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ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION SURGERY

Here are guidelines that will help you to prepare for ACL reconstruction surgery:

PREOPERATIVE INSTRUCTIONS

BEFORE SURGERY:

Dr. Nelson will see you in the office. He will do a preoperative history and physical examination and complete the necessary paperwork. He will write preoperative hospital orders and schedule an appointment with the pre-operative test center if needed. You will have an opportunity to speak with anesthesia and physical therapy. It is recommended that you utilize a stationary cycle to maintain your knee range of motion and improve the overall function of the knee prior to surgery. Continue to perform the ACL-preoperative exercises.

SEVERAL DAYS PRIOR TO SURGERY:

Wash the knee with soap or Hibiclens several times per day to get the skin as clean as you can. This decreases the risk of infection. **Be careful not to get any scratches, cuts, sunburn, poison ivy, etc.** The skin has to be in very good shape to prevent problems. You do not need to shave.

THE DAY BEFORE SURGERY:

Please be in touch with Dr. Nelson's office to confirm the exact time that you should report to the hospital for surgery. **You can have nothing to eat or drink after midnight on the day before surgery.** It is very important to have a completely empty stomach prior to surgery for anesthesia safety reasons. This included no chewing gum or drinking coffee. If you have to take medication, you can do so with a sip of water early in the morning prior to surgery (but later tell the anesthesiologist you have done so).

DAY OF SURGERY:

Please bring any crutches, brace, ice machine or imaging studies that you have received.

SURGERY:

The operation to replace the torn **anterior cruciate ligament** will be done arthroscopically. A small incision will be made on the inner side of the knee to take the graft from the middle of the patellar tendon together with a small piece of bone from the bottom of the kneecap and the upper part of the tibia (mid-third patellar tendon graft, "bone-tendon-bone"). The incision leaves a small area of numbness on the outer side of the upper leg. Most of this numbness clears but it takes a year or two and is not usually bothersome. In certain circumstances, the graft is a hamstring tendon or a donor graft from a cadaver (allograft).

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AFTER SURGERY:

- **The most important aspect is to get the knee out completely straight.**

You will be given a **prescription** for pain medication to take home with you. In addition to this medication, you should take one aspirin per day to help prevent blood clots (phlebitis) for 14 days. The pain medication has a tendency to make you constipated and over the counter medication for constipation should be taken on an as needed basis.

The **dressing** can be removed at two days. The wound is sealed with steri-strips (small pieces of tape on the skin). You **can shower** on the second day following surgery, but be careful standing in the shower so that you **do not fall**. It is better to have a small stool to be able to sit on. However, you can get the leg wet and wash it, but do not scrub the wound or pick off steri-strips as they will fall off on their own. Do not submerge the knee under water in a bath, hot tub or swimming pool.

To help control swelling in the lower leg, you should elevate the extremity, if excessive wear compression stockings after surgery until your first post-operative visit. **If you develop calf pain or excessive swelling in the leg, call Dr. Nelson's office.**

A **cryocuff** is a blue wrap that is put on the knee to keep it cold. You can use this as often as you want to cool down the knee to reduce swelling and pain. Check your skin every time that you remove the wrap to make sure that it is intact. Be sure to stock up on extra ice in your freezer. These can be bought through the office. Ice bags work just as well.



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ACL Reconstruction Rehabilitation Guidelines

PHASE 1: 0-2 weeks after surgery

This handout is to use as a guideline for your **rehabilitation after anterior cruciate reconstruction**. You may vary in your ability to do these exercises and to progress from one phase to the other. Please call Dr. Nelson's office if you are having a problem with your knee or if you need clarification of these instructions.

GOALS

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

Do not place a pillow under the knee for comfort. This can lead to knee stiffness.

BRACE/CRUTCHES

Your knee brace is set to allow your knee to bend and straighten from 0 to 90 degrees. Use it when walking. In some cases, you may be sent home with the brace locked at 0 degrees (fully straight). After you arrive home, and the anesthetic nerve block has worn off, unlock the brace to allow 0 to 90 degrees of motion.

You had an ACL reconstruction with Hamstring Autograft. Weight bearing is 50% for the first two weeks. Weight bear as tolerated with crutches beginning 3 weeks post operative. You should use the crutches in the beginning, but can discontinue the crutches when you have confidence in the knee to support you. In some cases, crutches and restricted weight bearing may be necessary for longer periods, such as, if a meniscal repair was performed. Then you must remain partial weight bearing for 4 weeks. Dr. Nelson or the physical therapist will give special instructions in these cases. Wean the crutches and advance to full motion at 4-6 weeks in these cases.

Criteria to discontinue crutches is when you attain a normal gait pattern.

CRYOCUFF (COLD APPLICATION)

If you are experiencing pain, swelling, or discomfort, we suggest icing for 15-20 minutes with at least a 60-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.

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WOUND CARE

Remove your bandage on the second morning after surgery but leave the small pieces of white tape (steri strips) across the incision. You can wrap an elastic bandage (ace) around the knee at other times to control swelling. You may now shower and get your incision wet, but **do not** soak the incision in a bathtub or Jacuzzi until the stitches have been removed.

FREE/MACHINE WEIGHTS (Upper Body/Trunk Only)

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.

EXERCISE PROGRAM

Days per week: 7 Times per day: 3-4

Quadriceps sets	1-2 sets of 15-20 reps
Hamstring sets	1-2 sets of 15-20 reps
Heel prop	5 minutes
Heel slides with towel assist	1 set of 5-15 minutes
Sitting heel slides	1-2 sets of 15-20 reps
Straight leg raises (emphasize no lag) (may e-stim)	1-2 sets of 15-20 reps
Patellar Mobilization (IMPORTANT)	1 set for 1-3 minutes
Hip abduction	3 sets of 10
Ankle pumps	1 set of 2-3 minutes
Prone hang	5 minutes

Cardiopulmonary

UBE or similar exercise is recommended

Criteria for phase 2

no lag SLR

Normal gait

Crutch D/c

ROM: no greater than 5 degree active extension lag, 110 active flexion

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PHASE 2: 2 – 6 weeks after surgery

Goals

1. Protect the reconstruction, avoid falling
2. Ensure wound healing
3. Full ROM
4. Begin quadriceps muscle strengthening
6. Decrease knee and leg swelling

CRYOCUFF

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

BRACE/CRUTCHES

In cases where the patellar tendon autograft is used, you can begin placing all of your weight on the operated leg when you walk unless otherwise instructed by Dr. Nelson. Discontinue using your crutches when you are comfortable doing so. Continue using your brace when walking outside of the home. Within one or two weeks, you can usually discontinue use of the crutches if you have good control of the leg and are sure that you will not fall or get injured. Concentrate walking normally, in a heel-strike to toe-off pattern, without a limp. Occasionally (every one or two hours) practice standing on your operated leg, with your knee fully straight, for 10 to 20 seconds.

In cases where a meniscus repair is done along with the ACL reconstruction, the brace should be locked fully straight when walking for the first 6 weeks after surgery.

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.

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Water Workout (optional)

Days per week: 3 Times per day: 1

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: 1-2

ROM:

- low load, long duration (assisted PRN)
- Heel slides/wall slides
- Heel prop/prone hang (minimize co-contraction/nociceptor response)
- Bike (rocking-for-range → Ride with low seat height)
- flexibility stretching all major groups

Strengthening:

- Quads: Quad sets, Mini Squats/Wall Squats, Steps-ups, Knee extension from 90-40, Leg press
- Hamstrings: Hamstring curls closed chain, resistive SLR with sports cord

Other musculature:

- Hip adduction/abduction: SLR or with equipment
- Standing Heel raises: progress from double to single leg support
- Seated calf press against resistance
- Multi-hip machine in all directions with proximal pad placement

Neuromuscular:

- Wobble board, Rocker board, Single-leg stance with or without equipment

Cardiopulmonary: Bike, Elliptical

If you did not have a meniscus repair, you can start the Leg Press during this phase under supervision of a physical therapist if you have achieved: 1. Full passive knee extension. 2. Full extension while quadriceps setting. 3. Flexion of 125 degrees. 4. Minimal swelling

Criteria for progression to phase 3

- Full ROM
- Minimal effusion
- Functional strength and control in daily activities
- IKDC Question #10 (global rating of function) score 7 or higher

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PHASE 3: 7-12 weeks after surgery

GOALS

1. Protect the reconstruction; avoid falling
2. Maintain full ROM
3. Walk with a normal heel-toe gait with no limp
5. Muscle strength and conditioning improvements

BRACE

The brace is discontinued after you see your surgeon at your 6-week post-operative office visit. Concentrate on walking with a heel-toe gait without a limp. In some cases, use of the brace will continue if the knee requires a longer period of protection.

CRYOCUFF/ICE Continue to use the cryocuff for 20 minutes after each workout

EXERCISE PROGRAM

Strengthening:

—Squats, Leg press, Hamstring curl, Knee extension 90 to 0, Step-ups/down, Shuttle, Sports cord, Wall squats

Neuromuscular training: wobble board/ rocker board / roller board, Perturbation training, instrumented testing systems, varied surfaces

Cardiopulmonary: continue Bike and Elliptical

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

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PHASE 4: 12-16 weeks after surgery

GOALS

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

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

- To build muscle strength and size, the amount of resistance used must be gradually increased.
- The exercises should be specific to the target muscles
- The amount of resistance should be measurable and gradually increased over a longer period of time

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- To avoid excess overload and injury, the weight or resistance must be gradually increased in increments of 5 to 10 %
- Resistance can be increased gradually every 10 to 14 days when following a regular and consistent program
- Adequate rest and muscle recovery between workout is necessary to maximize the benefit of the exercise
- If the PRE principle is followed too strictly, the weights potentially will go higher and higher.
- At a certain point, the joints and muscles will become overloaded and injury will occur.
- 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
- 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

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PHASE 5: 16-24 weeks after surgery

Cardiovascular Conditioning

Continue with the program outlined in phase 4

Muscle Strengthening Exercises

Continue with the program outlined in phase 4

Speed and Agility Training

Refer to Speed and Agility Progression

Sports-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. The following time-table illustrates an ideal progression sequence:

Activity	Weeks post-surgery
Running slowly	12-16
Golf	16-20
Roller blading	18
Tennis	20-24
Return to sport practice	24-32
Full return to sport	32-36

Return to sport eval recommendations:

- Hop tests (single leg, triple hop, crossover hop, 6 meter timed hop)
- Isokinetic strength test (60degree/second)
- Vertical jump
- Deceleration shuttle test

Returning to Sports

You should discuss the exact timing of return to sports activities and brace use with Dr. Nelson.

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Speed and Agility Progression

GOALS

1. Safely recondition the knee for the demands of sports activity
2. Provide a logical sequence of progressive drills for pre-sports conditioning
3. Provide objective criteria for safe return to sports

Phases of Training

Straight ahead running phase

Direction change running phase

Unrestricted direction change and impact phase

Prerequisites

Full Range of Motion

Strength at least 80 % of uninjured limb

Thigh girth within 1/2 inch of unaffected limb

No tenderness at the graft harvest site

Symmetrical quadriceps and hamstring flexibility

Perform and pass functional tests

Obtain clearance from your doctor or physical therapist

Functional Tests

Before starting the running sequence you must be able to:

1. Hop forward on both legs at least 2 feet
2. Hop to either side at least 1 foot
3. Hop up and down on both feet 10 times
4. Jog with no limp for 100 yards

Warm-up, Stretch and Ice

Be sure that you warm-up and stretch before and after workouts. Generally, you should do some walking, cycling or elliptical so that you break a sweat before starting the running program. You can then stretch before beginning the running drills. Ice your knee for 20 minutes following workouts and stretch all muscle groups as you are cooling down.

Recommended Frequency 2-3 times per week

Criteria to Progress

Do not progress to the next step in the phase until the present step is pain free, and you can perform with proper technique and without difficulty (muscle soreness or fatigue). Add only one new step in the progression per workout.

Dr. Nelson's ACL (Hamstring Autograft) Rehabilitation Protocol

Diagnosis:																				
Procedure date:	S/P:																			
		WEEK										MONTH								
		1	2	3	4	5	6	7	8	9	10	3	4	5	6					
PHASE 1 EXERCISES																				
Extension/Flexion sitting prone	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•				
Quad sets with straight Leg Raises	•	•	•	•	•	•	•	•	•	•	•									
Hamstring sets	•	•	•	•	•	•	•	•	•	•	•									
Patella Mobs/Quad patellar Tendon	•	•	•	•	•	•	•	•	•	•	•									
Wall slides					•	•	•	•	•	•	•									
Toe and Heel Raises			•	•	•	•	•	•	•	•	•	•	•	•	•					
MUSCLE STRETCHES																				
Sit and Reach for Hamstrings			•	•	•	•	•	•	•	•	•	•	•	•	•					
Lying Rectus			•	•	•	•	•	•	•	•	•	•	•	•	•					
Stork Stand for Quadriceps						•	•	•	•	•	•	•	•	•	•					
Runners stretch for calf and achilles			•	•	•	•	•	•	•	•	•	•	•	•	•					
CARDIOVASCULAR EXERCISES																				
Bike with Both Legs			•	•	•	•	•	•	•	•	•	•	•	•	•					
Aquajogging						•	•	•	•	•	•	•	•	•	•					
Swimming										•	•	•	•	•	•					
Eliptical trainer								•	•	•	•	•	•	•	•					
Rowing						•	•	•	•	•	•	•	•	•	•					
Stair Stepper								•	•	•	•	•	•	•	•					
Treadmill						•	•	•	•	•	•	•	•	•	•					
PHASE 2 SPORT CORD EXERCISES																				
Double Knee Bends (Knee not over foot)								•	•	•	•	•	•	•	•					
Carpet Drags								•	•	•	•	•	•	•	•					
Forward Backward Jogging											•	•	•	•	•					
Side to side agilities											•	•	•	•	•					
PHASE 3 WEIGHTS																				
Leg press down to 90 degrees				•	•	•	•	•	•	•	•	•	•	•	•					
Leg Curls				•	•	•	•	•	•	•	•	•	•	•	•					
Ab/Adduction				•	•	•	•	•	•	•	•	•	•	•	•					
Balance squats								•	•	•	•	•	•	•	•					
Knee Extension Pain free Arc				•	•	•	•	•	•	•	•	•	•	•	•					
NO LUNGES																				
PHASE 4 HIGH LEVEL EXERCISES																				
Biking Outdoors											•	•	•	•	•					
Rollerblading												•	•	•	•					
Running												•	•	•	•					
Skiing,basketball,Tennis,football,soccer																•				
Golf												•	•	•	•					
Agility Exercises																•				
Trail Riding												•	•	•	•					

***Weight bearing:** PWB (50% body weight) with crutches weeks 0-2 post-op -> WBAT weeks 2-6 post op
***Brace:** Hinged knee brace (set for 0-90 degrees) weeks 0-6 post-op (locked in extension for ambulation, 0-2wks)

Additional Instructions:

Dr. Nelson's ACL Rehabilitation Protocol with Meniscus Repair

	WEEK										MONTH				
	1	2	3	4	5	6	7	8	9	10	3	4	5	6	
PHASE 1 EXERCISES															
Extension/Flexion sitting prone	•	•	•	•	•	•	•	•	•	•		•	•	•	•
Quad sets with straight Leg Raises	•	•	•	•	•	•	•	•	•	•					
Hamstring sets	•	•	•	•	•	•	•	•	•	•					
Patella Mobs/Quad patellar Tendon	•	•	•	•	•	•	•	•	•	•					
Wall slides							•	•	•	•					
Toe and Heel Raises			•	•	•	•	•	•	•	•		•	•	•	•
MUSCLE STRETCHES															
Sit and Reach for Hamstrings			•	•	•	•	•	•	•	•		•	•	•	•
Lying Rectus			•	•	•	•	•	•	•	•		•	•	•	•
Stork Stand for Quadriceps						•	•	•	•	•		•	•	•	•
Runners stretch for calf and achilles			•	•	•	•	•	•	•	•		•	•	•	•
CARDIOVASCULAR EXERCISES															
Bike with Both Legs (High seat)				•	•	•	•	•	•	•		•	•	•	•
Aquajogging						•	•	•	•	•		•	•	•	•
Swimming										•		•	•	•	•
Elliptical trainer												•	•	•	•
Rowing												•	•	•	•
Stair Stepper												•	•	•	•
Treadmill												•	•	•	•
PHASE 2 SPORT CORD EXERCISES															
Double Knee Bends (Knee not over foot)												•	•	•	•
Carpet Drags												•	•	•	•
Forward Backward Jogging												•	•	•	•
Side to side agilities												•	•	•	•
PHASE 3 WEIGHTS (start light)															
Leg press down to 90 degrees								•	•	•	•	•	•	•	•
Leg Curls								•	•	•	•	•	•	•	•
Ab/Adduction								•	•	•	•	•	•	•	•
Balance squats											•	•	•	•	•
Knee Extension Pain free Arc								•	•	•	•	•	•	•	•
NO LUNGES															
PHASE 4 HIGH LEVEL EXERCISES															
Biking Outdoors												•	•	•	•
Rollerblading												•	•	•	•
Running												•	•	•	•
Skiing,basketball,Tennis,football,soccer															•
Golf												•	•	•	•
Agility Exercises															•
Trail Riding												•	•	•	•

***Weight bearing:** TDWB with brace locked in extension, wks 0-6

***Brace:** When NWB, brace unlocked 0-30 degrees wks 0-2; 0-60 degrees wks 2-4; 0-90 wks 4-6, 0-100 wks 6-12

Additional Instructions:

Ryan Nelson D.O.

Date