

Knee Pain

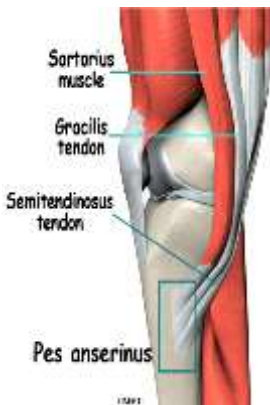
Main points in history taking
 Post OP TKR rehab
 Post ACL reconstruction Rehab
 Therapeutic Exercises



1

Where is your pain?

- This is a very high-yield question. Have your patient **point to the most painful point**, if possible. **Pain at the joint line is the result of a collateral ligament or meniscus problem (or both) until proven otherwise.** **Pain at the tibial tuberosity in a young patient is Osgood-Schlatter's syndrome until proven otherwise;** **anterior knee pain may be a patellofemoral disorder;** **pain over the medial tibial plateau, approximately 2 inches below the joint line, may be pes anserinus bursitis;** and **pain and swelling in the posterior knee may be a Baker's cyst.**



2



3

When did your pain begin, what were you doing at the time, and what were the initial symptoms?

- If the patient has a ligament injury, the patient will report a deceleration injury or twisting the knee that led to immediate symptoms of swelling and pain.
- In fact, **30 to 50% of patients will report actually hearing a “pop” at the time of injury**

4

- In contrast, patients with meniscus injuries may have a similar mechanism of injury (twisting or deceleration), but the patient will not notice swelling (if swelling occurs at all) until minutes or hours after the injury. There is also no “popping” sensation or sound in meniscus injuries.

5

- Patients with osteoarthritis, patellofemoral syndrome, and Osgood-Schlatter’s syndrome have a more chronic onset of symptoms.

Patients with fractures will generally report a history of trauma.

6

Do you experience any grinding, locking, catching, or giving way of the knee?

- Grinding is characteristic of osteoarthritis;
- locking and catching are characteristic of meniscus injuries and osteochondritis dissecans (meniscus injuries are much more common than osteochondritis dissecans);
- giving way is more characteristic of ligamentous injuries.

7

Are there any positions that make your knee more or less comfortable?

- Patients with patellofemoral disorders classically report pain with prolonged knee flexion, and pain relief with knee extension.
- The “movie theater sign”—in which the patient complains of aching knee pain while sitting with the knees flexed in the theater for a prolonged period of time—is classic for patellofemoral syndrome.

8

Have you tried anything to help the pain and, if yes, has that been successful?

- **Other important questions to remember to ask include:**
- **Have you ever had surgery on your knee?**
- **Do you have any hip or ankle **pain(both hip and ankle pain can refer pain to the knee, and vice versa)?****

9



10

Total Knee Arthroplasty

□ Total knee arthroplasty (TKA), also called total knee replacement, is a widely performed procedure for advanced arthritis of the knee primarily in older patients (≥ 70 years of age) with osteoarthritis

□ Indications

- Severe joint pain with weight bearing or motion
- Extensive destruction of articular cartilage of the knee
- Marked deformity of the knee such as genu varum or valgum
- Gross instability or limitation of motion
- Failure of nonoperative management or a previous surgical procedure

11



12

TABLE 21.3 Total Knee Arthroplasty: Interventions for Each Phase of Rehabilitation

Phase and General Time Frame	Maximum Protection Phase: Weeks 1–4	Moderate Protection Phases: Weeks 4–8	Minimum Protection/Return to Function Phases: Beyond Week 8
Patient presentation	<ul style="list-style-type: none"> ■ Patient enters rehabilitation 1–2 days postoperatively ■ Postoperative compression dressing ■ Postop pain controlled ■ ROM 10°–60° ■ Weight bearing as tolerated with cemented prosthesis, delayed with uncemented or hybrid 	<ul style="list-style-type: none"> ■ Minimum pain ■ Full weight bearing except with uncemented or hybrid ■ ROM 0°–90° ■ Joint effusion controlled ■ Impaired balance and functional mobility ■ Diminished muscle function and cardiopulmonary endurance 	<ul style="list-style-type: none"> ■ Muscle function: 70% of noninvolved extremity ■ No symptoms of pain or swelling during previous phase ■ Impaired balance and functional mobility

13

Key examination procedures

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> ■ Pain (0–10 scale) ■ Monitor for hemarthrosis ■ ROM ■ Patellar mobility ■ Muscle control ■ Soft tissue palpation | <ul style="list-style-type: none"> ■ Pain assessment ■ Joint effusion—girth ■ ROM ■ Patellar mobility ■ Gait analysis | <ul style="list-style-type: none"> ■ Pain assessment ■ Muscular strength testing ■ Patellar alignment/stability ■ Gait analysis ■ Functional status |
|--|--|--|

Goals

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> ■ Control postoperative swelling ■ Minimize pain ■ ROM 0°–90° ■ 3/5 to 4/5 strength of quadriceps ■ Ambulate with or without assistive device ■ Establish home exercise program | <ul style="list-style-type: none"> ■ Reduce swelling ■ ROM 0°–110° or greater ■ Full weight bearing ■ 4/5 to 5/5 strength ■ Unrestricted ADL function ■ Improved balance, neuromuscular control, and functional mobility ■ Adherence to home exercise program | <ul style="list-style-type: none"> ■ Develop maintenance program, and educate patient on importance of adherence including methods of joint protection ■ Community ambulation ■ Improve cardiopulmonary endurance/aerobic fitness |
|--|--|--|

14

TABLE 21.3 Total Knee Arthroplasty: Interventions for Each Phase of Rehabilitation—cont'd

Phase and General Time Frame	Maximum Protection Phase: Weeks 1-4	Moderate Protection Phases: Weeks 4-8	Minimum Protection/Return to Function Phases: Beyond Week 8
Interventions	<ul style="list-style-type: none"> ■ Pain modulation modalities ■ Compression wrap to control effusion ■ Ankle pumps to minimize risk of DVT ■ A-AROM and AROM ■ Muscle setting quadriceps, hamstrings, and adductors (may augment with E-stim) ■ Patellar mobilization (grades I and II) ■ Gait training ■ Flexibility program hamstrings, calf, IT band ■ Trunk/pelvis stabilization exercises 	<ul style="list-style-type: none"> ■ Patellar mobilization ■ LE stretching program ■ Closed-chain strengthening ■ Limited range PRE ■ Tibiofemoral joint mobilization, if appropriate and needed ■ Proprioceptive training ■ Stabilization and balance exercises ■ Protected aerobic exercise—swimming, cycling or walking 	<ul style="list-style-type: none"> ■ Continue as previous phase; advance as appropriate ■ Progression of balance and advanced functional activities ■ Implement exercise specific to identified deficits and expected functional tasks

15

CPM: no significant long-term benefits as to gains in ROM and functional mobility

•

16



17

Exercise Precautions Following TKA

- **Monitor the integrity of the surgical incision during knee flexion exercises. Watch for signs of excessive tension on the wound, such as drainage or skin blanching.**
- **Postpone SLRs in side-lying positions for 2 weeks after cemented arthroplasty and for 4 to 6 weeks after cementless/hybrid arthroplasty to avoid varus and valgus stresses to the operated knee.**
- **Confer with the surgeon to determine when it is permissible to initiate exercises against low-intensity resistance. It may be as early as 2 weeks or as late as 3 months postoperatively**

18

- If a posterior cruciate-sacrificing (posterior-stabilized) prosthesis was implanted, avoid hamstring strengthening in a sitting position to reduce the risk of posterior dislocation of the knee.
- Postpone unsupported or unassisted weight-bearing activities until strength in the quadriceps and hamstrings is sufficient to stabilize the knee.

19

What is your view about this situation?



20

BOX 21.5 Recommendations for Participation in Physical Activities Following TKA

Highly Recommended*

- Stationary cycling
- Swimming, water aerobics
- Walking
- Golf (preferably with golf cart)
- Ballroom or square dancing
- Table tennis

Recommended If Experienced Before TKA**

- Road cycling
- Speed/power walking
- Low-impact aerobics
- Cross-country skiing (machine or outdoor)
- Table tennis
- Doubles tennis
- Rowing
- Bowling, canoeing

21

Not Recommended***

- Jogging, running
- Basketball
- Volleyball
- Singles tennis
- Baseball, softball
- High-impact aerobics
- Stair-climbing machine
- Handball, racquetball, squash
- Football, soccer
- Gymnastics, tumbling
- Water-skiing

22

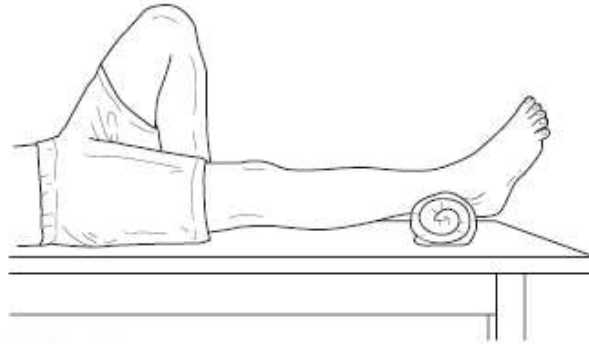


FIGURE 21.18 Heel prop in supine to increase knee extension. A cuff weight or sandbag placed across the distal femur increases the stretch force.

23

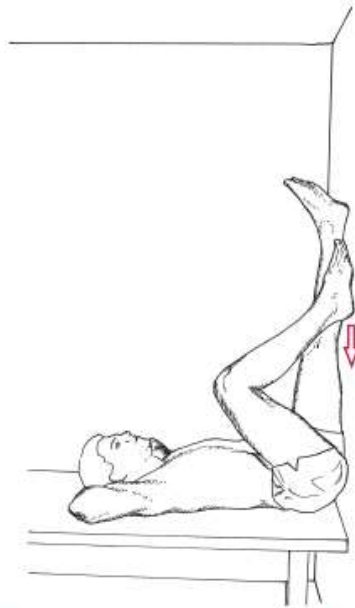


FIGURE 21.19 Gravity-assisted supine wall slide. The patient flexes the knee to the limit of its range and holds it there for a sustained stretch to the quadriceps femoris muscle.

24

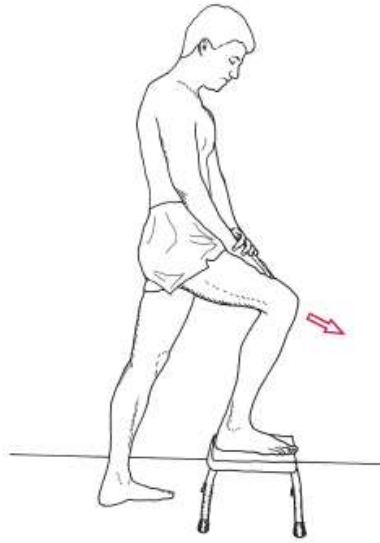


FIGURE 21.20 Self-stretching on a step to increase knee flexion. The patient places the foot of the involved side on a step, then rocks forward over the stabilized foot to the limit of knee flexion to stretch the quadriceps femoris muscle. A higher step is used for greater flexion.

25



FIGURE 21.22 Foam roller fascial release for a tight IT band.

26

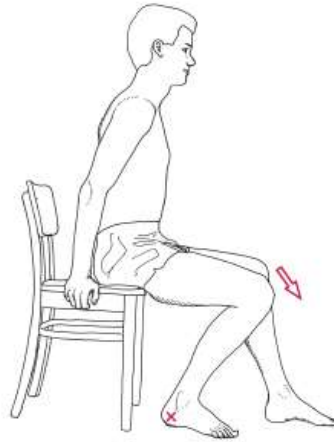


FIGURE 21.21 Self-stretching in a chair to increase knee flexion. The patient fixates the foot of the involved leg on the floor and then moves forward in the chair over the stabilized foot to place a sustained stretch on the quadriceps femoris muscle and increase knee flexion.

27

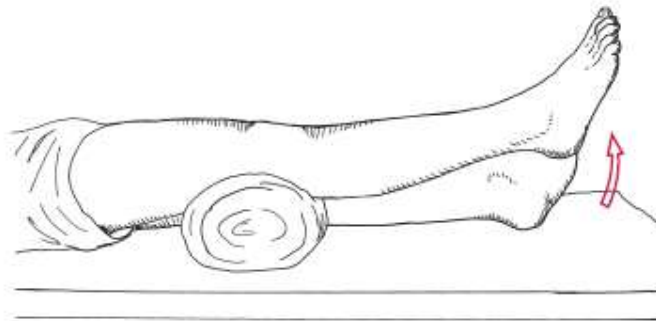


FIGURE 21.23 Short-arc terminal extension exercise to strengthen the quadriceps femoris muscle. When tolerated, resistance is added proximal to the ankle.

28

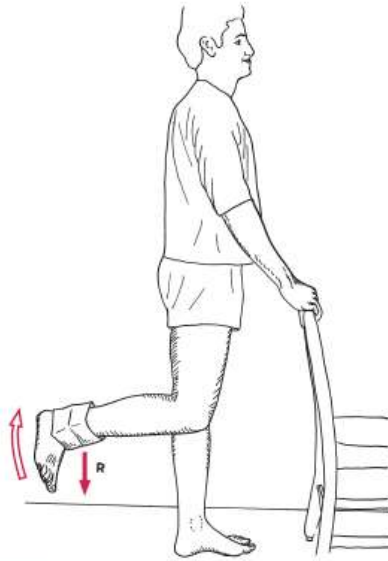


FIGURE 21.24 Hamstring curls; resistance exercises to the knee flexors with the patient standing. Maximal resistance occurs when the knee is at 90°.

29



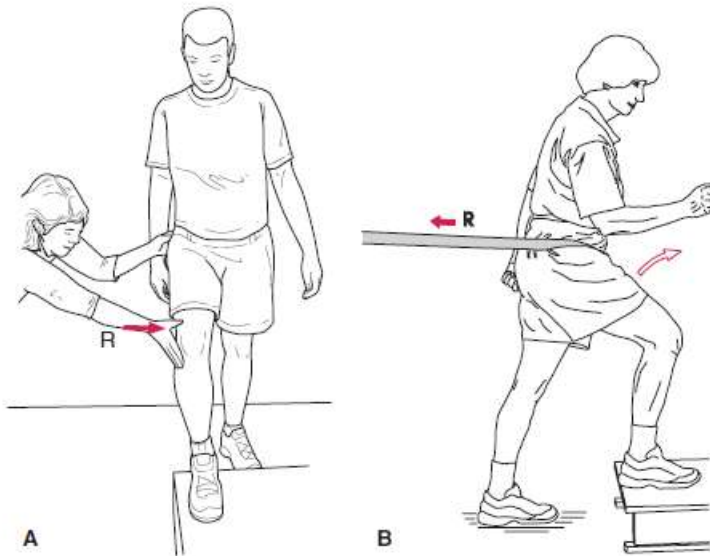
FIGURE 21.25 Forward scooting on a wheeled stool to strengthen knee flexors and backward scooting to strengthen knee extensors.

30



FIGURE 21.26 Unilateral closed-chain terminal knee extension.

31



32

Rehabilitaion Post ACL reconstruction

33



34

- Typically, the patient is discharged on the first postoperative day following an ACL reconstruction. Just as delayed repair of an ACL-deficient knee enhances the patient's postoperative recovery, **early rehabilitation after an ACL reconstruction is vital for optimal surgical results.**

35

- Following the surgery, the most common brace used is the **knee immobilizer** or **locked drop-lock knee extension brace**,
- Weight bearing as tolerated, with crutches.



36



37

- The brace is worn 24 hours a day and is only unlocked or removed for bathing and appropriate exercises. The patient is instructed on the use of crutches prior to discharge.

38

When It will be safe to discontinue Crutches

- **The crutches are discontinued when the patient can stand on the involved leg with the brace unlocked, or once the patient can ambulate without limping.**

39

- A patient may drive an automobile when he or she has full control of the surgical limb and is pain free.

40



41

TABLE 21.6 ACL Reconstruction: Interventions for Accelerated Postoperative Rehabilitation

Phase and General Time Frame	Maximum Protection Phase: Day 1–Week 4	Moderate Protection Phase: Weeks 4–10	Minimum Protection Phase: Weeks 11–24
Patient presentation	<ul style="list-style-type: none"> ■ Pain and hemarthrosis ■ Decreased ROM ■ Diminished voluntary quadriceps activation ■ Ambulation with crutches ■ Use of protective bracing (if prescribed) 	<ul style="list-style-type: none"> ■ Pain controlled ■ Joint effusion controlled ■ Full or near full knee ROM ■ Fair plus to good muscle strength (3+/5 to 4/5) ■ Muscular control of joint ■ Independent ambulation 	<ul style="list-style-type: none"> ■ No joint instability ■ No pain or swelling ■ Full knee ROM ■ Muscle function: 75% of noninvolved extremity ■ Symmetrical gait ■ Unrestricted ADL ■ Possible use of functional brace or sleeve
Key examination procedures	<ul style="list-style-type: none"> ■ Pain scale ■ Joint effusion—girth ■ Ligament stability—joint arthrometer (days 7–14) ■ ROM ■ Patellar mobility ■ Muscle control ■ Functional status 	<ul style="list-style-type: none"> ■ Pain scale ■ Effusion—girth ■ Ligament stability—joint arthrometer ■ ROM ■ Patellar mobility ■ Muscle strength testing ■ Functional testing 	<ul style="list-style-type: none"> ■ Ligament stability—joint arthrometer ■ Muscle strength testing ■ Functional testing ■ Full clinical examination

42

Goals		
<ul style="list-style-type: none"> ■ Protect healing tissues ■ Prevent reflex inhibition of muscle ■ Decrease joint effusion ■ ROM 0°–110° ■ Active control of ROM ■ Weight bearing: 75% to weight bearing as tolerated ■ Establish home exercise program 	<ul style="list-style-type: none"> ■ Full, pain-free ROM ■ 4/5 muscular strength (MMT) ■ Dynamic control of knee ■ Improved kinesthetic awareness ■ Normalize gait pattern and ADL function ■ Adherence to home program 	<ul style="list-style-type: none"> ■ Increase muscle strength, endurance, and power ■ Improve neuromuscular control, dynamic stability, and balance ■ Regain cardiopulmonary endurance ■ Transition to maintenance program ■ Regain ability to function at highest desired level ■ Reduce risk of reinjury

43

TABLE 21.6 ACL Reconstruction: Interventions for Accelerated Postoperative Rehabilitation—cont'd

Phase and General Time Frame	Maximum Protection Phase: Day 1–Week 4	Moderate Protection Phase: Weeks 4–10	Minimum Protection Phase: Weeks 11–24
Interventions	Weeks 0–2 <ul style="list-style-type: none"> ■ PRICE: (protective bracing, rest, ice, compression, elevation) ■ Gait training: crutches, partial weight bearing to WBAT ■ PROM/A-AROM (range-limiting brace, if prescribed) ■ Patellar mobilization (grades I/II) ■ Muscle setting, isometrics: quadriceps, hamstrings, adductors at multiple angles (may augment with E-stim) 	Weeks 5–6 <ul style="list-style-type: none"> ■ Multiple-angle isometrics ■ Closed-chain strengthening and PRE ■ LE stretching program ■ Endurance training (bike, pool, elliptical trainer) ■ Proprioceptive training in single-leg stance: balance board, BOSU ■ Stabilization exercises, elastic bands, band walking Weeks 7–10 <ul style="list-style-type: none"> ■ Advance strengthening (include PNF), endurance, and flexibility exercises 	Weeks 11–24 <ul style="list-style-type: none"> ■ Continue LE stretching ■ Advance PRE/initiate isokinetic training (if desired) ■ Advance closed-chain exercise ■ Initiate plyometric drills: bounding, jumping ■ Initiate plyometric drills (bouncing, jumping rope, box jumps: double-/single-leg) ■ Advance proprioceptive and balance training ■ Progress agility drills (figure-eight, skill-specific)

44

- Assisted SLRs—supine
 - Ankle pumps
- Weeks 2–4
- Continue as above
 - Progress to full weight-bearing; begin closed chain squats; heel/toe raises
 - SLRs in four planes
 - Low-load PRE: hamstrings
 - Open-chain knee extension (range 90°–40°)
 - Trunk/pelvis stabilization
 - Aerobic conditioning: stationary cycle
- Proprioceptive training: high speed stepping drills, unstable surface challenge drills, balance beam
 - Initiate a walk/jog program at the end of this phase
- patterns)
 - Simulated work or sport-specific training
 - Transition to full-speed jogging, sprints, running, and cutting

45



46



47



48



49



50

BOX 21.11 Exercise Precautions After ACL Reconstruction**Resistance Training—General Precautions**

- Progress exercises more gradually for reconstruction with hamstring tendon graft than bone-patellar tendon-bone graft.
- Progress knee flexor strengthening exercises cautiously if a hamstring tendon graft was harvested and knee extensor strengthening if a patellar tendon graft was harvested.

Closed-Chain Training

- When squatting in an upright position, be sure that the knees do not move anterior to the toes as the hips descend because this increases shear forces on the tibia and could potentially place excess stress on the autograft.
- Avoid closed-chain strengthening of the quadriceps between 60° to 90° of knee flexion.*

Open-Chain Training

- During PRE to strengthen hip musculature, initially place the resistance above the knee until knee control is established.
- Avoid resisted, open-chain knee extension (short-arc quadriceps training) between 45° or 30° to full extension for at least 6 weeks or as long as 12 weeks.*
- Avoid applying resistance to the distal tibia during quadriceps strengthening.*

*Contraction of the quadriceps in these positions and ranges causes the greatest anterior tibial translation and can create potentially excessive stress to the graft during the early stage of healing.^{67,99,299,303}

51

Exercise Techniques to Increase Flexibility and Range of Motion

- Hold relax stretching
- Passive 'g' assisted stretch

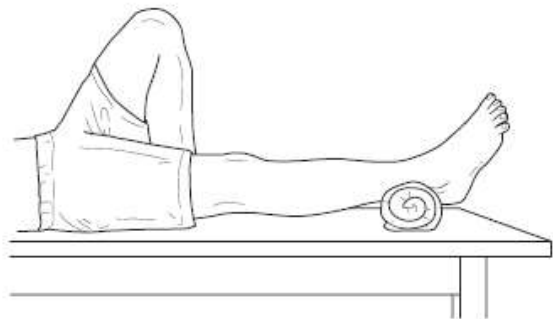


FIGURE 21.18 Heel prop in supine to increase knee extension. A cuff weight or sandbag placed across the distal femur increases the stretch force.

52

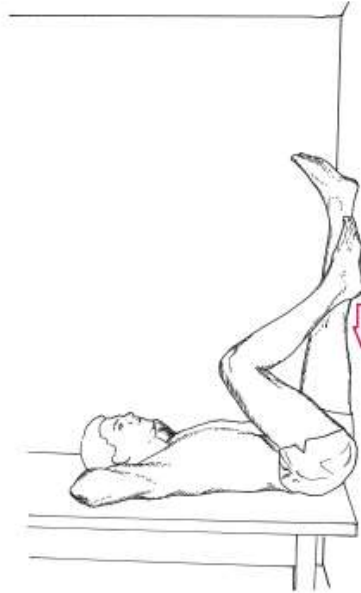


FIGURE 21.19 Gravity-assisted supine wall slide. The patient flexes the knee to the limit of its range and holds it there for a sustained stretch to the quadriceps femoris muscle.

53



FIGURE 21.20 Self-stretching on a step to increase knee flexion. The patient places the foot of the involved side on a step, then rocks forward over the stabilized foot to the limit of knee flexion to stretch the quadriceps femoris muscle. A higher step is used for greater flexion.

54

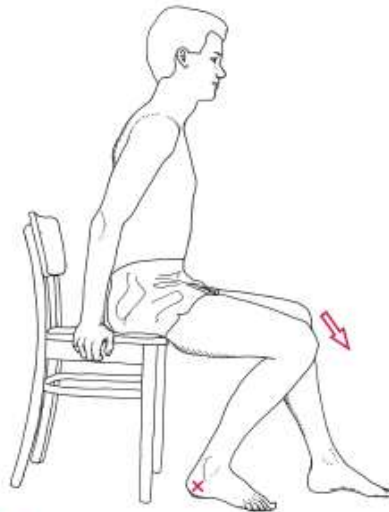


FIGURE 21.21 Self-stretching in a chair to increase knee flexion. The patient fixates the foot of the involved leg on the floor and then moves forward in the chair over the stabilized foot to place a sustained stretch on the quadriceps femoris muscle and increase knee flexion.

55



FIGURE 21.22 Foam roller fascial release for a tight IT band.

56

Exercises to Develop and Improve Muscle Performance and Functional Control

- The quadriceps has been shown to develop greater strength using resisted open-chain than closed-chain exercises.
- Closed-chain strengthening should be initiated first in partial weight bearing and later in full weight bearing as healing allows and then integrated with balance and proprioceptive training and functional weight-bearing activities.

57

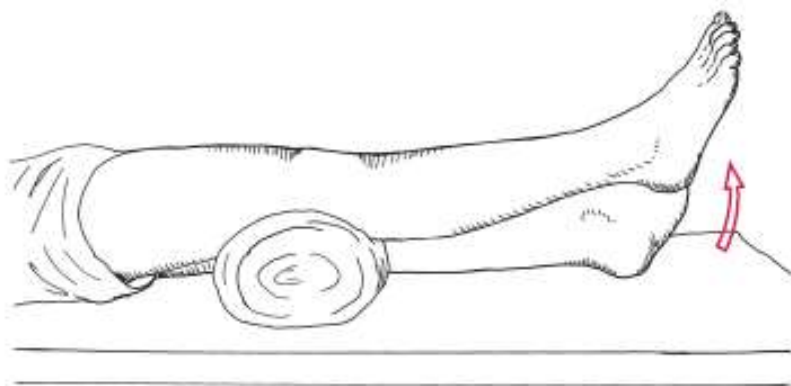


FIGURE 21.23 Short-arc terminal extension exercise to strengthen the quadriceps femoris muscle. When tolerated, resistance is added proximal to the ankle.

58

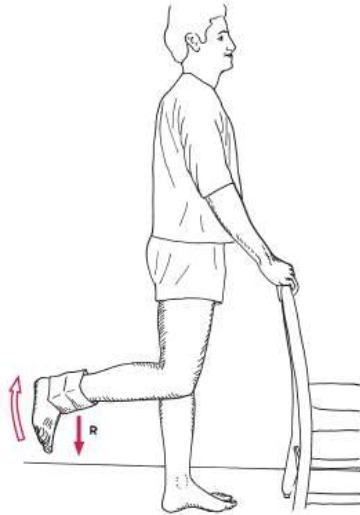


FIGURE 21.24 Hamstring curls; resistance exercises to the knee flexors with the patient standing. Maximal resistance occurs when the knee is at 90°.

59



FIGURE 21.25 Forward scooting on a wheeled stool to strengthen knee flexors and backward scooting to strengthen knee extensors.

60

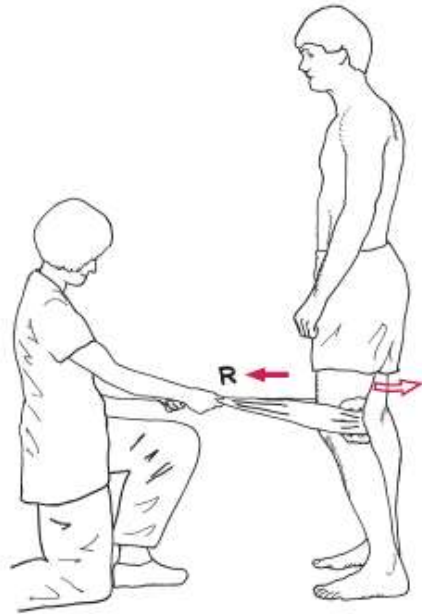


FIGURE 21.26 Unilateral closed-chain terminal knee extension.

61

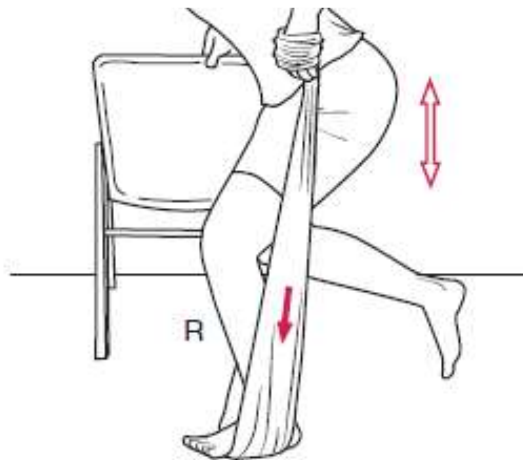


FIGURE 21.27 Resisted minisquats using elastic resistance; closed-chain short-arc training in (A) bilateral stance and (B) unilateral stance.

62

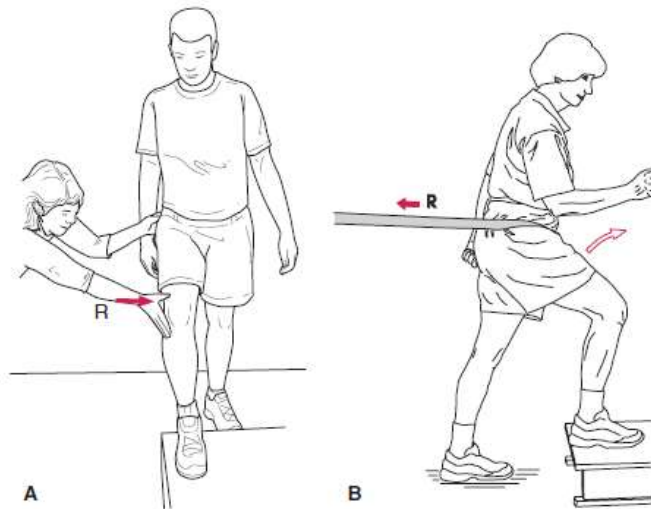


FIGURE 21.28 (A) A forward step-up with manual pressure applied to the lateral thigh to reinforce proper lower extremity alignment and stimulate the gluteus medius. **(B)** Resisted step-ups against elastic resistance or a pulley to strengthen knee extensors.