



Sports & Orthopaedic Specialists

ACL Deficient Knee Protocol

This protocol provides appropriate guidelines for the rehabilitation of patients with an ACL deficient knee. The protocol draws evidence from the current literature and accounts for preferences of the providers at Sports & Orthopaedic Specialists. The program may be modified by the referring provider for an individual patient. If questions arise regarding the utilization of the protocol or the progress of the patient, contact Sports & Orthopaedic Specialists:

Main line: (952) 946-9777

Physical therapy: (952) 914-8631

Overall Objectives and Methods

1. Hamstring control of pivot shift instability
(Motor skill learning; progressive strength, endurance, and proprioceptive training emphasizing hamstring and quadriceps coaction; progressive sport-specific functional drills.)
2. Protection of the knee from further injury
(Bracing and/or activity restriction until level of control equal to demands of intended activity; sport-specific safety measures.)

Level 0 (Immediate post-injury)

Control of pivot shift instability: None.

Objectives:

- Emphasis on recovery from the acute effects of injury
- Limited range of motion, strength, and endurance training introducing the concept of quadriceps and hamstring coaction.

Physical therapy:

- Measures to limit/ reduce swelling.
- Isometric quads/ hams (coaction) sets.
- When swelling stabilized:
 - o AROM as tolerated or prescribed
- When 5"-100" pain free (and permitted) knee motion:
 - o Low resistance, high r.p.m. exercising as tolerated

Protection required:

- Knee immobilizer until swelling stabilized
- Motion-limiting hinged brace after swelling stabilized

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Activities permitted:

- Necessary ambulatory activities of daily living with immobilizer/brace as tolerated.
- Exercycling, pool exercises, swimming only permitted unbraced activities

Criteria for advancement: pain and swelling subsiding.

Level I

Control of pivot shift instability: None to voluntary.

Objectives and methods:

- Emphasis on basic bench work/ biofeedback training for recognition and voluntary control of pivot shift instability.
- Continued range of motion, strength, and endurance training emphasizing quadriceps and hamstring coaction.

Physical therapy (Level 0 plus):

- Basic bench work pivot shift recognition/ control drills
- Theraband hamstring curls as tolerated
- Theraband, Sportcord, and weight machine leg press and half squats as tolerated.
- Exercycle interval training as tolerated.

Protection required: motion limiting hinged brace.

Activities permitted: same as Level 0.

Criteria for advancement:

- Swelling resolved
- Consistent voluntary control of pivot shift instability

Level IIA

Control of pivot shift instability: Voluntary

Objectives and methods:

- Emphasis on psychomotor skill retraining for control of pivot shift instability with simple, predictable activities
- Continued basic bench work, range of motion, strength, and endurance training

Physical therapy (Level I plus):

- Step-down exercises
- Slow, two-legged “known maneuver” drills (with and without brace)

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- PNF (proprioceptive neuromuscular facilitation) exercises
- Theraband, Sportcord, barbell (controlled, straight-ahead) lunges with and without brace
- Pilates reformer exercises
- Barbell half- to full- (parallel) squats with and without brace
- Weight machine, isokinetic hamstring curls
- Stairmaster, NordicTrak, rowing machine

Protection required: Same as Level I

Activities permitted: Jogging on even surfaces

Criteria for advancement:

- Able to do 3 sets of 100 repetitions full-height step-downs
- Able to do slow, two-legged “known maneuver” drills without brace
- Able to do straight-ahead lunges and squats without brace
- ROM and strength (leg-press, hamstring curls) comparable to uninjured limb

Level IIB

Control of pivot shift instability: Voluntary to “automatic”

Objectives and methods:

- Emphasis on psychomotor skill retraining for control of pivot shift instability with increasingly more difficult and less predictable activities.
- Continued reinforcement/ maintenance bench work, strength, and endurance training.
- Limited sport-specific reconditioning

Physical therapy (level IIA plus):

- Fit for custom brace
- Fast two-legged, slow one-legged, and fast one-legged, “known maneuver” drills with and without brace
- Theraband, Sportcord side lunges and jumps with and without brace
- Acceleration, deceleration, lateral shuffle “unknown maneuver” drills with brace
- Minitrampoline drills with and without brace
- B.A.P.S. with and without brace
- Power cleans
- Running drills (two-step decelerations, cuts, figure eights) with brace
- Running interval training

Protection required:

- None for very predictable ambulatory activities of daily living
- Hinged brace for less predictable ambulatory activities of daily living and non-knee strenuous occupations
- Custom brace for knee strenuous occupational and athletic activities

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Activities permitted:

- “Predictable” knee strenuous activities, e.g. hiking, running, tennis, intermediate level downhill skiing, etc, with brace
- Caution w.r.t. unpredictable activities of daily living without brace

Criteria for advancement:

- Able to do 5 sets of 100 repetitions full-height step-downs
- Able to do one-legged, “known maneuver” drill for time without brace
- Able to do side lunges, jumps, B.A.P.S. without brace
- Mastery of two-step deceleration technique

Level III

Control of pivot shift instability: “Automatic”

Objectives and methods:

- Emphasis on sport-specific reconditioning
- Continued reinforcement. Maintenance bench work, strength, endurance, and motor skill training

Physical therapy (Level II plus)

- Jumping and pivoting drills with and without brace
- Acceleration, deceleration, lateral shuffle, “unknown maneuver” drills on sport-specific surfaces with and without brace
- Running drills (two-step decelerations, cuts, figure-of-eights) without brace
- Sport-specific progressive challenge drills (e.g. jump shot with bump) with brace
- Gradual return to practices and competition

Protection required:

- Custom brace for “unpredictable” knee strenuous occupational and athletic activities (e.g. basketball, volleyball, soccer, hockey, baseball, football, expert level downhill skiing, etc)

Activities permitted:

- “Predictable” athletic activities without brace
- Caution w/r/t/ unpredictable activities of daily living without brace

Criteria for advancement:

- Able to do jumping and pivoting, “unknown maneuver” and running drills confidently without brace
- Able to do sport-specific challenge drills confidently with brace



Level IV

Control of pivot shift instability: “Automatic” to “reflexive”

Objectives and methods:

- Emphasis on preparation for return to high-level, knee-strenuous sport without bracing
- Continued reinforcement/ maintenance strength, endurance, and sport-specific motor skill training

Physical therapy (Level III plus):

- Weight machine, isokinetic leg extensions (with hamstring coaction)
- Progressively challenge drills (e.g. jump shot with bump) without brace

Protection required: same as Level III

Activities permitted: same as Level III

Criteria for advancement:

- Able to do all challenge drills confidently without brace
- No instability episode with unbraced activities

Level V

Control of pivot shift instability: “Reflexive”

Physical therapy: Maintenance

Protection required: Muscular control

Activities permitted: as tolerated

Follow-up:

- Physician examination annually and p.r.n./ instability episode or change of symptoms; radiographic examination at one year post-injury and every five years thereafter



Indications for Reconstructive Surgery:

1. - Skeletally mature athlete, skill position/ sport
 - functional stability very high priority
 - Quadriceps/ patellofemoral function, range of motion lesser priorities
 - Unable to achieve “reflexive” pivot shift control (unable to meet all protocol level IV objectives) **OR** bracing unacceptable **OR** time constraints preclude adequate trial of rehabilitation
2. - Skeletally mature athlete
 - functional stability high priority
 - Quadriceps/ patellofemoral function, range of motion lesser priorities
 - Unable to achieve “automatic” pivot shift control (unable to meet all protocol level III objectives) **OR** bracing unacceptable
3. - Skeletally mature athlete or non-athlete
 - unable to achieve “automatic” pivot shift control (unable to meet all protocol level II objectives)
 - Frequent severe instability episodes with unbraced activities

* Adapted with permission from the Iowa Hamstring Reflex Pivot Shift Control Program developed by John P. Albright, MD and coworkers at the University of Iowa.