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ACL Reconstruction Rehabilitation Guidelines

This handout is a guideline for your rehabilitation after anterior cruciate ligament reconstruction. You may vary in your ability to do the exercises and progress from one phase to the next during the corresponding timeline, but you will ultimately progress and achieve your goals. Please call Dr. Spencer's office if you are having a problem with your knee or if you or your physical therapist or athletic trainer has questions.

PHASE 1: ~0-2 weeks after surgery

GOALS

1. Protect the reconstruction and avoid falling
2. WBAT with crutches in your brace
3. Ensure wound healing
4. Attain and maintain full knee extension (Symmetric)
5. Gain knee flexion (knee bending) to 90 degrees
6. Decrease knee and leg swelling
7. Promote quadriceps muscle strength
8. Avoid blood pooling in the leg veins

Do not place a pillow under the knee. This will lead to stiffness.

BRACE

- Sleep with brace locked in extension for 1 week
- Brace stays locked in extension for ambulating until you can do a straight leg raise without the knee bending (***No Extensor Lag***)
- You may then unlock your brace to allow flexion up to 90 degrees when ambulating
- You may discontinue the brace once you are able to walk normally, without a limp
- If you had a ***meniscus repair*** or ***cartilage resurfacing***, you will leave the brace locked in extension while ambulating for 6 weeks, DO NOT bend your knee past 90° during ROM exercises
- During Phase 1, wear the brace for all activities, besides showering and performing your exercises

WEIGHT-BEARING / CRUTCHES

- **Weight-bear as tolerated** with crutches and brace
 - Use crutches to assist when walking
 - Occasionally (every one or two hours) practice standing on your operated leg, with your knee fully straight, for 10 to 20 seconds.
 - Concentrate walking normally, in a heel-strike to toe-off pattern, without a limp
 - You may gradually wean from 2 crutches to 1 crutch, held on the side opposite the injured knee
 - Progress to no crutches when you can walk without a limp and there is no pain and you can perform a SLR without extensor lag
 - Do not pivot on your operative leg when turning
- If you had a **meniscus repair** or **cartilage resurfacing**, you will leave the brace locked in extension while ambulating for 6 weeks, *DO NOT bend your knee past 90° during ROM exercises*

CRYOTHERAPY

If you are experiencing pain, swelling, or discomfort, we suggest ice therapy for 20 minutes with at least a 20-minute break in between. Use your cryocuff or place ice in a zip lock bag and/or in a towel and apply to the injured area. Never place ice directly on the skin.

WOUND CARE

Remove your bandage on the third morning (72 hours) after surgery but leave the small pieces of white tape (steristrips) across the incision. You can wrap an elastic bandage (ace) around the knee after showering to help control swelling. **Do not** soak the incision in a bathtub or Jacuzzi until the incisions are completely healed. Please see your post-op instructions.

SHOWERING

You may shower 3 days (72 hours) after your surgery. Sit down on a stool in the shower, remove your brace, remove the ACE wrap and gauze dressings, but leave the steri-strips in place (white tape over incisions). Use *Glad Press'n Seal* to wrap the knee several times to make a water-resistant barrier by pressing firmly above and below your bandages completely around your thigh and calf. Proceed to shower. Do not submerge the knee under water. Once finished showering, pat the knee dry, do not rub. Remove the *Glad Press'n Seal*. Reapply new gauze pads and a new ACE wrap, then put your brace back on. *Do not hop on one leg.*

ASPIRIN

Take a 325mg Aspirin once a day for three weeks. Please also do at least 10 ankle pump exercises each hour to help prevent blood clots in the veins for the first week.

CPM (CONTINUOUS PASSIVE MOTION) MACHINE

If you were given a CPM machine, use it as directed. Discontinue CPM after 2 weeks.

E-STIM

If using an electrical stimulator, please use high-intensity levels.

FREE/MACHINE WEIGHTS (Upper Body/Trunk Only)

During Phase 1, we suggest that you do not use any lower extremity free or machine weights. If you are doing free or machine weights for the upper body and trunk, we suggest a very light resistance of 3 sets of 15-20 repetitions. Do not place yourself in a compromising position with your recently operated knee.

****NO OPEN CHAIN EXERCISES FOR 8 WEEKS***

HOME EXERCISE PROGRAM

*Perform exercises without your brace.

Days per Week: 7

Times per Day: 3-4

Quadriceps squeeze	1-2 sets of 15-20 reps
Heel prop	5 minutes
Heel slides with towel assist	1 set of 5 to 15 minutes
Sitting heel slides	1 to 2 sets of 15 to 20 reps
Straight leg raises (Without extensor lag)	1-2 sets of 15-20 reps
Patellar mobilization (very important!!)	1 set for 1 to 3 minutes
Hip abduction	3 sets of 10 reps
Ankle pumps	1 set of 2 to 3 minutes
Prone hang	5 minutes

START PHYSICAL THERAPY

- You can start formal physical therapy about 3 to 5 days after the operation
- We ask that your PT follow our written protocol
- If your PT has questions, please ask them to call us to discuss them

***CRITERIA FOR ADVANCEMENT TO PHASE 2:**

- Full extension/hyperextension
- Good quad set, SLR without extension lag
- 90° of flexion
- Minimal swelling/inflammation
- Normal gait on level surfaces

PHASE 2: ~2 – 6 weeks after surgery

Goals

1. Protect the reconstruction and avoid falling
2. WBAT and wean crutches and brace
3. Ensure wound healing
4. Maintain full knee extension (Symmetric)
5. Advance quadriceps muscle strengthening
6. Attain knee flexion of 120° or more (except for meniscal repairs- limit to 90°)
7. Decrease knee and leg swelling
8. Normal gait without crutches

BRACE / WEIGHT-BEARING / CRUTCHES

- **Weight-bear as tolerated** and wean the crutches and brace
 - Use your brace until you can perform a straight leg raise without your knee bending
 - Continue to use your brace in situations where you may be at risk of falling (Crowds, children, animals, walking on uneven surface, sidelines, etc...) for up to 12 weeks
 - Concentrate walking normally, in a heel-strike to toe-off pattern, without a limp
 - Progress to no crutches when you can walk without a limp and there is no pain
 - Do not pivot on your operative leg when turning
- *If you had a **meniscus repair** or **cartilage resurfacing**, you will leave the brace locked in extension while ambulating for 6 weeks, **DO NOT bend your knee past 90° during ROM exercises***

CRYOTHERAPY

Use the cryocuff or ice bags to decrease swelling for 20 minutes three times a day after each exercise session.

SWELLING

Continue wrapping the knee with an elastic bandage (ACE) to control swelling.

EXERCISE PROGRAM

Stationary Bicycle

Days per week: 5-7

Times per day: 1-2

Utilize a stationary bicycle to move the knee joint and increase knee flexion. If you cannot pedal all the way around, then keep the foot of your operated leg on the pedal, and pedal back and forth until your knee will bend far enough to allow a full cycle. Most people are able to achieve a full cycle revolution backwards first, followed by forward. You may ride the cycle with no resistance for up to 10-15 minutes, 1 to 2 times a day. Set the seat height so that when you are sitting on the bicycle seat, your knee is fully extended with the heel resting on the pedal in the fully bottom position. You should then actually ride the bicycle with your forefoot resting on the pedal.

Water Workout (optional)

Days per week: 3

Times per day: 1

Once the incisions are well healed, you may do Aqua-jogger exercise or Flutter kick swimming 20-30 minutes

RANGE OF MOTION AND STRENGTHENING EXERCISES (brace off)

Days per Week: 5-7

Times per Day: 2-3

Quadriceps setting	1-2 sets of 15-20 reps
Heel prop	5 minutes
Prone hang	5 minutes
Heel slides with towel assist	1 set of 5 to 15 minutes
Straight leg raises	1-2 sets of 15-20 reps
Standing hamstring curl	3 sets of 10 reps
Standing toe-raises	3 sets of 10 reps
Hip abduction	3 sets of 10 reps
1/3 knee bends	3 sets of 15 reps
Wall slides	3 sets of 15 reps

OPTIONAL ADDITIONAL EXERCISES

If you did NOT have a meniscus repair, you can start the Leg Press and Hamstring Curl machine during this phase under supervision of a physical therapist if you have achieved the following goals:

1. Full passive knee extension
2. Full extension while quadriceps setting
3. Flexion of 125 degrees
4. Minimal swelling

***CRITERIA FOR ADVANCEMENT TO PHASE 3:**

1. No patellofemoral pain
2. Minimum of 120 degrees of flexion
3. Sufficient strength and proprioception to initiate running
4. Minimal swelling/inflammation

PHASE 3: ~6-12 weeks after surgery

GOALS

1. Protect the reconstruction; avoid falling
2. Maintain full knee extension
3. Attain full knee flexion
4. Walk with a normal heel-toe gait with no limp
5. Muscle strength and conditioning improvements
6. No Open Chain exercises for 8 weeks

BRACE

You may discontinue the brace once you can perform a SLR without extensor lag. You should continue to use your brace in situations where you may be at risk of falling (Crowds, children, animals, walking on uneven surface, sidelines, etc...) for up to 12 weeks.

CRYOCUFF

Continue to use the cryocuff for 20 minutes after each workout.

EXERCISE PROGRAM

Range of Motion and Strengthening Exercises

Days per week: 3	Times per day: 1
Quadriceps setting	1-2 sets of 15-20 reps
Heel prop	5 minutes
Prone hang	5 minutes
Heel slides with towel assist	1 set of 5 to 15 minutes
Straight leg raises	3 sets of 10 reps
Standing hamstring curl	3 sets of 10 reps
Standing toe-raises- single leg	3 sets of 10 reps
Hip abduction	3 sets of 10 reps
Squat to chair	3 sets 15 reps
Wall slides	3 sets of 15 reps

Stretching Exercises

Days per week: 5-7	Times per day: 1-2
Hamstring stretch	3-5 reps holding 15 to 30 seconds
Quadriceps stretch	3-5 reps holding 15 to 30 seconds
Calf Stretch	3-5 reps holding 15 to 30 seconds

Optional Additional Weight Training

Days per week: 2-3	Times per day: 13 sets of 20 repetitions
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The following exercises may be added to your exercise program about 6-8 weeks after surgery: Seated Leg Press, HIP Abductor/Adductor Machine, Roman Chair, Calf Raise Machine, Hip Flexor Machine

Cardiovascular Conditioning

Days per week: 1-2 Times per day: 1 Duration: 20-30 minutes

The following can be performed for conditioning: stationary bicycle, walking, rowing, elliptical trainer, and water workout

Single-Leg Strengthening Progression

At this time, it is important to begin the development of single-leg strength. Begin to follow the "Progression for Single Leg Strengthening" included in this packet.

*If you do not have access to gym equipment, the following exercises from Phase 2 can be substituted using ankle weights (Start with one pound and add one pound a week until 5 pounds): Straight leg raise, Side lying abduction, and Standing hamstring curl.

***Precautions When Exercising**

- Avoid pain at the patellar tendon site
- Avoid pain and/or crepitus at the patella
- Build up resistance and repetitions gradually
- Perform exercises slowly avoiding quick direction change and impact loading
- Exercise frequency should be 2 to 3 times a week for strength building
- Be consistent and regular with the exercise schedule

***Principles of Strength Training**

- Warm-up prior to exercising by stationary cycling or other means
- You are "warmed -up" when you have started sweating
- Gently stretch all muscle groups next
- Do exercises involving multiple muscle groups first and individual muscle groups last
- Do aerobic workouts *after* strength workouts
- Cool-down by stretching after finishing exercise

***DO NOT** do any of the following exercises:

- Knee extension weight lifting machine
- Running
- Jumping
- Pivoting or cutting
- Lunges
- Stairmaster
- Step exercises with impact

If you have any questions regarding the exercise program, please call the office.

***Criteria to advance to Phase 4 include:**

1. No patellofemoral pain
2. Minimum of 120 degrees of flexion
3. Sufficient strength and proprioception to initiate running.
4. Minimal swelling/inflammation

PHASE 4: ~3-4 months after surgery

GENERAL GOALS

1. Regain full muscle strength.
2. Work on cardiovascular conditioning.
3. Sports-specific training.

SPECIFIC GOALS

1. Continue flexibility and ROM exercises as appropriate for patient
2. Knee extensions 90°-30°, progress to eccentrics
3. Isokinetics (with anti-shear device) – begin with mid range speeds (120°/sec - 240°/sec)
4. Progress toward full weightbearing running at 12 weeks.
5. Begin swimming if desired
6. Recommend isokinetic test with anti-shear device at 12 weeks to guide strengthening.
7. Progressive hip, quadriceps, hamstring, calf strengthening
8. Cardiovascular/endurance training via Stairmaster, elliptical, bike
9. Advance proprioceptive activities

EXERCISE PROGRAM

Muscle Strengthening Exercises

You should continue muscle-strengthening exercises from Phase 2 and 3 on a three times a week basis. At this time, you can decrease the number of repetitions per set from 15 to 10. This will allow you to work with more resistance. Remember to do all exercises slowly, with good form. You may begin to hold dumbbells when doing the chair squat, single-leg 1/3 knee bends and single-leg wall slides. Weights can be increased when you can do a particular weight easily, for 3 sets of 10 repetitions, for 3 consecutive workouts. At all times, be cautious of pain or crunching at the kneecap or patellar tendon while exercising. You may use resistance machines at your gym, but do not use the knee extension machine and do not do lunging or high impact drills.

Cardiovascular Conditioning

You can use the elliptical trainer, stationary bicycle, rowing machine or swimming workouts to build cardiovascular fitness. Three to five times per week for 20 to 30 minutes is sufficient for improvement in this area. Please note that excessive long duration cardiovascular exercise can retard or delay muscular strength development when strength improvement and gains in muscle size are the programs' primary goal.

At this time, light running on a soft level surface with a sports brace can begin if your surgeon advises. You need to have full range of motion, good strength and no swelling to run safely. If you run, 3 times per week for 10 minutes is advisable for the first 2 weeks. If there is no pain or swelling, you can increase your running time by 1 minute per session for a maximum of 30 minutes. Walking and hiking on gentle trails can also be used for conditioning activity.

Jump and Plyometric training

With the approval of the doctor and physical therapist, you can begin the Jump and Plyometric Training Progression that is included in this packet.

Progressive Resistance Exercise (PRE) Principle

1. To build muscle strength and size, the amount of resistance used must be gradually increased.
2. The exercises should be specific to the target muscles
3. The amount of resistance should be measurable and gradually increased over a longer period of time
4. To avoid excess overload and injury, the weight or resistance must be gradually increased in increments of 5 to 10 %
5. Resistance can be increased gradually every 10 to 14 days when following a regular and consistent program
6. Adequate rest and muscle recovery between workout is necessary to maximize the benefit of the exercise
7. If the PRE principle is followed too strictly, the weights potentially will go higher and higher.
8. At a certain point, the joints and muscles will become overloaded and injury will occur.
9. This eventuality can be avoided by refraining from using excessive weight during strength training.

Basic Knee Strengthening Program

Days per week: 2-3

Times per day: 1

3 sets of 10-15 repetitions

*Emphasis is to build muscle strength using BOTH legs

*Progress according to the PRE principle

Basic Program Exercises

- Leg Press (resistance)
- Hamstring Curl
- Wall Slides (hold dumbbells for resistance)
- Roman Chair (strengthens hamstrings)
- Chair Squat (hold dumbbells for resistance)
- Calf Raises or calf raise machine
- Hip Abductor/Adductor machine
- Hip flexor machine
- Single leg strengthening progression

PRECAUTIONS

The following exercises can cause injury to the knee and are usually not recommended at this time:

- Leg extension machine (quadriceps extensions)
- Stairmaster or stair climber machines
- Lunges
- Squats past 90 degrees of knee flexion
- High Impact and plyometric exercises

***Criteria for advancement to Phase 5:**

1. No significant swelling/inflammation.
2. Full, pain-free ROM
3. No evidence of patellofemoral joint irritation
4. Strength approximately 70% of uninjured lower extremity per isokinetic evaluation
5. Sufficient strength and proprioception to initiate agility activities
6. Normal running gait

PHASE 5: ~4-6 months after surgery

Continue PHASE 4 Conditioning

- Cardiovascular Conditioning
- Muscle Strengthening Exercises
- Speed and Agility Training
- Jump and Plyometric Training

SPORT-SPECIFIC TRAINING

To reach your ultimate goal of returning to sports participation, you must follow an orderly sequence of drills that are designed to re-train the muscle-to-joint coordination that is necessary to provide the proper control of your knee.

EXERCISES

1. Continue and progress flexibility and strengthening program based on individual needs and deficits.
2. Initiate plyometric program as appropriate for patient's athletic goals
3. Agility progression including, but not limited to:
 - a. Side steps
 - b. Crossovers
 - c. Figure 8 running
 - d. Shuttle running
 - e. One leg and two leg jumping
 - f. Cutting
 - g. Acceleration/deceleration/sprints
 - h. Agility ladder drills
4. Continue progression of running distance based on patient needs.
5. Initiate sport-specific drills as appropriate for patient

The following timetable illustrates an ideal progression sequence:

Activity	Time frame after Surgery
Running slowly	3-4 months
Golf	4-5 months
Tennis	5-6 months
Return to sports practice	6-8 months
Full return to sports	9-12 months

***Criteria for advancement to Phase 6:**

1. No patellofemoral or soft tissue complaint
2. Necessary joint ROM, strength, endurance, and proprioception to safely return to sport/athletics
3. Physician clearance to resume partial or full activity

PHASE 6: After 6 months

GOALS

1. Return to practice
2. Return to play

Evaluation Tests

- Stability evaluation, if required
- Triple jump test, stairs hopple test
- Individual progression (sport-specific)
- Figure-of-eight start/stop
- Skill drills endurance, coordination/proprioception training
- Strength test - full ROM
- Jump rope
- Paced sport return depending on sport and individual progress

RETURN TO PLAY CRITERIA

1. Quads strength: no more than 10% difference between sides
2. 4 single leg hop tests: no more than 10% difference between limbs; w/ symmetric movements
3. T-Test agility drill performed in under 11 seconds.
4. Quad:Hamstring ratio of <1.5:1 before RTS
5. Psychologic factors (AFAQ): Confidence- No fear of pain, movement, instability, or re-injury

***NOTE:** Studies of professional athletes who return to sport in under 9 months from their surgery have a significantly higher rate of re-tear than those who return after 9 months. Remember, professional athletes take almost an entire year to recover from an ACL tear. Most patients won't be completely recovered for about 12 months.