

STUDY OF OSTEOPOROTIC FRACTURES (V5)

Lower Extremity Joint Examination Protocol

I. Introduction:

The lower extremity joint examination is being performed to assess the relationship between hip OA and hip function, and to compare hip function to the assessment performed at V2. The protocol is nearly identical to that used at V2. **A major goal of this exam is to reproduce the procedures used at the second examination as closely as possible.**

The joint examination will be performed in a systematic fashion. The examiner should review pertinent sections of Chapters 1, 6 and 7 in

Clarkson HM and Gilewich GB. Musculoskeletal assessment: joint range of motion and manual muscle strength. Baltimore: Williams and Wilkins. 1989.

Where the procedures in this protocol manual differ from those in the above text, the procedures in this manual are to be followed.

The following sequence will be followed: hips then knees. Each joint will be examined for pain on passive motion and the knee for tenderness on palpation. Examinations will be performed on both sides.

For purposes of recording, tenderness and pain on motion will be noted as present or absent and not scaled according to severity or grade if present.

Goniometry

Range of motion of hips and knees, and ankle joints will be measured in degrees using a goniometer. Goniometry is the measurement of angles, in our study the measurement in degrees of the range of motion of the hip and knee. The measurement is taken while the pivot, or axis, of the goniometer is over the axis of motion of the joint. Since the axis of motion may shift somewhat when the joint is moved, care should be taken to be sure the pivot of the goniometer is as closely as possible over the axis of motion, or designated bony prominence, when the measurement is taken.

We will measure free and easy range of motion, which is defined as movement of the joint up to the point of increased resistance, or to the point where joint pain prevents further movement. For some participants this will mean moving the joint beyond the onset of mild discomfort.

IMPORTANT: For purposes of recording, the goniometer measurement will always be an angle $\leq 180^\circ$. Always read the angle from the black numbered scale between the stationary and moveable arms of the goniometer. The 'stationary' arm of the goniometer is the arm attached to the circular dial calibrated in degrees. The moveable arm pivots around the circular dial.

II. Subject Preparation

Dress: The participant should be wearing slacks, sweatpants, or surgical pants that can be rolled up past the knee. Shoes, stockings, and pantyhose should be removed, but socks may be kept on.

"This part of the examination looks at the movement of your hips and knees, and any pain you may have during these motions. The movement of these joints is important for mobility and balance and is sometimes compromised by arthritis. I'll be making measurements on both sides using this instrument (show goniometer). I'll move each joint through its range and take measurements of the range of motion. I want you to tell me if any of these movements are painful in the hip or the knee. I'll also be checking your knees for tenderness.

III. Examination and Measurement Procedures:

A. LIMB ABNORMALITY BY OBSERVATION

1) Ask whether she has had a hip or knee replacement and record the information for use during the exam.

"Have you ever had hip replacement surgery where part or all of your hip joint was replaced? (If yes 'Which side?')"

"Have you ever had knee replacement surgery where part or all of your knee joint was replaced? (If yes 'Which side?')"

If she has had a total hip replacement, do not assess hip abduction on that side. If she has had a total knee replacement, you will not be able to assess knee tenderness on that side.

2) Observe and record lower limb paralysis, presence of a cast, or amputation.

B. HIP (SUPINE POSITION)

1) Assist the participant in lying down on the examination table.

"Let's start with the hip. I'll move it through its range of motion by lifting and turning. Tell me if you feel any pain in your hip during these movements."

Start with the left side. Movements of the hip are shown in Figure 3.

When you describe what you are going to do, do NOT move the participant's leg. The description should be purely verbal. The first time the participant's leg is moved is for the reading.

2) Hip Flexion.

a) With the examinee lying on her back, and both legs lying flat on the table, place your hand under her knee and cradle the heel in the other hand.

"I'm going to lift your leg and bring your knee toward your chest.

b) Gently lift the participant's leg, and move the knee toward the chest until the subject notes pain, winces, or grimaces, or until there is resistance to movement. The knee will be flexed as the hip flexes. Ask:

"Does this hurt in or around your hip?"

Note pain. Since the knee will also be flexed, distinguish hip from knee pain.

c) With the subject's help (Figure 4), hold the hip at its maximum free and easy range and measure degrees of flexion.

"Please help me hold your leg there just like that. Put your hand on your shin/under your thigh to steady it while I make a measurement."

Place the stationary arm of the goniometer alongside and parallel to the long axis (mid axillary line) of the trunk and the moveable arm along the lateral midline of the femur, pointing towards the lateral epicondyle. The pivot of the goniometer is placed over the greater trochanter.

Read the angle between the arms of the goniometer (between 0° and 180° degrees; full ROM usually no less than 45-55°). (Figure 5)
NOTE: For hip flexion, a smaller angle indicates a greater range of motion. Women with hip replacements will generally be limited to about 90° of flexion on the side with the prosthesis.

NOTE: Watch for flexion of the lumbar spine, which falsely increases the apparent ROM.

d) Alternative: Use the technique for moving the leg and holding the goniometer illustrated in figures 6.7 and 6.8 of Musculoskeletal Assessment. This allows you to measure ROM without having the participant hold her leg in place.

e) Record pain and degrees of motion.

f) Repeat procedures for right side.

3) Hip Abduction. DO NOT PERFORM ON SIDE OF HIP REPLACEMENT DUE TO RISK OF DISLOCATON.

a) Palpate the right and left anterior superior iliac spines (ASIS) (Figure 6). It may help to mark each with a piece of tape.

Place the pivot of the goniometer over the ASIS on the left side. Align the stationary arm of the goniometer on a line between the two ASIS. The moveable arm of the goniometer should be on top.

You may ask the participant to help hold the goniometer in place.

b) Set the angle of the goniometer to about 140° and hold in the hand closer to the subject's head. Or if you find it more comfortable, move the arm of the goniometer with the leg.

c) Standing by the side of the examinee, place the other hand under the examinee's left heel. (Figure 7) NOTE: In some cases, you may need to cradle the examinee's leg in your forearm.

"Now I'm going to carry the weight of your leg while we move your leg as far sideways as possible. Keep your knee straight."

"Does this hurt in or around your hip?"

Lift the leg just off the table and then pull it away from the body until you feel resistance, or the subject notes pain, or grimaces, etc. Be careful not to rotate the leg as you move it outward. Keep the great toe pointed straight up. Note pain.

d) With your thumb, align the movable arm of the goniometer along the midline of the femur.

e) Read the angle between the two arms of the goniometer (between 90° and 180°; full range of motion usually no more than about 140-150°). (Figure 8)

Move the leg back to the starting position.

f) Record pain and degrees of motion.

g) Repeat procedures for right side. Place the pivot of the goniometer over the ASIS on the right side.

4) Internal and External Rotation of the Hip

NOTE: This measurement is taken with subject sitting on the edge of the table, after knee flexion is assessed.

a) Have the participant sit with her legs over the side of the table and knees flexed to 90°, with knees separated by about 8 inches. Her hands are resting on her knees to help hold the goniometer in place and to keep her buttocks on the table. Ask her to keep her "bottom on the table" as you move her leg. Kneel, crouch, or sit in front of the participant.

b) Have the participant hold the goniometer with the pivot centered over the middle of the patella of the left knee and the stationary arm on a line between the patellae of the R and L knees. (Figure 10)

c) Internal Rotation. Hold the left leg at the shin. Making sure that she does not raise her hips or buttocks from the table and that the goniometer remains parallel to the table top, move her left leg (and the arm of the goniometer) to the outside through its free and easy range. If necessary, have the subject assist in moving the joint through its range.

Ask "Does this hurt in or around your hip?"

d) Read the angle between the arms of the goniometer (between 90° and 180°; full ROM usually not more than about 135-145°) If necessary, return the leg to its starting position without changing the angle of the goniometer and read the angle.

e) Record pain and degrees of motion.

f) External Rotation. Grasp the leg at the shin and move the leg to the inside through its free and easy range. NOTE: Move the left leg over the right leg if necessary to reach full ROM.

Ask "Does this hurt in or around your hip?"

Obtain the goniometer reading (angle between 0° and 90°; full ROM usually not less than about 45°) and return the leg to starting position. NOTE: For internal rotation, a smaller angle indicates a greater range of motion.

g) Record pain and degrees of motion. (Figure 10)

h) Repeat for the right leg. Align the stationary arm of the goniometer on a line between the patellae of the knees and parallel to the tabletop, with the pivot over the right patella. The stationary arm should still be on the bottom, but this time pointing in the opposite direction as for the left leg measurement. Be sure to keep it parallel to the table top during rotation of the hip. The range of possible angles is the same as for the left leg.

C. KNEE (SUPINE POSITION)

1) With the bare knee exposed and extended and leg lying relaxed on the table:

a) Palpate the joint for tenderness.

"I'm going to put a little pressure on the area around your knee. Is that tender?"

i) Press firmly down on the patella. (Figure 11) Note any tenderness.

ii) Rest your left hand on the patella to stabilize the knee. With your right hand below the knee, press the medial and lateral

joint spaces with your thumb and forefinger. (Figure 12) Note tenderness.

b) Record tenderness for each knee. NOTE: If subject has total knee arthroplasty, record 'unable to examine'.

2) Conduct the ROM exam for left knee (OK to examine if total knee replacement).

a) Place your right hand under the examinee's knee and your left hand on the heel of the foot.

"I'm going to move your knee now by bringing your foot toward your thigh. Does this hurt your knee?"

b) Lift the leg so the heel is just off the table and bend the knee. Slowly move the foot back towards the buttocks until the participant notes pain, winces, grimaces, or until there is increased resistance to movement. Note pain.

c) To measure degrees of knee flexion, ask the participant to help hold the leg in position. If necessary, use sandbags on the foot to maintain the position.

"Please try to hold your leg there just like that. Put your hand on your thigh to keep it in place while I make a measurement."

Place the stationary arm of the goniometer on a line from the lateral condyle of the femur to the greater trochanter. Place the moveable arm on a line parallel with the fibula, pointing toward the lateral malleolus (ankle bone). The pivot point is over the lateral condyle of the femur. (Figure 13)

Obtain the goniometer reading (angle between 0° and 180°; most ppts will have values less than 90° but about 1-5% will be above 90°; full ROM usually not less than about 45-35°) and return the leg to starting position. NOTE: For knee flexion, a smaller angle indicates a greater range of motion.

c) **Alternative:** Use the technique for moving the leg and holding the goniometer illustrated in figure 7.5 of Musculoskeletal Assessment. This allows you to measure ROM without having the participant hold the limb in place.

e) Record pain and degrees of motion.

f) Repeat procedures for the right side.

IV. Recording of Findings and Definitions

Limb Abnormality by Observation

Total hip and knee replacement: The right and left leg will be coded separately. If you check a "Yes" box, do as much of the examination as possible, recording where you are "unable to examine". This condition will limit the completeness of the examination and is important to record.

Paralysis: The right and left leg will be coded separately. Check the "Yes" box for right and/or left leg if the right and/or left leg is paralyzed. Otherwise, check "No". Paralysis for purposes of this study will be the loss or impairment of motor function in the leg. If you check a "Yes" box, do as much of the examination as possible, recording where you are "unable to examine". This condition will limit the completeness of the examination and is important to record.

Cast: Check the "Yes" box for the right and /or left leg if the right and/or left leg has a cast on it. A cast for purposes of this study will include a soft cast which cannot be removed or a stiff dressing or casing made of bandage impregnated with Plaster of Paris or other hardening material, used to immobilize the leg. If you check a "Yes" box, do as much of the examination as capable, recording where you are "unable to examine". This condition will limit the completeness of the examination and is important to record.

Amputee: The right and left leg will be coded separately. Check the "AK" box if the right and/or left leg has been amputated above the knee. Check the "BK" box if the right and/or left leg has been amputated below the knee. Otherwise, check the "No" box. If you check a "Yes" box, do as much of the examination as capable, recording where you are "unable to examine". This condition will limit the completeness of the examination and is important to record.

Joints - Tenderness, Range of Motion, and Pain

Tender on Palpation: The examinee's response is an indication of the inflammation in the joint and the degree of response roughly correlates with the severity of the inflammation. Other variables may influence the examination, such as: amount of pressure applied by the examiner, pain tolerance of the examinee, other deficits, and to some degree which joint is being palpated. While applying pressure to each site, the examiner should ask "Is this tender?" For purposes of this study tender on palpation will include any of the following:

- a) a complaint of tenderness;
- b) a complaint of tenderness and wincing;
- c) wincing and an attempt to withdraw.

Any of the above mean tenderness is present.

Pain on Passive Motion is the degree of a patient's discomfort when a joint is moved passively through its free and easy range of motion. Thickened, inflamed synovial tissue or a tense joint effusion will limit the free and easy range of motion and result in pain. The patient's response is used as an indicator of inflammation in the joint and the degree of response will roughly correlate with the severity of the inflammation. Other variables, however, may influence this examination, including attempts to move the joint beyond the normal extremes of range of motion, the pain tolerance of the examinee, other diseases and joint incongruity and/or malalignment. At the point of resistance for each joint, or when the participant grimaces, the examiner should ask "Does that hurt in your [joint]?" For purposes of this study joint pain on motion will include any of the following:

- a) complaint of pain;
- b) complaint of pain with wincing;
- c) wincing and attempt to withdraw.

Free and Easy Motion - Each diarthrodial joint can be moved passively through one of several arcs of motion. Joint limitation of motion or loss of motion is a reduction in the arc or arcs of normal motion of joint due to pathological processes. The participant may experience pain before the examiner notes any resistance to movement. Move the joint to the point where resistance to movement is first noted, or where the participant notes real pain, winces, grimaces, etc. The joint should be moved beyond mild discomfort. This will not cause injury to the participant.

Hip Joint (right and left coded separately)

Pain on Passive Motion: True hip pain is usually localized to the groin or may radiate to the anterior thigh. Check the "Yes" box if the examinee exhibits pain on passive motion in the hip joint on flexion, rotation and /or abduction. Check the "No" box if there is no pain on passive motion.

Passive Free and Easy Range of Motion - The hip joints will be coded separately for degrees of passive range of motion for flexion, abduction, internal rotation, and external rotation.

Knee Joint (right and left coded separately)

Tenderness on Palpation: Check the "Yes" box if there is tenderness in the knee joint during either compression of the patella or compression of the medio-lateral joint space. Check the "No" box if there is no tenderness.

Pain on Passive Motion: Check the "Yes" box if the examinee exhibits pain on passive flexion of the knee joint. Check the "No" box if there is no pain on passive flexion.

Passive Free and Easy Range of Motion - The right and left knee joints will be coded separately for degrees of passive range of flexion.

V. Performing the ROM Exam at Home Visits

It should be possible to perform all, or nearly all, of the ROM exam during a home visit.

The supine portions of the exam (hip flexion, hip abduction, knee flexion) are best performed on the portable exam table. Using the portable table may have certain advantages: a) it is higher than a couch or bed and will be less awkward for the examiner; b) it is more firm than most couches or beds, which may improve the quality of the measurements; c) the sitting measurement of internal and external rotation will be easier to perform if the participant's feet are not touching the floor.

It is acceptable to perform the measurements on a firm couch or bed if this is the only practical approach. For example, if the participant cannot get out of bed, then perform the exam on the bed. However, the examiner should supply a firm, flat padded support (e.g. a CPR board covered with a towel) to support the buttocks and trunk. The participant should be able to lie down with the hip and knee in nearly full extension.

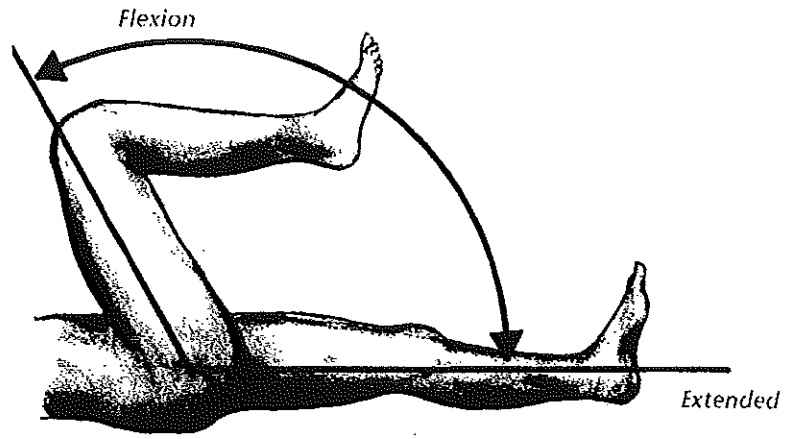
If necessary, have the participant turn around on the bed, couch or portable table in order to examine both the right and the left sides. Complete all the supine measurements on the right side (hip and knee) before proceeding to the left.

If you do not use the portable table, perform the assessment of internal and external rotation of the hip with the participant seated in the highest available chair, so that her legs move as freely as possible during the exam. A firm rather than a soft/squishy seat is also required for this assessment. The padded board could be placed on the chair for this purpose.

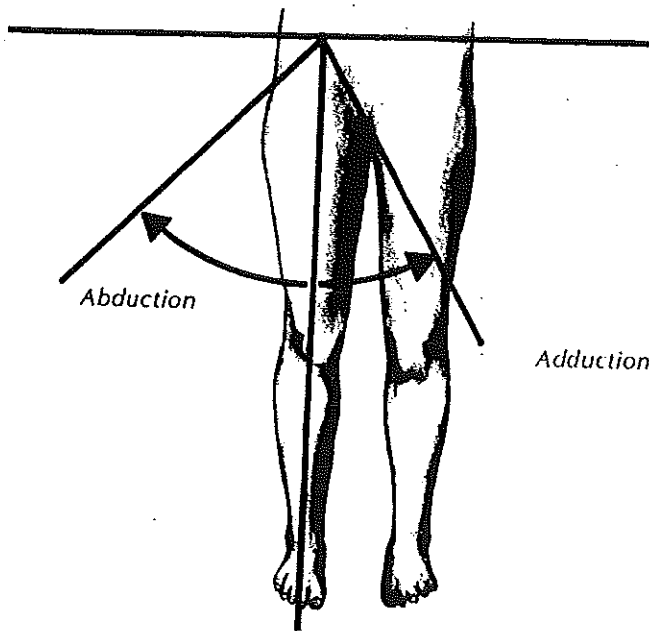
If a participant is bed bound and cannot sit up, assess internal and external rotation in the supine position using the leg and hand positions illustrated in figures 6.27 and 6.29 of Musculoskeletal Assessment. The hip should be flexed to 90°. Ask the participant to help you hold the goniometer in place. The pivot is placed over the patella on the side being assessed. The stationary arm should be on a line between the patella and the ASIS on the opposite side. The moveable arm is positioned on a line parallel to the tibia. Manipulate the arms of the goniometer with your outstretched thumbs. If the participant is unable to assist and you cannot work the goniometer unaided, record pain but not ROM.

If you are unable to complete any parts of the ROM exam during a home visit, record 'Unable to examine' on the form.

FIGURE 3
Movements of the hip

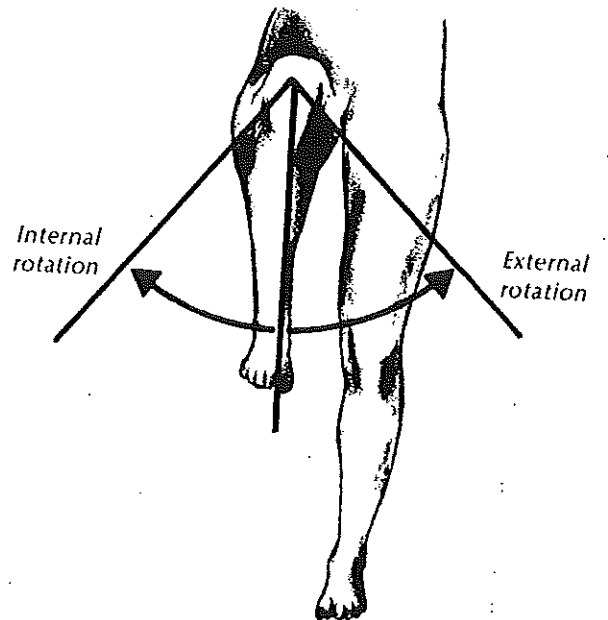


Flexion



Abduction

Adduction



Internal and external
rotation

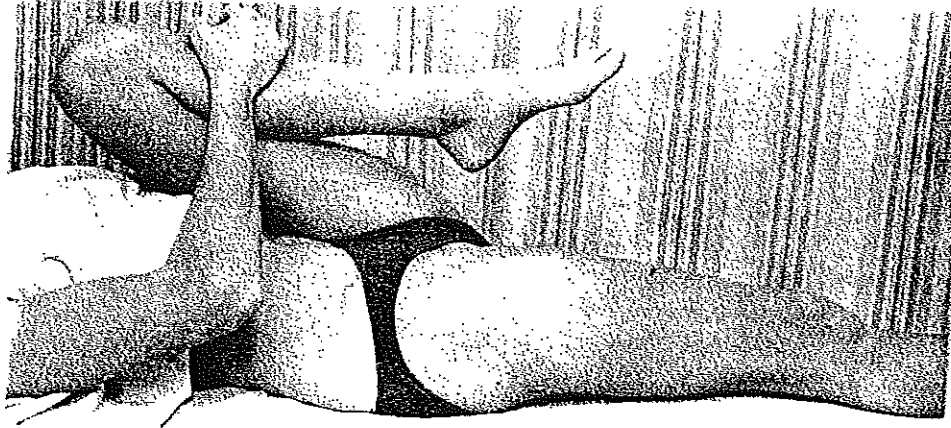


FIGURE 4
Holding hip in flexed position

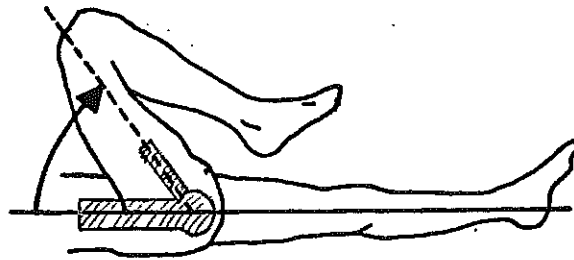


FIGURE 5
Goniometer placement for hip flexion

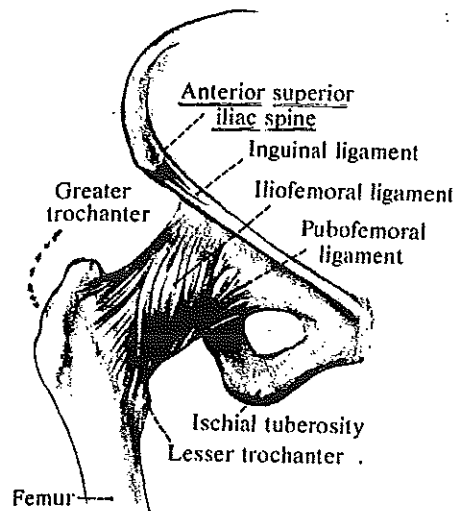


FIGURE 6
Anterior iliac spine

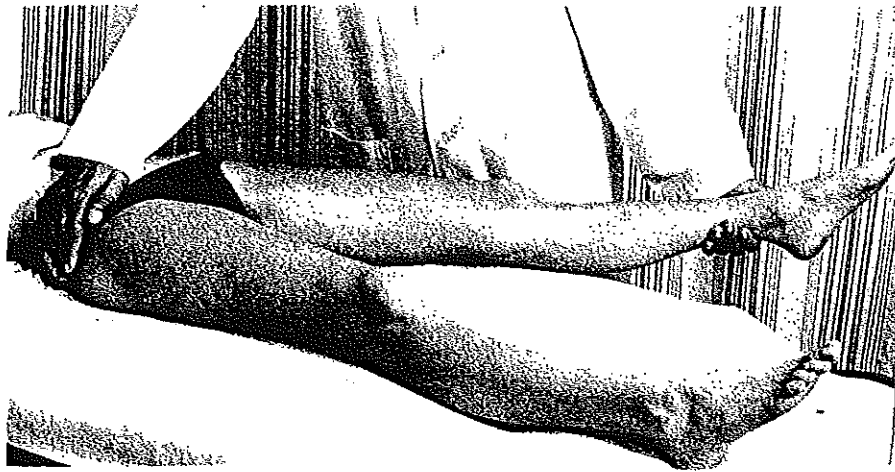


FIGURE 7
Hand placement for hip abduction

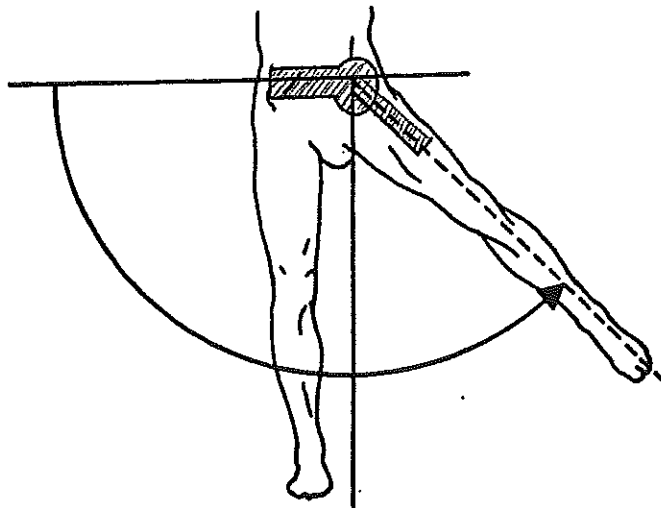


FIGURE 8
Goniometer placement for hip abduction

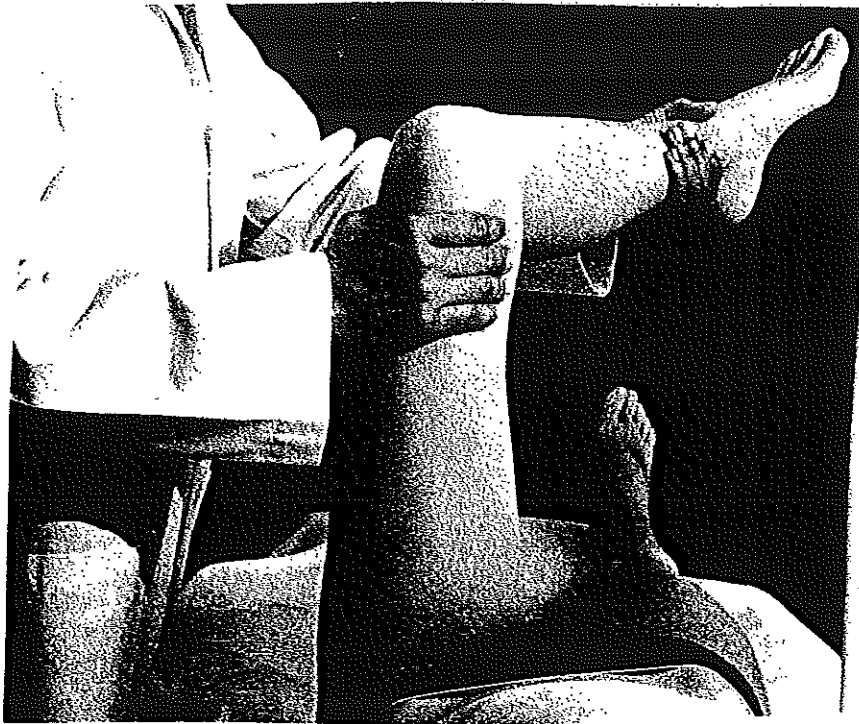


FIGURE 9
Hand position for internal and external rotation of the hip

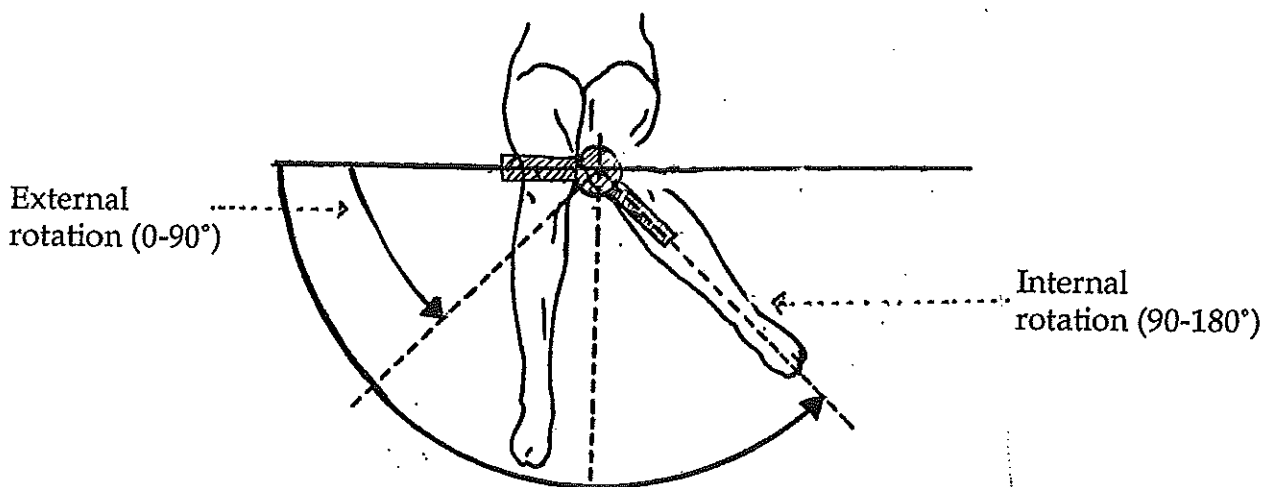


FIGURE 10
Goniometer placement for internal and external rotation of the left hip
with subject sitting

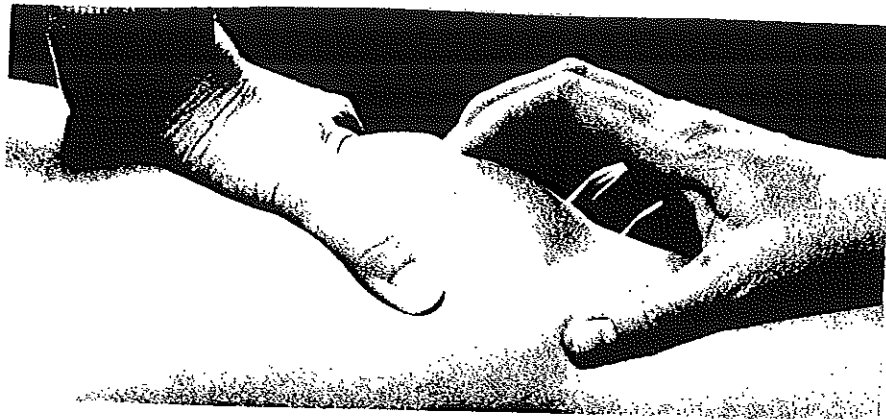


FIGURE 11
Palpating the patella of the knee

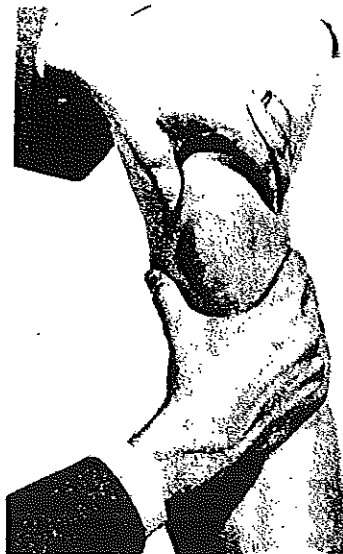
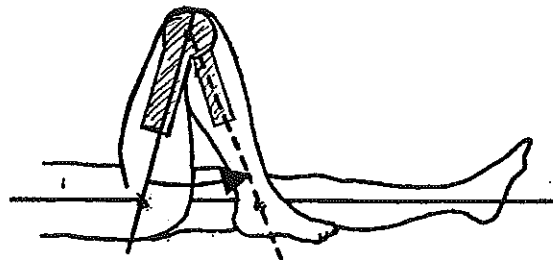


FIGURE 12
Palpating the joint line of knee

FIGURE 13
Goniometer placement for
knee flexion



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