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Effective Treatment of an Apparent Meniscal Injury Using the Mulligan Concept

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Objective: Present a clinic case demonstrating the effectiveness of the Mulligan Concept (MC) in treating an apparent meniscal injury. The utilization of the MC in the evaluation and treatment of a 20-year-old soccer player with an apparent acute meniscal injury is presented. **Background:** Meniscal injuries are common knee injuries. The MC is a therapeutic intervention strategy applied as both a treatment-based evaluation and therapeutic intervention. **Treatment:** The patient was successfully treated in four treatment sessions using the MC. The patient experienced minimal clinically-important differences on a variety of global and regional patient-rated outcomes. **Uniqueness:** To the author's knowledge, there are currently no published case reports of using the MC in clinical practice to treat an apparent meniscal pathology. **Conclusion:** The MC can be utilized as an evaluation and treatment technique in patients suspected of having meniscal pathology in the knee.

Key Words: *Mulligan Concept, apparent meniscal injury, patient-rated outcomes*

Introduction

Meniscal injuries are present in various populations, and can be traumatic or degenerative in origin.[1] Acute traumatic presentations occur more often in younger, active populations.[1] Meniscal lesions are approached carefully, whether through conservative therapy or surgical intervention, to retain as much of the meniscus as possible.[1-3]

The Mulligan Concept (MC) is a therapeutic intervention strategy which includes a technique that couples sustained passive accessory glides with active motion, or mobilizations with movement (MWM). The active motion utilized during the technique aligns with the patient's chief complaint, and is utilized as the Client Specific Impairment Measure (CSIM).[4]

A tenant of the MC is the PILL response.[4] When evaluating a patient to determine whether the MC is an appropriate intervention, the clinician assesses for a **P**ain-free mobilization that has an **I**mmediate effect. Additionally, the improvement on the CSIM from the MWM should be **L**ong-**L**asting. If the PILL response is not present with the initial MWM, a series of alternate glides with the active motion can be attempted. If several iterations of MWMs do not produce the PILL response, the intervention is not indicated, and the clinician should seek an alternate appropriate intervention strategy.[4]

There are several proposed hypotheses about possible mechanisms of actions related to the MC. No single mechanism has been definitively supported. It is likely that a multifaceted explanation exists for the effectiveness of the MC.[4,5]

The purpose of this case report is to present the effectiveness of the MC in the treatment of an apparent meniscal injury that demonstrated a PILL response upon evaluation using the MC. Patient-rated outcomes (PRO) related to pain, function, and disability were evaluated to assess the effectiveness of the intervention strategy.

Case-Report

A 20-year-old female soccer player presented with the athletic training clinic with a chief complaint of knee pain and an inability to fully extend or flex the knee. Initial onset began during a seated leg press the previous day. Since then, the patient had experienced painful ambulation on stairs and sporadic giving out of the knee. The completion of PROs at the beginning of the evaluation revealed moderate self-reported pain and dysfunction (Table 1).

Table 1. Outcomes Measures Through Treatment, Discharge, and Follow-up

PRO	Initial Evaluation	Post First Treatment Session	Post Second Treatment Session	Discharge	One-Week Follow-up	One-Month Follow-up
NRS[a]	4.7	3.3	1.3[c]	0.83	0	0
DPA	46	-	31[c]	0[c]	0	0
GRC	-	+6[c]	+6	+7	+7	+7
PSFS[b]	4	4.75	7.75[c]	8.75	10	10
LEFS	55/80	-	64/80[c]	80/80	80/80	80/80
CSIM squat; lunge	4/10; 6/10	2/10; 3/10	0/10; 1/10	0/10; 0/10	0/10; 0/10	0/10; 0/10

Note: NRS = Numerical Rating Scale; DPA = Disablement in the Physically Active; GRC Global; Rating of Change; PSFS = Patient Specific Functional Scale; LEFS = Lower Extremity Functional Scale; Client Specific Impairment Measure; The use of "-" indicates a score was not recorded at that time point.

a Average of worst, best, and current pain over last 24 hours

b PSFS functional activities: lunges, stairs, standing from seated position, fully extend knee

c Denotes minimal clinically-importance difference from previous treatment session.

The patient presented with cardinal signs of inflammation in the joint line and moderate swelling in both the medial and lateral joint lines. The patient reported tenderness to palpation in the medial (5/10) and lateral (4/10) joint line. Pain limited knee extension by 20°, and knee flexion was pain-limited to 92°. The clinician assigned a manual muscle testing grade of 4/5 to both the hamstring and quadriceps groups through the available range of motion on the affected limb. The patient reported pain over the lateral joint line during the McMurray test and Thessaly test at 20°.

Considering the history, observations, and special tests, the clinician proceeded with a working diagnosis of lateral meniscal pathology. The clinician attempted the MC squeeze technique[4], designed for meniscal pathology, both laterally and medially while performing the CSIM forward lunge. The squeeze technique did not elicit a PILL response. The clinician continued the evaluation using several iterations of MWMs, including weight-bearing and non-weight bearing. The clinician produced a PILL response by utilizing a supine tibial internal rotation glide with a flexion-extension active movement. The production of the PILL response during the MC evaluation indicated the MC as an appropriate treatment intervention.[4]

Outcome Measures

Global and regional outcome measures are utilized to assess the effectiveness of a treatment intervention on a patient's perceived pain, function, and/or disability. Appropriately selected interventions should have significant effects on PROs. Minimal clinically-important differences (MCID) are the calculated level of change on a PRO that demonstrates a meaningful change to the patient following therapeutic intervention.[6]

The Disablement in the Physically Active (DPA) scale was developed to assess the patient's perception of disablement related to an injury.[6] The DPA utilizes a scale from 0-64, with a lower score representing less perceived disablement. The MCID for the DPA was calculated as nine points for acute injuries and six points for chronic injuries.[7] The commonly used 0 (no pain) to 10 (worst pain imaginable) Numeric Rating Scale (NRS) is used to assess the significance of the patient's pain.[8] The scale can be utilized to determine pain intensity at the present moment, or to represent the patient's level of pain over the last 24 hours by asking pain at worst, best, and now.[9] The calculated MCID for the NRS is 2 points.[8]

The Lower Extremity Functional Scale (LEFS) was designed to assess the patient's perceived disablement from a wide variety of lower extremity orthopedic conditions.[10] A LEFS score ranges from 0/80, representing extreme disablement, to 80/80 representing no disablement. The calculated MCID is 9 points.[10] The Global Rating of Change (GRC) is used to assess a patient's perception of the effectiveness of an intervention in addressing the patient's dysfunction. The MCID for a fifteen-point scale (-7 to +7) is suggested to be 5 points, but the MCID for an eleven-point scale is calculated as 2 points.[11] The utilization of the Patient-Specific Functional Scale (PSFS) allows the patient to assess their functional abilities on a 0 ("unable to perform activity") to 10 ("able to perform activity at the same level before injury or problem") scale related to tasks deemed meaningful by the patient. The MCID for averaged PSFS scores is 2 points.[12] The CSIM is a patient specific movement that can be quantified to assess changes resulting from an intervention.[4] In this case the CSIM was pain, rated 0-10, during a body-weight squat and forward lunge.

The NRS over the previous 24 hours was recorded at the start of each treatment session. The current NRS was recorded at the end of each treatment session and after several sets of MWMs. Also, the GRC was completed after each treatment session. The PSFS was recorded before each treatment session, and the DPA and LEFS were utilized before treatment at the initial visit and one-week. All PROs were recorded at discharge, one-week follow-up and one-month follow-up.

Intervention

The patient was treated using the MC for a total of four sessions in the clinic. The sessions were spaced out over nine days. As demonstrated in Table 2, a variety of MWMs were used over the duration of treatment (Figure 1). At the beginning of each treatment session an MWM targeted at the patient's chief complaint and CSIM was assessed for the PILL response. As the patient's complaints were alleviated during the treatment session, further targeted MWMs were assessed to address the patient's pain and functional limitations. Similarly, the patient was progressed, as able, from non-weight bearing to weight bearing MWMs in order to more closely replicate the functional positions of chief complaint. The MC taping for tibial internal rotation was applied following the initial visit and then re-applied at the third visit. The patient discontinued the use of the taping at discharge. Additionally, the patient wore a compressive sleeve when not in the clinic, and did not use any cryotherapy, NSAIDs, or analgesics.

FIGURE 1

Examples A-D picture MC techniques utilized during the treatment in the case report. (A) MC squeeze technique for lateral meniscal pathology pictured in the non-weight bearing version of the technique. The weight-bearing forward lunge version of the technique did not produce a PILL response in the patient. (B) Non-weight bearing tibial internal rotation glide with flexion-extension active motion. (C) Weight-bearing tibial internal rotation glide with kneeling forward lunge. (D) Weight-bearing tibial internal rotation glide combined with a distal anterior tibiofibular glide with kneeling forward lunge. (E) Lateral tibial glide while ascending a step. (F) Mulligan Concept tibial internal rotation glide taping technique

Results

Significant intra-session improvements were noted for the CSIM and NRS during each treatment session. The patient reported MCID improvements on all outcomes measures after two treatment sessions (Table 2.) The patient was discharged after four treatment sessions. The improvements were maintained at one-week and one-month follow-ups after discharge. The patient participated in full sport-related activity during the follow-up period. Range of motion during initial evaluation was limited. Knee extension was lacking 20° of motion and knee flexion was limited to 92°. After the first treatment session, extension improved by 10° and flexion improved to a measurement of 105°. The patient exhibited full ROM (135° flexion, 0° extension) by the beginning of the third treatment session. The ROM improvements were maintained through discharge and follow-up.

Table 2. Mulligan Concept Interventions and Related Decreases in Patient Pain Scores (Figure 1)

Visit Number	Intervention Performed	Pain after tx (0-10)
1	Start of session	5
	3x10 non-weight bearing (NWB) tibial internal IR (IR) MWM flexion/extension	-
	3x10 weight bearing (WB) tibial IR MWM knee flexion	-
	3x10 WB tibial IR MWM with anterior tib/fib glide for dorsiflexion	2
	Taped the tibial IR glide using Coverall and Leukotape	-
2	Start of session	3
	1x10 NWB tibial IR MWM flexion/extension	-
	2x10 WB tibial IR MWM knee flexion	0
3	Start of session	4
	2x10 lateral tibial glide while walking up steps	1
	2x10 tibial IR with lateral tibial glide while walking up steps	0.5
	2x10 mulligan squeeze technique while walking up steps	0
	Taped the tibial IR glide using Coverall and Leukotape	
4	Start of session	1
	2x10 Mulligan squeeze technique while lunging	0.5
	3x10 standing forward lunge with medial tibial glide	0

Note: The use of "-" indicates a pain score was not recorded at the end of that intervention.

Discussion

The authors of a recent critically appraised topic (CAT) concluded that current evidence supports a level B recommendation for clinical diagnosis of a meniscal tear being as accurate as an MRI.[13] The clinical criteria used for the diagnosis in the CAT were: pain, locking, joint line tenderness, giving way, and a positive McMurray Test. [13] The patient in this case demonstrated all of these criteria.

Additionally, the patient demonstrated joint line swelling and a positive Thessaly Test at 20°. However, there is discussion over the validity of the McMurray and Thessaly test in the clinical diagnosis of meniscal injury.[14,15] Despite the lack of additional imaging, a working diagnosis of an apparent meniscal injury was concluded. However, less importance was placed on a pathoanatomical diagnosis and more emphasis placed toward improving the patient's chief complaints. This was monitored through PROs.

Currently there are no published accounts presenting the treatment of apparent meniscal tears in a young, active population using the MC. Authors of a previous case series[16] reported similar robust improvements in pain, ROM, and function after four treatments in a case series of 19 older individuals with osteoarthritis using the MC. The improvements in the patient's outcomes reported in this case report lend support to the findings previously reported in knee patients treated with the MC. However, direct comparison cannot be made between this case report and the previous case series due to significantly different populations and suspected conditions. Still, the current case report, in connection with the previous case series, lends support for the inclusion of the MC as a clinical technique for the evaluation and treatment of knee patients.

In this case report, importance was placed on resolving the patient's chief complaints or CSIM. The MC can be used to directly address a CSIM.[4] An additional benefit of the MC is that the technique can be used as an evaluation concept as well as a treatment. It is suggested that patients who respond with a PILL response during evaluation will benefit from the applied MC intervention.[4] The concept of treatment-based evaluation techniques being used to effectively classify patients whose CSIM respond to an intervention has been previously reported.[17] In the current case report the patient responded with a PILL response during evaluation and was subsequently effectively treated using the technique. Additionally, the patient quickly progressed from non-weight bearing to weight-bearing treatments; therefore addressing the patient's functional chief complaints.

Conclusion

In this case report, the MC was used as a part of the evaluation process to identify an apparent meniscal tear that, according to the PILL response, would benefit from an intervention utilizing the MC. The patient returned to full activity in 9 days. Improvements in PROs persisted at one-week and one-month follow-ups. In this case the clinician effectively used the MC to treat an apparent meniscal injury; however, more research is warranted addressing evaluation and treatment using the MC in clinical practice. Future well-designed clinical control trials would elucidate the effectiveness of the technique. Also, researchers should continue to attempt to decipher the mechanisms by which the MC works.

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