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# **REVIEW ARTICLE**

# **Knee Mobilisation Exercises**

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#### ABSTRACT

Osteoarthritis is a widespread degenerative disease that causes pain, stiffness, and decreased functioning. Various physiotherapy treatments and approaches, including soft tissue techniques, therapeutic exercises, and manual techniques, have been utilized to treat osteoarthritis. The major goal of this study was to assess the short- and long-term effectiveness of manual therapy in treating pain and increasing knee range of motion and functioning in patients with knee osteoarthritis. According to the existing research, knee mobilization exercises can provide a short-term decrease in pain as well as an increase in knee functioning in individuals with knee osteoarthritis. These exercises can help to treat individuals with knee osteoarthritis by lowering pain and boosting functioning. More study is needed to back up these findings by comparing the efficacy of knee mobilization exercises to that of other treatment techniques and methodologies in both the short and long term.

Keywords: Knee osteoarthritis; Manual therapy; Mulligan technique; pain therapy.

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#### INTRODUCTION

Osteoarthritis is becoming a global cause of pain and functional disability worldwide especially in elderly population. It is characterized by progressive loss and degeneration of articular cartilage, sclerosis of the sub chondral bone and formation of osteophytes. These changes often lead to pain, loss of mobility and muscle function, restriction in activities of daily living and decreased quality of life. Pain is the most frequent reason for patient with OA knee to seek medical attention and rehabilitation. If left untreated, pain and stiffness will result in a loss of physical function. Manual therapy is as old as the science and art of medicine and commonly used treatment method for the management of tissue, joint and movement dysfunction. Manual therapy includes soft tissue manipulation, massage, manual traction, joint manipulation and joint mobilization [1].

Joint mobilization is essential to maintain its long term function and mobility. Exercises can be taught by the treating Physician but in difficult cases or when cooperation is not achieved it is essential to refer the patient to a professional Physiotherapist. Exercises that we prescribe include passive and active symmetric movements in all directions, upon maximal movement further stretching exercises are recommended to increase range of motion. Exercises combined with anti-inflammatory drugs are an effective strategy. Careful follow up and meticulous recording of the extent of the motion is essential. In addition the patient should be actively involved in goal setting and follow up. Nowadays evidence shows that mobilization with movement has a beneficial effect on knee osteo arthritis subjects. Mobilization with movement (MWM) is a manual therapy technique that is used most frequently for the management of musculo skeletal conditions. It was initially advocated by Brian .Mulligan and has been proposed as a novel manual therapy technique to treat a varieties of upper and lower limb joint related soft tissue conditions. In this technique the physiological movement is performed in a pain free manner with accessory glides being applied in the direction towards the opposite of the previously painful movement to have the greatest improvement [2].

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Joint mobilization is also known as manipulation refers to manual therapy techniques that are used to modulate pain and treat joint impairments that limits range of motion by specifically addressing the altered mechanics of the joint. The altered joint mechanics may be due to pain, muscle guarding, joint effusion, contractures or adhesion in the joint capsules or supporting ligament or aberrant joint motion. It is an example of a hands on treatment and is a form of passive movement technique for musculo skeletal conditions. This technique which is considered manual therapy, usually involves applying force that would mimic the glide that happens in between the bones.

Joint mobilization is usually done at a slow speed with or without oscillations or a stretch. This technique is usually graded and is varied based on 2 factors – pain tolerance of the patient and acuity of the patient's condition.

Restore normal articular relationships, restore normal range of movement, pain control, increase blood flow and reducing muscle guarding.

## Factors that may alter joint mobilization

Pain and muscle guarding, joint hypo mobility, joint effusion, contractures, or adhesion in the joint, mal alignment or subluxation of bony surfaces.

## Basic concept of joint motion (arthrokinematics) [3-7]

## 1.Joint Shapes;

The type of joint motion occurring between bony partners in a joint is influenced by the shape of joint surface. The shape may be described as ovoid or sellar.

**Ovoid ;** In ovoid joint , one surface is convex and other is concave .

**Sellar** ; In sellar (saddle) joint, one surface concave in one direction and conveys in the other with the opposing surface convex and concave respectively.

# 2.Types of joint motions;

As a bony lever moves about an axis of motion, there is also movement of the bony surface on the opposing bone surface in the joint. The movement of the bony lever is called SWING and is classically described as flexion, extension, abduction, adduction and rotation. The amount of movement can be measured in degree with a Goniometer aid is called Range Of Motion.

**1.ROLL**; Characteristic of one bone rolling on another. Rolling results in angular motion of the bone and it is always in the same direction as the swinging bone motion whether surface is convex or concave.

2.SLIDE / TRANSLATION ; Characteristic of one bone sliding across another include following ;

For a pure slide, the surface must be congruent either flat or curved.

**3. SPIN** ; Characteristic of one bone spinning on another include the following. There is rotation of segment about a stationary mechanical axis.

## Other accessory motion that affect the joint;

**COMPRESSION;** It is decrease in the joint space between bony partners. Normally occurs in the extremities and spinal joints when weight bearing.

**TRACTION / DISTRACTION**; Traction is longitudinal pull and Distraction is a separation or pulling apart. **Effects of joint mobilization** ;.

#### 1. Neuro physiological effects ;

It stimulates mechano receptor to decrease pain, affect muscle spasm and muscle guarding.

#### 2. Nutritional effects ;

Distraction or small gliding movement cause synovial fluid movement tensile strength of articular tissues. This movement can improve nutrient exchange.

#### 3. Mechanical effects ;

It improves mobility of hypo mobile joints, maintains extensibility and tensile strength of articular tissues.

### Indication for joint mobilization ;

Painful joint, reflex muscle guarding, muscle spasm, reversible joint hypo mobility, positional faults / subluxation, functional immobility.

## Contra indication for joint mobilization

Inflammatory arthritis, Malignancy, Osteoporosis, Ligament rupture, bone fracture, congenital bone deformities, joint effusion and hyper mobility.

# Joint Position ;

Joint positions used during mobilization exercises are

a. Resting position; position in which joint capsule and ligaments are most relaxed.

b. Loose packed position ; Articulating surface are maximally separated

c. Close packed position; Joint surfaces are in maximal contact to each other. As a general rule extremes of joint motion are close packed and mid-range position are loose packed.

### Rules of mobilization ;

- Patient and therapist must relax.
- Keep the procedures as pain free as possible.Kalpana et al
- Stabilize and mobilize
- Brief first session and monitor reaction
- Compare to normal side
- One joint, one movement at a time.
- Don't mobilize acute, actively inflamed joint.
- Initial session should be brief and tolerated well by patient.
- Initial mobilization should only last for 30 seconds.
- Movements are oscillations with in the range. If the oscillations are too fast or too slow it will be impossible to gain any feel of the movement.
- Whole body should be used to generate the movement and not just the small muscle of hands and fingers.
- Therapist hands must be relaxed so the feeling can be maximized.
- Pain often limits the therapist ability to mobilize in the appropriate direction. In these cases, it is desirable to continue in a pain limited or pain free range.

### Grades or dosage movement for mobilization technique [4]

The main aim of joint mobilization is to restore the normal joint play that might have been compromised by damage or injury .Normal motion of the affected joint will be restored more quickly if it is addressed early in the treatment program. Also mobilization is in cases when range of motion is lacking. The varying grades of joint mobilizations are from grades 1 to 5.Grade 1 to 4 deals with knee range of motion starting from partial movement to end range movement. Grade 5 is more of manipulation than mobilization.

**Grade I** ; small amplitude rhythmic oscillations are performed at the beginning of the available range of movement. They are usually rapid oscillations like manual vibrations.

**Grade II**; large amplitude rhythmic oscillations are performed within the available range, not reaching the limit. Usually performed at 2 or 3 per second for 1 to 2 mts.

**Grade III** ; large amplitude rhythmic oscillations are performed upto the limit of available motion and are stressed into the tissues resistance. Usually performed 2-3 sec for 1-2 mts.

**Grade IV** ;small amplitude rhythmic oscillations are performed at the limit of available motion and are stressed into the tissues resistance. Usually they are Rapid oscillations like manual vibrations.

**Grade V** ; In many places, written consent will be required from patient before applying grade 5 manipulation. The grading scale has been separated into two due to their clinical indications.

**Lower grades** (I & II) are used to reduce pain and irritability.

**Higher grades** (III& IV) are used to stretch the joint capsule and passive tissues which support and stabilize the joint so increase range of movement.

## Treatment Principles ;

There are 4 principles. They are

- Use grade I and II to reduce pain.
- Use grade III and IV to increase mobility.
- Begin and end all mobilization sessions with grade I and II
- Initial mobilization technique should be performed in the loose packed position.

#### Types of knee mobilization exercises [5];

#### Anterior glide ;

Anterior tibial glide can be performed with the patient in supine and lower leg propped reaching maximal or near maximal extension. The proximal tibia is stabilized with one hand and mobilizing hand is placed on the distal femur. A posteriorly directed forces is applied directly downward through the distal femur. This mobilization is useful for obtaining terminal extension of knee.

#### Posterior glide ;

Patient is positioned in supine with knee slightly flexed and a prop placed under the distal femur. The stabilizing hand is used to prop the distal femur and mobilizing hand placed over proximal tibia just below the tibial tuberosity. The mobilization itself is performed by a force perpendicular to the line of tibia. This technique is useful for obtaining joint play for knee flexion.

## Rotational glide ;

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Internal and external rotation glide are useful for gaining joint play for knee flexion and extension respectively. These glides can be performed at range of motion of the knee with patient positioned in supine. The stabilizing hand grasps the heel of the patient's foot. The ankle is maximally dorsi flexed so that rotational motion is applied to the rotating tibia and not at other joints more distally. The foot is either rotated medially or laterally depend on the mobilization preferred (internal or external rotation) and at the range where restriction may be apparent.

### Tibia femoral distraction ;

Patient is positioned in prone wit thigh fixated to table via use of a stabilizing belt. The therapist grasp the involved leg just proximal to the malleoli and provides distraction force by learning backward along the line of tibia. This technique is particularly effective for pain control.

#### Patella femoral glides ;

This technique is used when restriction of the patella femoral joint cause pain or decrease over all knee range of motion / function. Medial or lateral glides are utilized with patient in supine with the knee slightly flexed. To provide a medial glide the therapist utilized both hands to press on the inferior and superior aspects of medial patella and deiver force to glide the patella in a lateral direction. Conversely, contact points on the lateral patella are used to produce a medial glide. Superior and inferior glides are used for joint play and patellar motion necessary for extension and flexion respectively. Similar to the medial / lateral glide, joint surface on the side of the patella, opposite the direction of mobilization are used [7].

#### Knee flexion;

Patient is lying on his stomach, the knee is slowly oscillated, back and forth. Up to ten oscillations can be done in two sets to start off and can be increased as the patient's tolerance allows.

#### Knee extension ;

Knee extension mobilizations are exercises that aim to straighten the affected knee joint. With the patient lying on their back and the leg in a semi straight position, the therapist then places his hands on either side of the target joints, pushing the knee thereby extending it.

#### Tibio femoral posterior glide [6];

Patient position is sitting with knee flexed over the edge of treatment table, beginning in the resting position, progress to near 90 degree flexion with tibia positioned in internal rotation. When the knee flexes past 90 degree, position the patient prone. Place a small rolled towel proximal to the patella to minimize compression forces against the patella during the mobilization.

Therapist position is when in the resting position, stand on the medial side of the patient's leg. Hold the distal leg with your distal hand and place the palm of your proximal hand along the anterior border of the tibial plateaus. When near 90 degree, sit on a low stool, stabilize the leg between your knees and place one hand on anterior border of tibial plateaus. When prone, stabilize the femur with one hand and place the other hand along the border of the tibial plateaus.

#### Tibio femoral anterior glide ;

Patient is placed in a prone position with the knee in resting position, progress to the end of the available range. Place a small pad under the distal femur to prevent patellar compression. Grasp the distal tibia with the hand that is closer to it and place the palm of the proximal hand on the posterior aspect of the proximal tibia, Apply force with the hand on the proximal tibia in an anterior direction. The force may be directed to the lateral or medial tibial plateau to isolate one side of the joint.

If the patient cannot be positioned prone, position him supine with a fixation pad under the tibia. The mobilizing force is placed against the femur in a posterior direction.

## Patello femoral distal glide;

Patient is placed in supine, with knee extended, progress to positioning the knee at the end of the available range in flexion. Stand next to the patient's thigh, facing the patient's feet. Place the web space of the hand that is closer to the thigh around the superior border of the patella. Use the other hand fir reinforcement. Glide the patella in a caudal directions parallel to the femur. Do not compress the patella into the femoral condyles while performing the technique [9].

## Patello femoral medial or lateral glide ;

Patient is positioned in a supine with knee extended, side lying may be used to apply a medial glide. Place the heel of your hand along either medial or lateral aspect of patella. Stand on opposite side of the table to position your hand along the medial border and on the same side of the table to position your hand along the lateral border. Place the other hand under the femur to stabilize it. Glide the patella in a medial or lateral direction, against the restriction.

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#### **Complications of joint mobilization** [10]

They are dislocation, fracture, tendon or nerve injury and nerve damage. Therefore proper grading of these techniques should be followed and they should be performed by a qualified therapist to avoid any unnecessary injuries.

From a physiotherapy perspective manual therapy and mobilization exercises are essential and commonly used treatment method for the management of tissue, joint and movement dysfunction. When executed properly these exercises can greatly help in reducing pain and in restoring joint play.

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