Articular Cartilage Lesions in the Knee

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History
- Direct trauma
- Twisting motion with impact
- Mechanical clicking, locking
- Instability
- PAIN
  - Location
  - Aggravating factors
  - Effusions

Examination
- Observation
  - Antalgic gait
  - Pain or weakness
  - Malalignment
    - Varus/valgus thrust
    - Ligament insufficiency
  - Effusions
  - Quadriceps atrophy
  - Prior surgical scars
- Palpation
  - Condyle injuries — ipsilateral joint line tenderness
    - Meniscal pathology usually more posterior
  - Patellofemoral — anterior knee pain
    - Left and right of patella and tendon

Imaging
- Xray
  - AP/L — weight bearing
  - Merchant
  - Full alignment view checking mechanical axis
- MRI
  - Lesion size, depth
  - Quality of subchondral bone
  - Bony fractures
  - Other soft tissue pathology

Associated pathology
- Malalignment
- Meniscal deficiency
- Ligamentous instability
  - ACL
  - PCL
  - MCL
  - LCL
  - PLC — posterolateral corner
- All may cause poor outcomes of any treatment
Conservative management:
- Oral anti-inflammatories
- Bracing
- Offloading affected compartment
- Physical therapy
  - Quad/HS strengthening
  - Core strengthening
  - Lifestyle modification

Operative solutions:
- Palliative procedures
  - Arthroscopic debridement
  - Pain relief
  - Little potential for cartilage regeneration
- Reparative procedures
  - Marrow stimulation techniques
  - Clot in lesion with potential to grow cartilage like material
- Restorative procedures
  - Attempt to restore hyaline cartilage
  - Cultured cartilage cells
  - Osteochondral graft

Arthroscopic Debridement:
- First line treatment in acute injury
- Pain relief
- Remove debris and inflammatory proteins
- Diagnostic
- Evaluate prior cartilage procedures for quality and possible complications

Reparative procedure:
- Subchondral drilling
- Abraison arthroplasty
- Microfracture
  - Surgical awl creates tunnel
  - Allows migration of marrow
  - Mesenchymal cells
  - Clot in defect forms fibrocartilage
  - Biologically and mechanically inferior to native cartilage

Microfracture:
- Damaged cartilage is removed
- Stable, vertical borders
Microfracture

Restorative procedure

- Autologous chondrocyte implantation (ACI)
- 2 stage
  - Harvest chondral cells for culture
  - Implantation into defect
- Hyaline like cartilage
- Large defects
- No bone loss

ACI

- Advantages
  - Histologically, most similar to native hyaluronic composition
- Disadvantage
  - Donor site morbidity
  - Two stage procedure
  - Slowest rehabilitation protocol

Osteochondral Transplant

- Lesions with subchondral bone loss
- Autograft
  - Harvested from non weight bearing regions
- Allograft
- Used in primary and revision setting
- Lesions smaller than 2cm²
  - Limited blood supply
  - Decrease donor morbidity

Fibrocartilage filling between transplants
- Viable native cartilage from each transplant
Osteochondral Allograft Transplant
- Large defects
- Mature, living cartilage cells
- Considered last option before total knee replacement is needed

Osteochondral Allograft
- Size the area

Osteochondral allograft
- Place guide pin in center of lesion

Osteochondral Allograft
- Ream out lesion

Osteochondral Allograft
- Take fresh frozen allograft condyle and ream graft plug from exactly the same area
- 2mm larger in circumference for press fit
- Must match curvature exactly

Osteochondral Allograft
- Carefully and gently press into place
- Too much compression may damage chondral cells
Complications
- Osteochondral transplantation
- Subchondral collapse
- Nonunion
- ACI
- Patch hypertrophy
- Graft detachment
- Delamination

Outcomes
- Microfracture
  - 60-80% good outcomes
- Osteochondral autograft
  - 90% G-E on femoral condyle
  - 80% on tibia
  - 70% on trochlea
- Osteochondral allograft
  - 85% G-E results
- ACI
  - 70-90% G-E outcomes

Rehabilitation
- Hinged knee brace
- Protected weight bearing depending on type of procedure for 6-8 weeks
- Early passive ROM
- Patellar mobilization
- Quadriceps sets
- Isometrics
- Proximal core strengthening
- After 3 months, plyometrics

Rehabilitation
- Microfracture
  - NWB/TDWB 6 weeks, RTA 6-9 months
- Osteochondral transplantation
  - Autograft NWB 6-8 weeks
  - Allograft PWB additional 2-4 weeks
- ACI
  - NWB 6-12 weeks, RTA 12-16 months