How often is the knee injured?

- 13% of NHL injuries from 2006-2012 (McKay et al.)
- 3rd most injured body region following head and thigh
- Accounted for 15.5% of total games lost to injury
- 22% of Men’s Division I injuries in 2001-2002 (McKay et al.)
  - MCL injuries 2nd only to concussion
- 15% of Women’s Canadian college injuries in 1998-1999 (Schick et al.)
  - MCL injuries 7.5% of all injuries
Types of Knee Injuries
- MCL sprain/rupture
- ACL rupture
- Meniscus tear
- Patellar dislocation/subluxation (MPFL tear)
- Articular cartilage defects
- Fractures
- PCL sprain/rupture
- Posterior lateral corner

MCL Injuries
- Very common injury with hockey
- Typically sustained by contact injury that forces valgus stress
- Rarely requires surgery
- Severity varies and determines time off the ice
  - Gr. I (<5 mm opening)
  - Gr. II (5-10 mm opening)
  - Gr. III (>10 mm opening)

ACL Injuries
- 200,000+ injuries per year in U.S.
- Up to 90% have surgery
- Much less common than MCL in hockey
  - 47 NHL players from 2006-2010 (Sikka et al)
  - Majority are contact injuries, unlike basketball, soccer, and football
  - 46 of 47 NHL ACL ruptures were contact with another player or the boards (Sikka et al)
Mechanism of Injury

- Ovechkin at Worlds 2014
- Ryan Miller knee sprain
- Matt Duchene knee injury

Rehab

**Phase I**
- Control swelling/effusion
- Protect healing tissue
- Begin to restore ROM
  - Extension more important than flexion in early phase
- Initiate quad activation

**Phase II**
- Normalize gait pattern
- Progress ROM
- Begin proprioceptive training

**Phase III**
- Maximize ROM
- Improve strength
  - Progress from double leg to single leg
- Challenge proprioception/neurom Re-ed
  - Prevent functional valgus

**Phase IV**
- Initiate dynamic exercises
- Walk to jog intervals
- Plyometrics
- Agility
- Hockey specific exercises/simulation
Return to Sport Progression

- Criterion Based (Adams et al, 2012)
- Less focus on time from surgery
- Functional advancement and sport specific focus

When to Return to the Ice?

- Different for all athletes
- No swelling fluctuation
- Able to run without pain
- Tolerating dynamic warm up
- High knees, butt kicks, skip, shuffle, etc.
- No discomfort on slide board or other skating simulations
- Demonstrates good confidence

**Hockey conditioning is very specific to skating, therefore, the earlier an athlete can safely get on the ice the better. The athlete has to have a good understanding of restrictions and the rehab professional has to feel confident the athlete will stay within the parameters recommended.**

When to Return to Competition?

- No pain with increased skating intensity
- Able to do hard stop and starts
- Gained explosive power back
- Adjusted to contact
- Restored endurance level
- Passed functional test in clinic
Importance of Functional Test

- MD's typically will judge return to play based on these numbers
- Quantitative analysis of symmetry - MD viewpoint
- Qualitative analysis of movement to identify areas of weakness - PT viewpoint
- Allows athlete, therapist/ATC, parents, coach and MD to all be on the same page
- Assist in decision to continue PT, join bridging program (TRIA LEAP), or return to sport

Functional Testing

- Many different functional tests used for knee population
  - LESS (Landing Error Scoring System)
  - Vail Sport Test
  - Tuck Jump Assessment
  - FMS
- In 2011 systematic review only 35/264 (13%) of ACL-R articles showed some measurable objective criteria for return to sport
- Hop testing most consistently included in testing (Abrams et al, 2014)

Functional Testing at TRIA

- Increased the intensity of our functional test for athletes
- Both quantitative and qualitative components
- Less ceiling effect due to increased challenge
- Challenges cardiac fitness/endurance
Functional Test - Static

- Paur Step
  - Single leg squat off plyo box for depth
- Side Plank
  - To fatigue or failure
- Single leg 90/90 Hamstring Bridge
  - 2 minutes at 30 BPM
- Single leg squat to 60 deg
  - 2 minutes at 30 BPM
- Star Excursion Balance
  - Limb symmetry on each component

Side Plank to Fatigue

Single Leg Squat to 60 Degrees
90/90 Single Leg Hamstring Bridge

“Paur” Step

Star Excursion Balance
Functional Testing-Dynamic

- 4 Hop Tests
  - Single leg hop for distance
  - Single leg triple hop for distance
  - Single leg triple crossover hop for distance
  - Single leg 6M timed hop
- Tuck Jump
- Drop-Vertical Jump
  - Qualitative Assessment
  - Single leg lateral line hop
  - Max reps in 30 seconds

Drop-Vertical Jump

Tuck Jump
Qualitative Analysis

Qualitative Scoring - Hop tests, drop vertical jump, tuck jumps

- 0 = poor form (excessive knee valgus, lateral trunk displacement, decreased knee flexion)
- 1 = fair form (mild knee valgus, small trunk displacement, weight shift towards uninvolved)
- 2 = good form (no valgus, good squat depth, equal weight distribution, good trunk control)

When Am I Done?

- Greater than 90% on functional test
- Good knee frontal/sagittal plane stability and control at full speed movements requires:
  - Sufficient cardiovascular conditioning
  - Engaged quads/hams/gastrocnemius/hip abduction/trunk and core
  - Dynamic knee stability with coordinated movement patterns
  - Sports specific movements at full speed
  - High confidence with no fear of re-injury during higher level tasks
  - Return to sport based more on movement patterns and quantitative hop data vs. time since surgery and passive laxity

References


Knee Rehab Breakout Session

TRIA ORTHOPEDIC AND SPORTS MEDICINE CONFERENCE 2016
JOHN BOTTOMS, PT, DPT, OCS

When to Initiate Dynamic Progression?
- Precursors
  - Full ROM
  - No swelling
  - Minimal to no pain
  - Normal gait pattern
  - Good knee control on static exercises

Where to Begin?
- Walking lunges
- Step and hold
- Hockey hop and hold
- Dynamic warm up:
  - Butt kicks, High Knees, Skipping, Shuffle, Carioca
- BOSU squat w/ stickhandling
Think Hockey Specific

- Hockey strides on sliders
- Lateral bounding
- "Y" Balance
- Pilates Reformer exercises
- Slide Board
- Resisted lateral bounding with sport cords