Acute tears caused by a specific mechanism of injury occur more often in young active individuals,⁵ whereas the prevalence of degenerative tears with a gradual onset increases with age.⁴ The most common risk factor for sustaining an acute meniscal tear is participation in sports.⁶ In contrast, chronic

tears often occur as a result of persistent kneeling, repetitive squatting, or climbing stairs.^{6,7} Classic signs and symptoms of all meniscal tears include catching, locking, and clicking; joint line tenderness (JLT); and a feeling of “giving out” or instability.⁸ Patients also commonly report pain with squatting, the inability to perform a full squat, and a gradual onset of swelling over the first 24 hours following an injury.⁴

The current practice in the diagnosis and treatment of meniscal tears involves reliance on diagnostic imaging and surgery.⁹⁻¹² Arthroscopy is the gold standard for diagnosis; however magnetic resonance imaging (MRI) is more commonly utilized for a variety of reasons (eg, less invasive).¹³ Despite the prevalence of MRI confirmation, experienced clinicians are encouraged to rely on a detailed patient history combined with battery of special tests to accurately diagnose meniscal tears.^{8,13-15} Several researchers conclude that a thorough clinical exam may be as accurate or better than MRI in detecting meniscal tears.^{8,13,14,16,17} In fact, Lowery et al⁸ have presented a clinical composite exam for the identification of meniscal tears that has a diagnostic accuracy similar to that of an MRI. The exam is focused on

^a WWAMI Medical Education Program, University of Idaho, Moscow, Idaho.

^b Department of Movement Sciences, University of Idaho, Moscow, Idaho.

Corresponding author: Belinda Sanchez, DAT, ATC, 875 Perimeter Drive, MS 4207, Moscow, ID 83844-4207. Tel.: +1 208 885 1557. (e-mail: belindas@uidaho.edu).

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assessing for a history of clicking/popping, JLT, pain with terminal knee extension, pain with terminal knee flexion, and a positive McMurray's test. The presence of all 5 symptoms results in 99% specificity, 11% sensitivity, and a 92.3% positive predictive value (PPV) for detecting a meniscal tear. The specificity and PPV drop to 96.1% and 81.8%, respectively, when only 4 symptoms are present, and to 90.2 and 76.7% with 3 symptoms, whereas sensitivity increases to 17% and 31%, respectively.⁸ The accuracy of the clinical composite exam is comparable to that of MRI; researchers have reported specificity to be between 71% and 93%, sensitivity between 64% and 96%, PPV 84%, and clinical accuracy 73%-88%, depending on the location and type of tear.^{4,18,19} Combined use of the Thessaly and JLT tests alone also offers 93% and 92% diagnostic sensitivity and specificity, respectively.²⁰

Arthroscopic meniscal repair and arthroscopic partial meniscectomy (APM) remain the current standard of practice,²¹ with APM being the most common orthopedic surgical procedure performed in the United States.^{9,22} Surgical repair is the most frequently advised method because of the preservation of the meniscus²³; however, meniscal repair surgery is limited to the presentation of the tear and is most successful when the tear is located in the vascular portion of the meniscus.¹² Surgical failure leading to follow-up compensatory surgeries (eg, APM) is associated with meniscal repair surgeries.^{12,24} A concern with the prevalence of APM is its correlation with osteoarthritis (OA), and some have suggested APM is the leading cause of OA of the knee.^{23,25}

To break the cycle between APM and OA and prevent unnecessary surgery, researchers overwhelmingly advise clinicians to exhaust conservative therapy options, which include range of motion and strengthening exercises, before encouraging patients to explore surgical treatment for meniscal tears.²⁶⁻²⁹ Unfortunately, like meniscal repair and APM, conservative treatment of meniscal tears has also produced less than optimal patient outcomes for various reasons, such as lengthy rehabilitation time frames and inconsistent patient compliance.^{10,12,26,27}

In pursuit of improved patient outcomes and a decreased patient burden, the Mulligan concept has been proposed as a potential alternative method for conservative management of meniscal tear symptoms.³⁰⁻³² The Mulligan concept is a form of manual therapy designed to immediately restore or improve normal physiological movement. Mobilizations with movement (MWMs), a component of the Mulligan concept, are designed to increase functional mobility and decrease pain. To perform an MWM, the clinician applies a passive joint mobilization while the patient simultaneously performs the previously provocative motion. Mobilizations with movement can be applied to acute, subacute, or chronic conditions. If indicated, the MWM will produce an immediate reduction or complete elimination of symptoms with lasting results.³³ If a pain-free mobilization cannot be achieved after multiple attempts, a MWM may not be indicated for the patient.

In addition to MWMs, the Mulligan concept also includes the "squeeze" technique designed to treat 2 common symptoms of meniscal tears: JLT and painful or limited range of motion at the knee.³³ To apply the technique, the clinician provides direct manual pressure at the site of maximal JLT while the patient moves into the previously limited or painful range of motion (ie, flexion or extension).³³ The maneuver is often uncomfortable for the patient, but if indicated, it will produce an increase in range of motion and a decrease in localized JLT after treatment. Few researchers have examined the effects of application of the Mulligan concept for the treatment of meniscal tears,³⁰⁻³² and more evidence is needed to assess the effect of combined Mulligan concept interventions when utilized in clinical practice. The purpose of this case study was to report on the immediate effects of the combined use of MWMs and the "squeeze" technique on a patient who presented with an insidious onset of symptoms for meniscal derangement meeting the clinical diagnostic criteria of a meniscal tear.

CASE REPORT

A 26-year-old physically active woman presented with insidious right knee stiffness and swelling that had developed over the previous 4 days. The patient recalled periods of momentary locking of her knee after the initial onset, as well as a popping sensation whenever ascending stairs. She did not report any previous history of right knee pathology. The initial orthopedic exam revealed joint effusion, painful end range of motion pain in knee flexion, and pain with squatting that she rated 3 of 10 on the numeric rating scale (NRS) for pain.

The presence of pain with squatting without any other obvious findings led to diagnostic application of MWMs (ie, various attempts to identify a pain-free mobilization) of the tibia while the patient performed an active weight-bearing squat (Figs 1 and 2). A tibia internal rotation MWM resolved the patient's pain while squatting, so the MWM was applied further as an intervention (Table 1). A compression wrap was applied to the patient's knee, in a spiral fashion distal to proximal, to address the joint effusion. The patient was then scheduled for follow-up assessment and implementation of a full rehabilitation protocol assuming her presentation did not change. Because of the insidious onset, absence of red flags for injury/illness, normal findings on all strength and orthopedic special tests (ie, Thessaly's test, anterior and posterior drawers, varus and valgus stress tests), and improvement with MWM application, the patient was provisionally classified with inflammation and irritation of the synovial capsule secondary to a suspected synovial plica.

At the reexamination, the patient reported decreased knee joint stiffness, but continued pain with biking and descending stairs (4/10 on the NRS). The joint effusion had not improved, and the anterior medial tenderness to palpation was more isolated to the joint line. Pain was present with terminal knee extension and flexion; when her history of popping/locking

Fig 1. Starting position for the tibia internal rotation mobilization with movement. The clinician applies a subtle internal rotation glide at the proximal tibia.

was combined with the focused JLT, she met 4 of the 5 signs of the Lowery et al⁸ clinical composite exam for meniscal pathology. The patient also reported pain with Apley's compression test and now presented with a positive Thessaly's test at 5° and 20° of knee flexion. Given the new findings, the patient was reclassified with the diagnosis of a meniscal pathology with the differential diagnoses of meniscal derangement and synovial plica, although no diagnostic imaging was performed.

The treatment plan was modified to include a combination of Mulligan concept interventions. Because of the presence of localized JLT and pain during the end ranges of motion, the Mulligan concept "squeeze" technique (Figs 3

and 4) was selected for use as a diagnostic intervention, as the technique has been found to resolve the findings in her clinical exam.^{30,32} The technique was first applied for 10 repetitions, and her complaint of JLT was rechecked; this resulted in decreased JLT and was therefore continued as the intervention for the day. The patient reported an immediate decrease in knee pain after treatment (Table 1).

On her third visit, the patient reported walking and biking to be nearly asymptomatic, but stated the popping sensation was still present when descending stairs. The physical exam revealed improvement in her symptoms (eg, decreased JLT), but she still met the clinical criteria for a meniscal tear. Thus, the "squeeze" technique was continued

Fig 2. Ending position for tibia internal rotation mobilization with movement. The clinician sustains the subtle internal rotation glide while the patient performs the previously painful movement (eg, a squat).

as her treatment; application of 2 sets resulted in resolution of the popping sensation while descending stairs. However, following the second set, the patient reported a new symptom: pain in the posterior aspect of her knee with terminal knee extension. As it was felt this complaint might be related to her initial presentation, the tibia internal rotation MWM was applied diagnostically. Application of the MWM resolved her new complaint, so 3 sets of 10 repetitions were applied while the patient performed active terminal knee extension in weight bearing. After completion of the intervention, the patient reported full resolution of her pain in all the previously provoking motions and activities (Table 1). The patient was asked to return for a fourth visit either to continue treatment or

to ensure the improvement was maintained. At the next visit, she reported feeling recovered from her injury and full resolution of pain and popping at the knee, and the orthopedic exam revealed normal findings on all the previously applied special tests. The patient gave consent for this report to be published.

OUTCOMES

Patient progress was measured using the Disablement in the Physically Active (DPA) Scale, the Patient-Specific Functional Scale (PSFS), and the NRS for pain. Attention was given to the reporting of a minimal clinically important

Table 1. Overview of Mulligan Concept Interventions Delivered Over the Course of Treatment

Visit No.	No. of Days After Initial Visit	Treatment	Immediate Results
1	—	Tibia IR MWM with squat 3 × 10	Pain with squat reduced from 3/10 to 1/10 ^a
2	4	MC “squeeze” 3 × 10	Pain with descending stairs reduced from 4/10 to 0/10 ^a
3	7	MC “squeeze” 2 × 10 Tibia IR MWM with terminal knee extension 3 × 10	Complete resolution of “popping” while descending stairs Complete resolution of posterior knee pain
4	11	No treatment Patient discharged	—

IR, internal rotation; MC, Mulligan concept; MWM, mobilization with movement.

^a Minimal clinically important difference.

difference (MCID) or minimal detectable change (MDC) with each scale.

The patient reported an initial DPA Scale score that is considered within normal ranges for a healthy population; however, her score continued to improve with each subsequent visit through discharge (Table 2). The patient reported a total decrease of 10 points throughout the course of treatment, indicating the criteria for a MCID on the DPA Scale³⁴ were met by discharge.

On day 1, the patient reported walking and biking as important limiting activities and reported a combined impairment score of 8 on the PSFS (Table 2). Subsequent collection on revealed a 1.5-point increase to a score of 9.5 on day 3 and a fully functional score of 10 on day 4. The overall

improvement of 2 points met the MDC criteria for the PSFS³⁵ and indicated 100% improvement in the previously dysfunctional activities of walking and biking.

The patient reported scores of 0 for current and best pain on every visit and was mainly concerned with pain during activities. Therefore, all reported pain scores indicate her worst pain experienced during activity (ie, biking and descending stairs). As the patient’s physical activity was not restricted between visits, she would return each day with the desire to reduce pain during a motion she had felt to be painful in her days between visits (eg, squatting, biking, descending stairs). The patient reported a MCID³⁶ on the NRS immediately after every treatment in this case, providing evidence of effective pain reduction/resolution with each treatment application.

Fig 3. Starting position for “squeeze” technique. The subject lies supine with involved knee in 90° of flexion. The clinician stands on the side of the joint line tenderness and applies a centrally oriented squeeze at the site of the joint line tenderness using an overlapping thumb grip.

Fig 4. Ending position for the “squeeze” technique, in flexion. The clinician sustains the squeeze on the joint line while the patient actively moves through the previously painful range of motion (ie, flexion or extension). If able, the patient is asked to apply overpressure at full flexion; here, the subject grasps the proximal tibia with both hands and draws her knee closer to her chest.

DISCUSSION

The patient in this case received a total of 3 Mulligan concept treatments over the course of 11 days, resulting in a full resolution of pain and popping at the knee, restored function with walking and biking, and normal findings on all the previously applied special tests. More notably, the patient reported pain and symptom reduction after each individual treatment. By the fourth visit, the patient had improved enough on the DPA Scale and PSFS to meet MDC/MCID values, and the reported values met normal/return-to-activity criteria for these outcome measures.

Previous research on the conservative management of meniscal tears is focused on degenerative tears with time frames ranging from 2 or 3 weekly treatments across 4-12 weeks.^{2,27,28,37} Patient outcomes in conservative therapy studies are reported as favorable; however, the reported

results are based on “small” to “moderate” improvements and a *reduction* of symptoms without the full resolution of symptoms.^{2,27,28,37} The present case provides support for the efficacy of the Mulligan concept in the immediate reduction and complete resolution of the symptoms of a meniscal pathology in a single patient. This case report further supports the few studies published providing evidence that symptoms commonly associated with meniscal tears can be effectively treated using the “squeeze” technique in isolation^{30,32} and in combination with other MWMs at the knee.³¹ Regardless of application method, all cases in the previously published literature on the use of the Mulligan concept have indicated that elimination of symptoms occurred in 6 or fewer treatments.

In theory, the inclusion of the Mulligan concept within a standard conservative therapy protocol could potentially reduce the required treatment time frame and produce improved results,

Table 2. Patient Outcome Measures

Outcome Measure	Visit 1		Visit 2		Visit 3		Visit 4
	Pre-Tx	Post-Tx	Pre-Tx	Post-Tx	Pre-Tx	Post-Tx	
DPA	16	—	—	—	9	—	6 ^a
PSFS	8	—	—	—	9.5	—	10
NRS	3	1 ^a	4	2 ^a	6	0 ^a	0 ^a

DPA, Disablement in the Physically Active Scale (0-64); PSFS, Patient-Specific Functional Scale (0 = unable to perform, 10 = able to perform at a normal level); NRS, numeric rating scale (0-10); Tx, treatment.

^a Denotes minimal clinically important difference.

given its reported effectiveness with acute meniscal tears^{30,32} and knee OA.³⁸ By its use of manual therapy techniques and tracking patient outcomes, this case supports the published recommendation to seek surgical treatment after conservative interventions have failed to resolve a patient's symptoms.^{2,27,28} Although the patient in this case was treated with manual therapy alone, the Mulligan Concept could have been delivered in combination with traditional range of motion and strengthening exercises had she not progressed as quickly as she did.

Perhaps equally as important as choosing an effective treatment protocol is the proper classification of an injury to effectively match a patient to an intervention. Despite the absence of a clear mechanism of injury, the patient in this case presented with 4 of the 5 symptoms included in the clinical composite exam⁸ correlating with a 96% specificity and 82% PPV for the presence of a meniscal tear at the second visit. Based on the evidence and clinical presentation, the clinician considered the presence of a meniscal pathology.^{8,13,15} As imaging was not used to confirm the clinical diagnosis and there was no clear mechanism of injury, the clinician can only conclude the presence of a meniscal derangement. A derangement has been defined as an anatomical disturbance in the normal resting position of the joint.³⁹⁻⁴¹ Perhaps the mechanical nature of the patient's condition, whether caused by a displaced meniscus or a meniscal tear, was affected by the direct mobilization of the tibia and meniscus during the MWM and "squeeze" techniques. It is possible that these Mulligan concept techniques could provide the appropriate mobilization needed to reduce a deranged or torn meniscus.

Irrespective of the diagnosis, the clinician chose a manual therapy intervention designed to be applied diagnostically initially, in which the treatment is indicated only if it produces an immediate effect.³³ Thus, effective manual therapy interventions, such as the Mulligan concept, can be used as an effective, noninvasive method for classification of patients as part of the examination process. Patients clinically diagnosed with a meniscal tear who respond immediately to the subtherapeutic dose of manual therapy during the examination should be classified as a patient who may be treated successfully with conservative therapy utilizing the tested manual therapy, as has been found in treatment-based classification research. Patients who do not respond immediately to treatment should be followed up with advanced diagnostic techniques (ie, imaging or arthroscopy) and may be more likely to require surgical intervention.

Limitations

One limitation is that there was no associated mechanism of injury to support meniscal tear, and no diagnostic imaging was obtained so it cannot be said for certain whether the meniscus was involved or what type of meniscus lesion was present. Follow-up with the patient was not obtained. Attempts to collect 6- and 12-month follow-up data were unsuccessful; therefore, the evidence presented in this article is based on the immediate and short-term outcomes of a single patient case. Clinical studies on a

larger sample size, including long-term outcome data, are necessary to determine the true effectiveness of the Mulligan concept. Additionally, it would be beneficial to study the treatment effects on a varied patient population (eg, physically active vs sedentary patients, younger vs older populations) with varying onsets of injury (ie, acute vs chronic onset of symptoms).

CONCLUSION

This patient responded favorably to use of the Mulligan concept as a manual therapy technique for the treatment of symptoms related to meniscal derangement. Such techniques may be used to identify patients who may respond well to conservative treatment.

FUNDING SOURCES AND CONFLICTS OF INTEREST

No funding sources or conflicts of interest were reported for this study.

CONTRIBUTORSHIP INFORMATION

Concept development (provided idea for the research): B.J.S., R.T.B.

Design (planned the methods to generate the results): B.J.S., R.T.B.

Supervision (provided oversight, responsible for organization and implementation, writing of the manuscript): B.J.S., R.T.B.

Data collection/processing (responsible for experiments, patient management, organization, or reporting data): B.J.S.

Analysis/interpretation (responsible for statistical analysis, evaluation, and presentation of the results): B.J.S.

Literature search (performed the literature search): B.J.S.
Writing (responsible for writing a substantive part of the manuscript): B.J.S.

Critical review (revised manuscript for intellectual content, this does not relate to spelling and grammar checking): B.J.S., R.T.B.

Practical Applications

- The patient responded positively to Mulligan Concept "squeeze" technique.
- While traditional conservative therapy protocols for meniscal tears extend a minimum of 4-6 weeks, the present patient experienced improvements in all her symptoms and regained full function in less than 2 weeks.

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