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Case Study – ACL INJURY – Integrating the KneeKG™

Clinical information

- 16-year-old man who practices competitive skiing
- Has pain in his right knee since a downhill skiing accident
- Giving way symptoms when practicing physical activities
- Pain increases during knee flexion, extension and pivoting
- Previously consulted his family doctor:
  - Suspects an ACL tear
  - Referred for physical therapy and a MRI
  - Instructed to apply ice, rest and decrease pivoting sports
  - Requires a second opinion

Recommendations following the KneeKG™ exam
(see results on reverse side)

1. Physical therapy treatments to address the identified biomechanical deficiencies:

Limited flexion excursion during loading phase
➜ Stabilizes the knee by keeping it in a slightly flexed position (hamstring facilitation strategy and/or co-contraction strategy)

Avoids knee flexion excursion during the loading phase
➜ Strategy to reduce the anterior force applied on the tibia by the eccentric contraction of the quadriceps, which induces anterior tibial translation

Important internal rotation of the tibia with regards to the femur
➜ Consistent with a suspected ACL rupture (since the role of the ACL is to prevent internal tibial rotation) *This biomechanical deficiency is directly linked to the development of knee OA in patients with an ACL injury[4]

Specific recommendations for physical therapists :

- Exercises to increase knee stability near extension
- Quadriceps and hamstring strengthening and stretching
- Proprioception exercises
- Exercises to increase muscle control near extension (step-up and step-down)
- Muscle activation exercises (co-contraction) for the hamstrings and quadriceps (with a focus on the lateral aspect of the thigh)
- Previous studies have shown that walking with an increased toe out angle can limit the internal tibial rotation. Some exercises should address this gait strategy

2. Referral for orthotics to address the following biomechanical deficiency:

Important internal rotation of the tibia with regards to the femur
- Hinge knee brace should be considered

3. Referral for knee X-rays:

- To rule out fractures

4. Referral for a consultation with an orthopedic surgeon:

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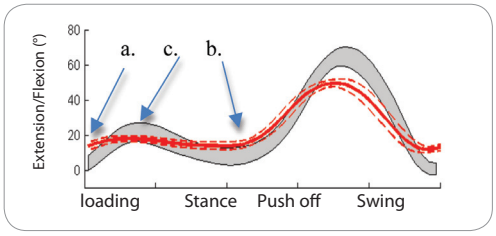
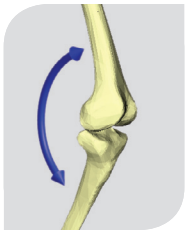
KneeKG™ results coincide with ACL injury biomechanical patterns

1) Knee flexum at initial contact (see a.)
2) Higher flexion angle during terminal stance phase (see b.)[1,2]
3) Flexion movement deficiency during loading phase (see c.)[2]
4) Significant internal rotation of the tibia in regards to the femur throughout the gait cycle (see d.)[3] and more importantly during terminal stance phase and push off (see e.)

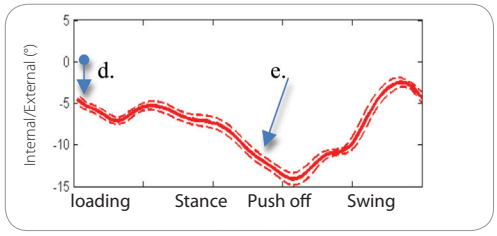
Flexion/extension of the knee

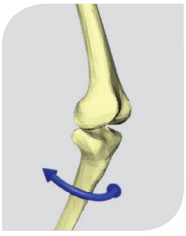




(grey curve represent the normal)

Internal/external tibial rotation





Benefits of using the KneeKG™

- Complements the orthopedic physical assessment by identifying and quantifying biomechanical deficiencies associated with the suspected ACL tear[5]
- Gives precise information concerning the impact of the ligament injury on the joint function during a dynamic and weight bearing activity
- Helps to optimize the conservative treatment plan and provides patient specific management to treat the injury
- Gives insights on the etiology and the development of secondary injuries and how to prevent them

[1]Fuentes et al. 2010 Clin Biomec (in press); [2]Hurd et al. J Orthop Res25(10) p.1369; [3]Andriacchi and Derby. 2005 J Biomec 38(2) p.514; [4]Andriacchi et al. 2006 Clin Orthop R Res 442 p.39; [5]Koh et al. 2005 Op Tech Orthop. 15 p.43