Handout:

I. Early Surgery – Speaker – Bailey (55 min)
   • A Look At The Numbers
     1. “Injury to chondral and meniscal tissues is commonly found with both acute
        and chronic anterior cruciate ligament (ACL) ruptures”
        1. McDonald L, Boorman-Padgett J, et al. ACL Deficiency Increases
           Forces on the Medial Femoral Condyle and the Lateral Meniscus with
        2. “Chondral injuries are reported in up to 23% of individuals undergoing acute
           ACL reconstruction and 54% of those undergoing delayed ACL reconstruction”
           1. Indelicato PA, Bittar ES. A perspective of lesions associated with ACL
              insufficiency of the knee. A review of 100 cases. Clin Orthop Relat
              Res. 1985 Sep;198:77-80.
        3. Meniscal injury is observed in up to 89% of those undergoing delayed ACL
           reconstruction
     • Let’s Define Our Terms: How Early is Too Early???
       1. EARLY WITHIN REASON!
          1. Restore Knee Extension
          2. Reduce Joint Effusion, Capsular and Soft-Tissue Irritation
          3. Regain Quadriceps Muscle Activation
       2. Ideal is 8-21 days
             Arthrofibrosis in acute anterior cruciate ligament reconstruction.
             The effect of timing of reconstruction and rehabilitation. Am J Sports
             Med 19:332–336
   • Mechanical Changes to the Knee
     1. Increased translation (Anterior & Internal Rotation)
        1. Noyes FR1, Jetter AW2, Grood ES3, Harms SP2, Gardner EJ2, Levy
           MS4. Anterior cruciate ligament function in providing rotational
           stability assessed by medial and lateral tibiofemoral compartment
        2. Defrate LE, Papannagari R, Gill TJ, Moses JM, Pathare NP, Li G. The 6
           degrees of freedom kinematics of the knee after anterior cruciate
           2006;34:1240-1246

2. Increased Shear Forces & Contact Pressures
2. More Posteriorly Directed

3. Increased Risk for Subsequent Subluxation(s)

• Demands to Secondary Restraints
1. Medial Meniscus Load

2. Lateral Meniscus Load

3. While the knee is subluxated, the lateral meniscus encounters greater forces than encountered in ACL-intact knees without this subluxation

- **Chondral Stress**

- **Tissue Adaptation**
  1. Soft-tissue Accommodation
     1. Indelicato PA, Bittar ES. A perspective of lesions associated with ACL insufficiency of the knee: a review of 100 cases. Clin Orthop Relat Res. 1985;198:77-80
  2. Hamstring Excitement
  3. Semi-membranosis excitation
  4. Proprioceptive Changes

- **Fending-Off Osteoarthritis**
  1. Happens regardless of reconstruction
  2. What’s the impact of prolonged instability
  3. Goal is to Preserve Quality of Life

- **Practical Considerations!**
  1. Popular Press
  2. Patient Expectations & Mechanical Instability
  3. Insurance Benefits

### II. Extended Prehab – Zarzycki (55 min)

Advantages of Preoperative Rehabilitation (“Prehabilitation”) prior to ACL Reconstruction

1. Overview
   a. What do we mean by prehab?
      i. Addressing impairments beyond a quiet knee (i.e. full ROM and minimal/no effusion)
      ii. Components include progressive OKC and CKC strengthening (focus on quadriceps and hamstring groups), plyometric training, agility training, neuromuscular training (e.g. perturbation training)
   b. General Theory
i. “Optimal preoperative knee function will lead to better post-operative knee function.”

2. Evidence in support of comprehensive prehabilitation programs
   a. Cohort study
      i. 5 week progressive exercise program consisting of strength training, plyometric exercises, balance/stability exercises, and perturbation training led to improved knee function (i.e. quad and hamstring strength, single legged hop performance immediately following the program).
   b. RCT
      i. 6 week preoperative program led to improved functional performance and self-reported function following the program and at 12 weeks after ACLR.
   c. Comparative effectiveness studies
      i. Delaware-Oslo cohort (DOC) compared to Norwegian National Knee Ligament Registry (NKLR). The DOC underwent progressive preoperative and postoperative program in a sports med clinic demonstrated better self-reported functional outcomes 2 years after ACLR.
      ii. Delaware-Oslo cohort compared to MOON cohort. DOC demonstrated better self-reported functional outcomes at 2 years after ACLR.

3. Evidence specific to pre-operative quadriceps strength
   a. Athletes that delayed surgery (mean 40 days) had better quadriceps strength at 2 and 4 months after ACLR allowing them to progress sooner to sport-specific rehabilitation.
   b. Increased peroperative quadriceps strength deficit results in lower limb symmetry index at 6 and 9 months after ACLR.
   c. Systematic review of preoperative predictors of outcomes after ACLR. Less than 20% quadriceps strength deficit was predictive of higher functional scores.
   d. Greater preoperative quadriceps strength is associated with higher self-reported function scores 2 years after ACLR. Recommend quadriceps deficit <20% prior to surgery.
   e. Greater preoperative quadriceps strength is associated with higher self-reported function 6 months after ACLR.

4. Extended prehab can identify candidates for non-operative care
   a. A classification algorithm was developed to identify candidates for non-operative care (potential copers). Using this algorithm, 42% of the cohort (N=345) were classified as potential copers. 72% of these potential copers successfully returned to pre-injury sport activities without ACLR after comprehensive rehabilitation.
   b. Classification of potential coper after per-operative rehabilitation predicted 2 year success in athletes managed both operatively and nonoperatively (Thoma, CSM platform, 2018)

5. Conclusion
   a. Extended prehab and greater quadriceps strength lead to better short term and long term functional outcomes.
   b. Classification of coper status following extended prehab identifies candidates for non-operative care.

References


III. Question & Answer (10 min)