Clinical Case Series (vs. Case Study)

- A series of similar patients numbering between 1 and 10
- Purposely followed to describe their clinical outcomes
  - Observational nature of the information
  - Intentions of describing occurrences in a like group of patients
  - Shares insights on those occurrences
- Case series does not have to include a hypothesis nor provide a cause and effect conclusion

Patient #1 Background
Male Collegiate Soccer Athlete

- Demographics
  - College freshman, age 22, height 182 cm, weight 82 kg
- Subjective
  - Experienced sharp and sudden knee pain following landing during a scrimmage (2-a-days)
- History of meniscectomy (~2 years prior)
- Objective
  - NWB w/ MCL and patellar tendon point tenderness
  - Unwilling to passively or actively move knee
  - No obvious swelling, bleeding, deformity
  - + (slight) MCL/ACL laxity; - Appley's compression - patellar apprehension sign
- Assessment
  - ACL sprain (acute vs. partial)
  - MCL sprain
  - Patellar desinsertion/adhesive
  - Menisco injury
- Plan
  - Ice, straight knee immobilizer, crutches, reassess

Patient #1 Progression
Male Soccer Athlete

- Athlete unable to weight bear and unwilling to move knee (~1 week)
  - No swelling occurred; same special test results
  - RICE w/ light ROM activities
  - Standard conservative treatment and rehabilitation (~3 weeks)
  - ROM, massage, squat/seat, MRE, cuff exercises
  - Athlete stated knee felt strong and stable
  - Continuous treatment and begin RTP activities (~5 weeks)
  - Increased exercise intensity (squatting, lunging, step-ups, etc)
  - Begin individual soccer-specific activities
    - Team events, jogging, dribbling, passing, 1-on-1, light plyometrics
  - No complaints reported
  - Increase RTP intensity & team activities (~7+ weeks)
    - Jumping, cutting, 3-on-3, 7-on-7; full-field scrimmaging; intense plyometrics
    - Athlete stated his knee felt “weak” with 80% intensity; psychological apprehension
  - Reduced RTP activities; increased rehabilitation exercises; reevaluation
  - Returned to sport-specific progressions; felt “weak” with 70% intensity
  - Unable to perform unrestricted soccer scrimmaging activities
Patient #2 Background
Male Collegiate Volleyball Player

- **Demographics**
  - College junior, 21 years old, height 187 cm, weight 90 kg

- **Subjective**
  - Reported injury after practice around the mid-point of the season
  - Instant knee weakness after jumping following block attempt
  - History of bilateral Osgood-Schlatter Disease, patellar tendopathy, contralateral grade III ankle sprain

- **Objective**
  - Weight bearing; slight analytic gait
  - Visible (localized) swelling with pain over inferior patellar pole
  - 3/5 knee extension MMT; - ligament and meniscus tests; full ROM

- **Assessment**
  - Partial patellar tendon tear
  - Osteochondral injury

- **Plan**
  - Recommended crutches, knee immobilizer, reevaluation

Patient #2 Progression
Male Volleyball Athlete

- Athlete declined all formal therapy (except ice)
- Played remaining month of the season with constant knee weakness and discomfort
  - Athlete stated he was at approximately 70% of his capability
- 4 month break (1 month of April; 3-month summer break)
  - No therapy or treatment performed
  - Athlete stated he only played volleyball 3-5 times and performed no other physical or conditioning activities
- Fall camp (August)
  - Knee weakness and discomfort persisted
  - Difficulty with squatting and jumping
- Sought medical assistance

Next Step....
Physician Evaluation

- Yep, something is wrong
  - Men’s soccer = failed extended therapy program with RTP progression
  - ACL tear?
  - Men’s volleyball = symptoms remained despite almost 4 months of rest
  - Partial patellar tendon tear?

- MRI performed
  - Identified isolated patellar osteochondral defects
  - No other structural damage
    - Ligament, tendon, meniscus

MRI Images
Treatment Options

- Men’s soccer
  - Continue treatment, therapy, and strengthening
    - Already failed several times
    - Worth attempting again?
- Men’s volleyball
  - Attempt treatment, therapy, and strengthening
    - Prolonged weakness after 4 months of rest
    - Would therapy be beneficial when still asymptomatic after prolonged rest?
- Surgery recommended and subsequently performed on both athletes

Grade III Chondromalacia???

- Grade I
  - Focal areas of hyperintensity with normal contour
  - Arthroscopically: softening or swelling of cartilage
- Grade II
  - Blisters-like swelling/fraying of articular cartilage extending to surface
  - Arthroscopically: fragmentation and fissuring within soft areas of articular cartilage
- Grade III
  - Partial thickness cartilage loss with focal ulceration
  - Arthroscopically: partial thickness cartilage loss with fibrillation (crab-meat appearance)
- Grade IV
  - Full thickness cartilage loss with underlying bone reactive changes
  - Arthroscopically: cartilage destruction with exposed subchondral bone

Surgical Treatment

- Patellar chondroplasty
  - 198 ± 30 days following initial injury
- Post-operative diagnosis
  - Grade III patellar chondromalacia
  - No other focal injuries identified or addressed

Chondromalacia Grading Pictures

http://radiopaedia.org/articles/chondromalacia-grading
Men’s Soccer

MRI Images

Men’s Volleyball

Post-Operative Care

- Week 1
  - Cryotherapy, ROM (ankle, knee, hip)
  - Strengthening
    - Ankle
    - VMO (with EMG biofeedback)
- Weeks 2-3
  - Strengthening (EMG biofeedback incorporated)
    - Hip (4-way, IR/ER, cuff weights, tubing, MRE)
    - Knee (flexion, extension, plyoball, MRE, cuff weights)
    - Ankle (PNF, MRE, tubing)
  - Lower-body open/closed chain (partial lunges, squating, step-ups, balancing)
  - Hip alignment assessments w/ muscle energy adjustments when warranted
  - DAPRE principle used for gradual increase in sets, repetitions, and intensity
  - Modalities to control pain and swelling
    - Ice, compression, elevation, muscle stimulation
- Only restriction
  - Avoid closed-kinetic chain knee flexion (i.e., squatting) past 60°

Gel-One® Cross-Linked Hyaluronate Injection

- Day 21 (± 10 days) post-surgery
- Gel-One® injection administered by physician
Gel-One® Cross-Linked Hyaluronate

- Product of Zimmer corporation
  - FDA approved for those 21+ years old
- Viscosupplementation
  - Provides knee
    - Shock absorption
    - Synovial fluid production and stimulation
- Single-injection product approved for non-surgical treatment of knee OA where medications (NSAIDS & analgesics) and/or therapy are ineffective
  - Vs. other products that require 3-5 separate injections

Followin Injection

- Unrestricted lower-body closed-kinetic chain exercises allowed
  - Lunges, squatting, jumping, passing, plyometrics, agility drills, cardiovascular conditioning
  - LIGHT team drills and activities
    - Team stretch and sport-specific drills
- Day 34 (± 2 days) post-surgery; final physician follow-up
  - Released to continue sport-specific RTP protocol under athletic trainer supervision without restrictions (PRN)
- Both athletes returned to unrestricted sport participation within days
- No knee weakness or discomfort reported

Gel-One® Cross-Linked Hyaluronate Injection Reasoning

- Stimulate synovial fluid production within the knee
- Prevent further joint deterioration
- Physician
  - Previously used in young (non-athletic) patients
  - Youngest patients to-date

Knee/Thigh Measurement Progression

Both Patients Combined
Between Injured & Non-Injured Limbs

- Week 1
  - ROM (ankle, knee, and hip)
    - Nominal
    - Thigh girth
      - 5 cm (average) difference
- Week 3
  - ROM (ankle, knee, and hip)
    - Equal bilaterally
    - Thigh girth
      - 2 cm (average) difference
- Week 5
  - ROM (ankle, knee, and hip)
    - Equal bilaterally
    - Thigh girth
      - 1 cm (average) difference
Results

• Both athletes went from experiencing prolonged knee weakness and discomfort to full return to participation within 40 days of surgery
  • Men’s soccer athlete
    – Participated with no limitations in spring soccer
    – No recurring knee issues during his final 3 seasons
  • Men’s volleyball athlete
    – Participated with no limitations his senior season
• Post-surgical treatment and therapy program addressing lower-body kinetic chain function is beneficial
  – Hip and leg length assessments, muscle-energy techniques, EMG biofeedback, and proprioception
• Gel-One® Cross-Linked Hyaluronate injection can be included
  – Possibly augments recovery
  – Possibly reduces likelihood of additional damage

General Conclusions

• Grade III chondromalacia can present in multiple manners
  – Correct diagnosis can be difficult without high degree of suspicion and/or advanced imaging
  – Prolonged knee weakness and discomfort with acute symptom development
  – Men’s soccer
    – Initially unable to weight bear; requiring knee immobilization
    – ACL tear or patellar dislocation
  – Several months of therapy (which failed)
  – Unable to progress past 80% of maximum intensity (w/pain and psychological apprehension)
  – Men’s volleyball
    – Partial patellar tendon rupture
    – 4 months of rest did not resolve underlying symptoms
  – Gel-One® Cross-Linked Hyaluronate injection could be considered
  – Well designed therapy program identifying and addressing global lower-body kinetic chain function
  – Both athletes able to return to full participation within 40 days of surgery

Uniqueness

• Both athletes diagnosed with identical injuries
• Both athletes underwent near-identical surgical and post surgical treatment
  – Near-identical general timelines
    • 198 (± 30) days from injury to surgery
    • 34 (± 2) days from surgery to full-participation
• Both athletes received health-care from the same providers
• Both athletes received Gel-One® Cross-Linked Hyaluronate injection

Take-Away Thoughts

• Grade III chondromalacia
  – Multiple presentations
• Gel-One® Cross-Linked Hyaluronate injection
  – Rationale and possible inclusion
• Global kinetic-chain rehabilitation and considerations
  – Incorporate multiple body regions into therapy
Questions???