An Update in Osteoarthritis of the Knee for the Aging Athlete

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A. Epidemiology
   a. Incidence
   b. Risk Factors
      i. Age
      ii. Obesity
      iii. Gender
      iv. Physical Activity
      v. Previous Injury

B. Articular Cartilage
   a. Type II collagen, 65–80% water
   b. Viscoelastic – deformation & recovery
   c. Load transmission
   d. Nutritional sources – diffusion of synovial fluid

C. Individualization:
   a. Lesion – location, size, depth, quality of other tissue
   b. Patient – age, BMI, health, goals

D. Surgical Approaches
   a. Micro-fracture
   b. OATS
   c. Osteochondral allograft transplant
   d. Osteochondral graft substitutes
   e. Autologus chondrocyte transplantation

E. Rehabilitation Strategies
   a. Joint Loading
      i. Joint loading determined by shear & compressive forces in all planes of motion.
      ii. Compression-Needed for resynthesis, destructive if excessive
      iii. Shear- Destructive

   b. Tibiofemoral Articulation
      i. Degeneration most common: 30 – 60° ROM
ii. Joint instability can expand zone

c. Articular cartilage Injury
   i. Usually uni-compartmental
   ii. Medial Compartment 10X more affected than lateral
   iii. 60 – 80 % of load across knee is transmitted to medial compartment

d. Rehabilitation via Biology
   i. Acute Period - limited joint loads
   ii. Proliferation/Graft integration
   iii. Protection- ↓pain/effusion, restore PROM and WB, initiate volitional control of quadriceps.
   iv. Sub-acute Period – initiate joint loads
   v. Remodeling – Matrix production & organization
   vi. PWB, FWB, FROM, normalize ADL and progress exercise.
   vii. Functional Period
   viii. Maturation – tissue reaches full maturation gradually add impact activities.

e. Rehabilitation Goals
   i. Maximize patient recovery while decreasing physical impairments and disability
   ii. Restore ROM, muscular strength and endurance
   iii. Facilitate cartilage healing and maturation while preventing further degeneration
   iv. Avoid arthrofibrosis with OATS due to larger incision

f. Factors affecting rehabilitation

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<table>
<thead>
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<tbody>
<tr>
<td><strong>Age</strong></td>
<td>Increased age - slower</td>
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<tr>
<td><strong>BMI</strong></td>
<td>&gt; 30 – slower</td>
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<tr>
<td><strong>Sport</strong></td>
<td>High vs. low impact</td>
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<tr>
<td><strong>Level of sport</strong></td>
<td>Competitive vs. recreational</td>
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<td><strong>Psychological</strong></td>
<td>Confidence through criteria progression</td>
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<td><strong>Defect size</strong></td>
<td>Small vs. large</td>
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Defect location: WB vs. NWB, patella vs. condyle

Repair technique: Repair vs. restorative (↑WB)

Added injury: ACL, meniscal repair - slower

F. Phases of Rehabilitation
   a. Acute Inflammatory Phase
      i. Minimize Immobilization
      ii. PROM: Restricted by size/location of defect
      iii. Establish FULL passive extension
      iv. AAROM: Reciprocal cycle
      v. Contralateral leg or band assist
      vi. AROM: Unloaded to Loaded progression

   b. Acute Phase – Regain Motor Control
      i. Regain Motor Control
      ii. Quad MAI: 0 – 20° & 70 – 90° (MVIC @ 30°)
      iii. OKC: Safe ranges, usually start at 4-6 wks.
      iv. Kinetic chain strategies (hip, gastroc/soleus)
      v. Monitor volume, intensity closely
      vi. Low resistance, relatively high reps.

   c. Normalize gait
      i. Partial thickness debridement
         1. Early weight bearing with assistive device
      ii. Full thickness repair procedures
         1. Generally NWB 4-6 wks. (location dependent)

   d. Criteria for Progression
      i. ROM 0 – 100 deg.
      ii. No joint effusion
      iii. Good lower extremity control – No Quad. lag
      iv. Functional reach test: 30% height (anterior)
      v. Pain free gait without deviations
      vi. D/C crutches

   e. Sub-Acute – Progressive Loading
      i. Muscular Control
         1. OKC progression: Short @ Long lever arm
         2. Avoid lesion region (ROM)
3. Muscular Control
4. Concentric Eccentric loading
5. Static Dynamic loading
6. Introduce gravity reduced exe. / plyometrics
7. Proprioception (stable/ unstable, uniplanar / multiplanar)
8. Sports specific movement component integration

f. Functional Return Phase
   i. Continued organization and maturation of cartilage adapting to increased demands of sports movements.
   ii. Replicating sport specific movements
   iii. Maximize muscle power (plyometrics)
   iv. Progression: In-line running, figure 8, accelerations, decelerations, pivot and cutting.
   v. Increasing speeds.

g. Conclusions
   i. Respect effect of disuse on articular cartilage
   ii. Minimize immobilization, regain ROM ASAP
   iii. Criteria based progression that follows science
   iv. Regain muscular control: MAI OKC CKC
   v. Avoid region of lesion with cartilage
   vi. Avoid early flexion with meniscal repair
   vii. Weight bearing progression avoiding degenerative zone
   viii. AVOID COMBINATION OF SHEAR AND COMPRESSION IN REHABILITATION

G. Outcomes
   a. Impairment Based
   b. Functional Based
   c. Pain
   d. Total Knee Replacement
   e. Gender Differences
   f. Return Sport
BIBLIOGRAPHY


Farquhar et al. Persistence of Altered Movement Patterns During a Sit-to-Stand Task 1 Year Following Unilateral Total Knee Arthroplasty *Phys Ther.* 2008;88:567-579


Jinks et al. Measuring the population impact of knee pain and disability with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). *Pain.* 2002;100:55-64


Studenski et al. Gait speed and survival in older adults. *JAMA* 2011;305:50-58

Tonelli et al. Women with knee osteoarthritis have more pain and poorer function than men, but similar physical activity prior to total knee replacement. *Biol Sex Differ.* 2011;2:12.


Wood et al. Associations between physical examination and self-reported Physical function in Older Community-Dwelling Adults With Knee Pain. *Phys Ther.* 2008;88:33-42