



Rehabilitation guidelines for arthroscopic knee surgery specific to ACL reconstruction



Aastha Knee Hip and Shoulder Clinic

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Dr. Krunal Shah management protocol after knee surgery especially ACL reconstruction (Prehabilitation followed by 5 staged recovery schedule)

Stage	Aims	Goals	Treatment Guidelines
Prehabilitation	Prepare patient for surgery	Full range of motion Pain-free mobile joint Teach simple postoperative exercises	Operating on pain-free mobile joints minimizes complications. May take many months Do not be pressured by patient into early surgery. Preprogramming postoperative rehabilitation is beneficial.
I: Acute recovery (day 1 to 10 -14)	Postoperative pain relief and management of soft tissue trauma Wean off crutches and progress to normal gait.	Wound healing Manage graft donorsite morbidity. ↓ swelling Restore full extension (including hyperextension). Establish muscle control.	↓ swelling and pain with ice, elevation, and co contractions Aim for full range of motion using active and passive techniques. Patella mobilizations Gait retraining with full extension at heel strike Return of coordinated muscle function encouraged with biofeedback Begin quadriceps strengthening as static co contraction with hamstrings, emphasizing VMO control at various angles of knee flexion. Gentle hamstring stretching to minimize adhesions Active hamstring strengthening begins with static weight-bearing co contractions and progresses to active free hamstring contractions by day 14. Resisted hamstring strengthening should be avoided for at least 6wk.



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<p>II: Hamstring and quadriceps control (2-6 wk)</p>	<p>Return patient to normal function. Prepare patient for stage III.</p>	<p>Develop good muscle control and early Proprioceptive skills. If not done sooner, restore normal gait. Reduce any persistent or recurrent effusion.</p>	<p>Progress co contractions for muscle control by ↑ repetitions, length of contraction, and more dynamic positions, Gradually introduce gym equipment (e.g., stepper, leg press, and minitramp). Hamstring strengthening progresses with ↑ complexity and repetitions; open-chain hamstring exercises are commenced</p>
<p>III: Proprioception (6-12 wk)</p>	<p>Improve neuromuscular control and proprioception.</p>	<p>Continue to improve total leg strength. Improve endurance capacity of muscles. Improve confidence.</p>	<p>Progress co contractions to more dynamic movements (e.g., step lunges, half-squats). Proprioceptive work more dynamic (e.g., lateral stepping, slide board) Can begin jogging in straight lines on the flat Progress resistance on gym equipment (e.g., leg press, hamstring curls). Solo sports (e.g., cycling, jogging, swimming) are usually permitted with little or no restrictions. Open-chain exercises commence (if no patellofemoral symptoms) 40 to 90 degrees, progressing to 10 to 90 degrees by 12 wk.</p>
<p>IV: Sport-specific (12 wk-5 mo)</p>	<p>Prepare to return to sport</p>	<p>Incorporate more sport-specific activities. Introduce agility and reaction time into proprioceptive work. Increase total leg strength. Develop patient confidence.</p>	<p>Progress strength work. Proprioceptive work should include hopping and jumping activities and emphasize good landing technique; incorporate lateral movements. Agility work may include shuttle runs, ball skills, sideways running, skipping. Sport-specific activities</p>
<p>V: Return to sport (5-6 mo)</p>	<p>Return to sport safely and with confidence.</p>	<p>Continue progression of plyometrics and sport specific drills. Return to training and participating in skill exercises. Continue to improve power and endurance. Add PEP* program³³ to warm-up to reduce further ACL injury. Complete PEP program for 30 consecutive days</p>	



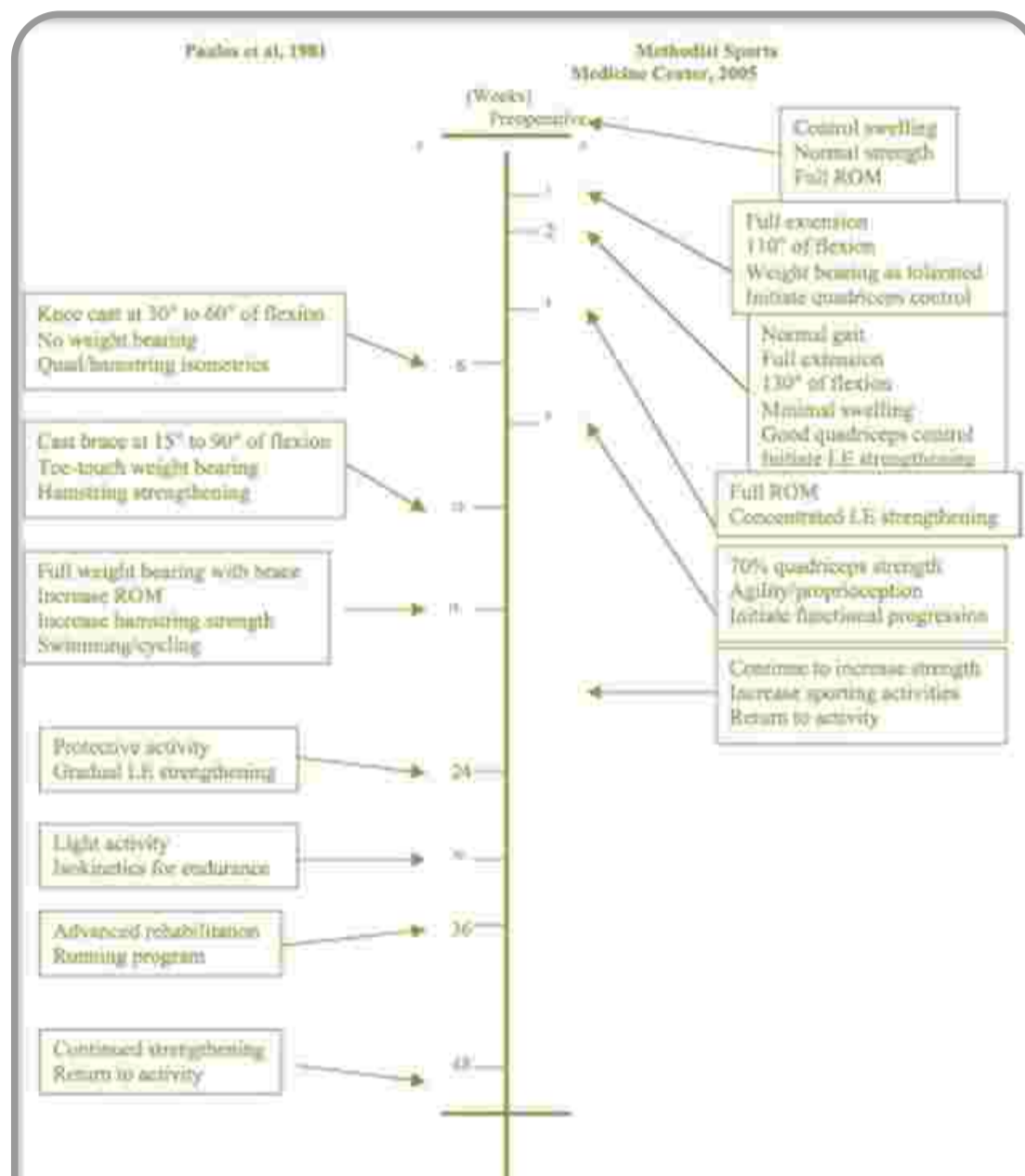
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Return to Sport Criteria

- _ Safe return to sport with good movement patterns
- _ Minimize risk of further injury
- _ Before return to Sport athletes must meet the following criteria which has been shown to reduce injury risk by a factor of 4x (Grindem BJSM 2016 & Kyritsis BJSM 2016):
 - _ >90% on Patient Reported Outcome Score (e.g. IKDC Subjective Score)
 - _ >90% quads strength
 - _ >90% hop symmetry
 - _ Completed on field sports specific rehabilitation
 - _ By this stage should be adept at neuromuscular program.
 - _ Neuromuscular warm up before training and playing
 - _ Advice may be needed as to the need for modifications to be able to return to sport, e.g. Football - start back training in short sprigs, or similar shoes with fewer grips . Will usually return to lower grades initially; skiing - stay on groomed slopes and avoid moguls and off paste initially. Racers may initially lower their DIN setting on the bindings. Play within level of confidence



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Comparison between traditional rehabilitation program of Paulos et al & Methodist Sports Medicine Center Rehabilitation program



1. Early Postoperative Exercises (after knee surgery)

Start the following exercises as soon as you are able. You can begin these in the recovery room shortly after surgery. You may feel uncomfortable at first, but these exercises will speed your recovery and actually diminish your postoperative pain.

Mobilize your patella



Quadriceps Sets

Tighten your thigh muscle. Try to straighten your knee. Hold for 5 to 10 seconds.

Repeat this exercise approximately 10 times during a two minute period, rest one minute and repeat. Continue until your thigh feels fatigued.



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Iliotibial band stretch

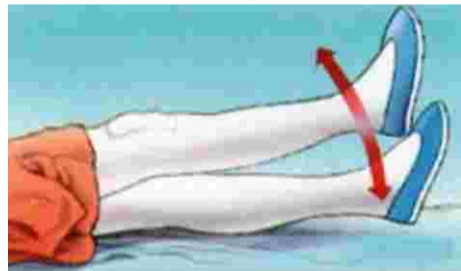


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Hamstrings stretch



Straight Leg Raises

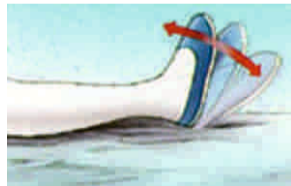


Tighten the thigh muscle with your knee fully straightened on the bed, as with the Quad set. Lift your leg several inches. Hold for five to 10 seconds. Slowly lower.

Repeat until your thigh feels fatigued.

You also can do leg raises while sitting. Fully tighten your thigh muscle and hold your knee fully straightened with your leg unsupported. Repeat as above. Continue these exercises periodically until full strength returns to your thigh.

Ankle Pumps



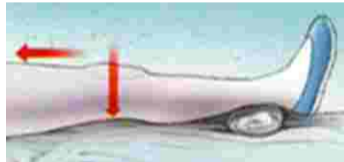


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Move your foot up and down rhythmically by contracting the calf and shin muscles. Perform this exercise periodically for two to three minutes, two or three times an hour in the recovery room.

Continue this exercise until you are fully recovered and all ankle and lower-leg swelling has subsided. Remember soleus muscle is peripheral heart of our body

Knee Straightening Exercises



Place a small rolled towel just above your heel so that it is not touching the bed. Tighten your thigh. Try to fully straighten your knee and to touch the back of your knee to the bed. Hold fully straightened for five to 10 seconds.

Repeat until your thigh feels fatigued.



Bed-Supported Knee Bends/ heel slides





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Bend your knee as much as possible while sliding your foot on the bed. Hold your knee in a maximally bent position for 5 to 10 seconds and then straighten.

Repeat several times until your leg feels fatigued or until you can completely bend your knee.



Sitting Supported Knee Bends



While sitting at bedside or in a chair with your thigh supported, place your foot behind the heel of your operated knee for support. Slowly bend your knee as far as you can. Hold your knee in this position for 5 to 10 seconds.

Repeat several times until your leg feels fatigued or until you can completely bend your knee.

Sitting Unsupported Knee Bends





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While sitting at bedside or in a chair with your thigh supported, bend your knee as far as you can until your foot rests on the floor. With your foot lightly resting on the floor, slide your upper body forward in the chair to increase your knee bend. Hold for 5 to 10 seconds. Straighten your knee fully.

Repeat several times until your leg feels fatigued or until you can completely bend your knee.



2. Early Activity

Soon after your surgery, you will begin to walk short distances in your hospital room and perform everyday activities. This early activity aids your recovery and helps your knee regain its strength and movement.



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Walking



Proper walking is the best way to help your knee recover. At first, you will walk with a walker or crutches. Your surgeon or therapist will tell you how much weight to put on your leg.

Stand comfortably and erect with your weight evenly balanced on your walker or crutches. Advance your walker or crutches a short distance; then reach forward with your operated leg with your knee straightened so the heel of your foot touches the floor first. As you move forward, your knee and ankle will bend and your entire foot will rest evenly on the floor. As you complete the step, your toe will lift off the floor and your knee and hip will bend so that you can reach forward for your next step. Remember, touch your heel first, then flatten your foot, then lift your toes off the floor.

Walk as rhythmically and smooth as you can. Don't hurry. Adjust the length of your step and speed as necessary to walk with an even pattern. As your muscle strength and endurance improve, you may spend more time walking. You will gradually put more weight on your leg. You may use a cane in the hand opposite your surgery and eventually walk without an aid.

When you can walk and stand for more than 10 minutes and your knee is strong enough so that you are not carrying any weight on your walker or



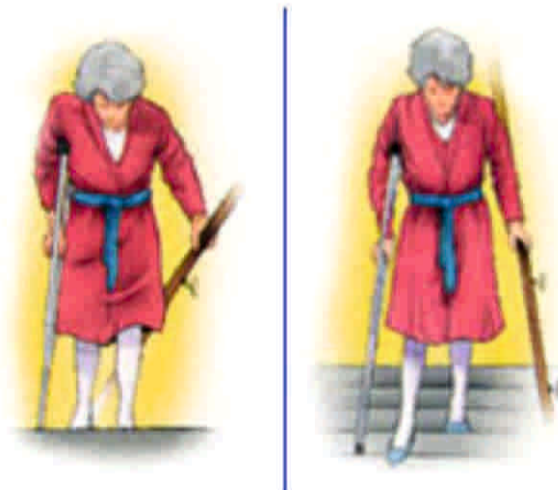
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crutches (often about two to three weeks after your surgery), you can begin using a single crutch or cane. Hold the aid in the hand opposite the side of your surgery. You should not limp or lean away from your operated knee.

Step down for quadriceps strengthening



Stair Climbing and Descending





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Going up

Coming down

The ability to go up and down stairs requires strength and flexibility. At first, you will need a handrail for support and will be able to go only one step at a time. Always lead up the stairs with your good knee and down the stairs with your operated knee. Remember, "up with the good" and "down with the bad." You may want to have someone help you until you have regained most of your strength and mobility.

Stair climbing is an excellent strengthening and endurance activity. Do not try to climb steps higher than the standard height (7 inches) and always use a handrail for balance. As you become stronger and more mobile, you can begin to climb stairs foot over foot.

Getting into bed





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Getting off the bed



Getting into tub shower with chair





3. Advanced Exercises and Activities

Once you have regained independence for short distances and a few steps, you may increase your activity. The pain of your knee problems before surgery and the pain and swelling after surgery have weakened your knee. A full recovery will take many months. The following exercises and activities will help you recover fully.

Standing Knee Bends



Standing erect with the aid of a walker or crutches, lift your thigh and bend your knee as much as you can. Hold for 5 to 10 seconds. Then straighten your knee, touching the floor with your heel first. Repeat several times until fatigued.

Assisted Knee Bends



Lying on your back, place a folded towel over your operated knee and drop the towel to your foot. Bend your knee and apply gentle pressure through the towel to increase the bend.

Hold for 5 to 10 seconds; repeat several times until fatigued.



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Knee Exercises with Resistance

You can place light weights around your ankle and repeat any of the above exercises. These resistance exercises usually can begin four to six weeks after your surgery. Use one- to two-pound weights at first; gradually increase the weight as your strength returns. (Inexpensive wrap-around ankle weights with Velcro straps can be purchased at most sporting goods stores.)

Exercycling



Exercycling is an excellent activity to help you regain muscle strength and knee mobility. At first, adjust the seat height so that the bottom of your foot just touches the pedal with your knee almost straight. Peddle backward at first. Ride forward only after a comfortable cycling motion is possible backwards.

As you become stronger (at about four to six weeks) slowly increase the tension on the exercycle. Exercycle for 10 to 15 minutes twice a day, gradually build up to 20 to 30 minutes, three or four times a week.

Pain or Swelling after Exercise You may experience knee pain or swelling after exercise or activity. You can relieve this by elevating your leg and



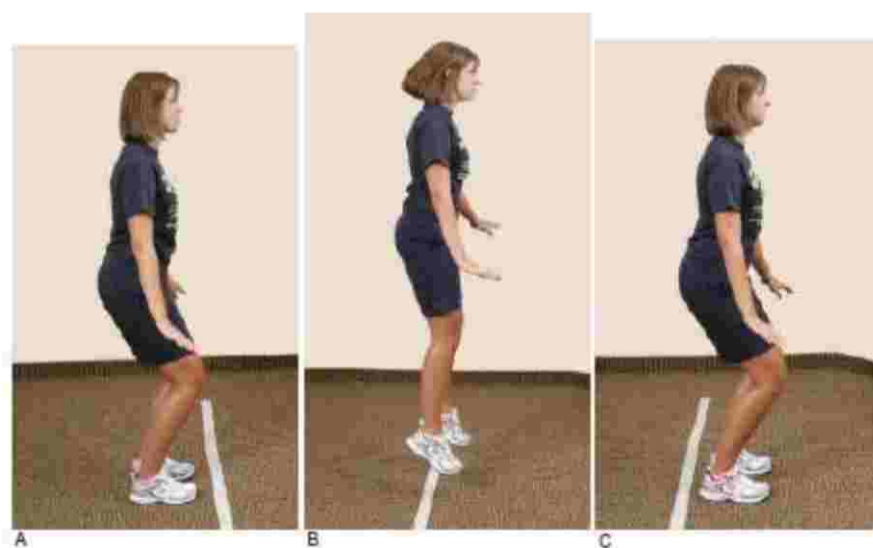
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applying ice wrapped in a towel. Exercise and activity should consistently improve your strength and mobility.

4. Perturbation training-Time to improve reflexes

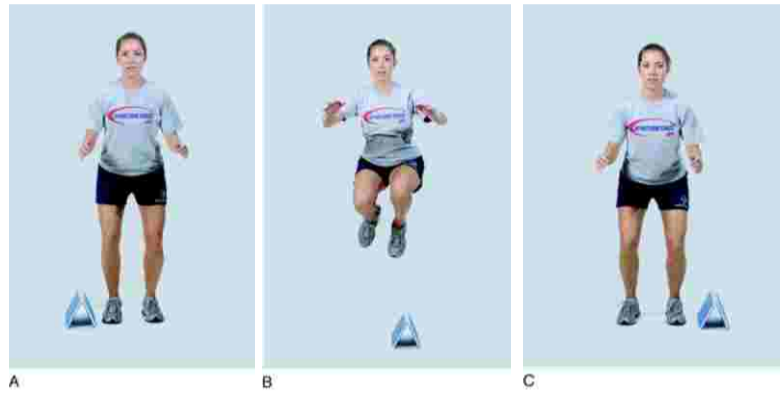


5. Plyometrics-improve your rise & fall





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6. Improve your strength



7. Outing time





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5. Aquatic therapy

For patients with arthritis or complex problems at the knee, many of the traditional cardiopulmonary-training activities are too painful. Most of these activities involve some weight-bearing through the knee. Walking, running, elliptical trainers, stair-steppers, and ski machines all require weight-bearing through the knee. Bicycling places lower weight-bearing loads across the knee than other cardiopulmonary-training activities, but still places large demands on this joint. The water is an excellent alternative to cardiopulmonary training on land.

Buoyancy helps.



Quadriceps strengthening

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