Knee and Thigh

Chapter 21
Nothing in this world has been accomplished without passion
George W. Hegel
General Rehabilitation Considerations

- One of most frequently injured joints
- Two long lever arms on either end of joint create more torque
- Ligaments and muscles very strong, good structurally
Knee Structure

- Two joints to consider: tibiofemoral and patellofemoral joints
- Capsule: aids in stability due to collateral ligaments, distributes synovial fluid
- Ligaments: MCL, LCL, PCL, ACL
- Meniscus: medial, lateral
- Screw Home Mechanism: occurs last 30 degrees of extension. Popliteus responsible for unlocking from full extension into flexionM
Knee Structure (cont)

- Patellofemoral joint: largest sesamoid bone in body
- Superior Tibiofibular joint: not actually a knee joint
- Muscles: quadriceps and hamstrings
Patellofemoral and Tibiofemoral Relationship

- Patella must glide freely for full knee motion to be possible
- Patella glides superiorly in knee extension, glides inferiorly in knee flexion (total excursion 5-7 cm)
- Patella’s inferior pole is at tibiofemoral joint’s margin and rests on supratrochlear fat pad
Patellofemoral and Tibiofemoral Relationship

- Greatest patellofemoral compression forces occur in 60 degree – 90 degree positions
- CKC positions from 0-20 degrees, and OKC greater than 30 degrees flexion produce minimal patellofemoral stress
- Distally attached cuff weights produce maximal patellofemoral compressive stress at 35-45 degrees
- Machine resistance applied at ankle reaches maximum compressive forces at 90 degrees
Q-Angle

- Q-angle formed by drawing a line from the anterosuperior iliac spine to the center of the patella. A second line drawn from the tibial tubercle to the center of the patella that intersects the first line forms the Q-angle.
**Q-Angle**

- Normal Q-angle: 10-12 degrees in males, 15-17 degrees in females
- Can change from wt bearing to non-wt bearing
- Larger in women due to pelvic structure
- Pronation or a weak VMO can cause increased Q-angle
Lower-Leg Alignment

- Excessive rearfoot pronation influences patellar alignment (increases tibial rotation and changes quad tendon pull)
- Since LE is a CKC during most functional activities, malalignment in one segment causes malalignment or compensation in another segment
Factors Influencing Postinjury Strength

- Edema: inhibits quad function
- Pain: causes reflex withdrawal inhibition
- Antalgic gait: causes weakness throughout LE
Rehabilitation Concepts

Extensor lag: incomplete active knee extension secondary to quad weakness

Quadricep force required for last 15 degrees of extension is twice as great as for other ROM due to reduced mechanical and physiological advantage
Rehabilitation Concepts

- ACL stress in weight bearing is least at 0-60 degrees
- ACL stress in non-weight bearing is greatest at 30-60 and least at 60-90
- Knee braces may provide proprioceptive feedback
Therapeutic Exercise Progression

- Dictated by tissue healing and response to exercise stress
- Range of motion via exercise, soft tissue mobilization, and joint mobilization
- Strength exercises with low-level resistance initially
- Balance with bilateral support, then unilateral static, then dynamic
- Agility activities
- Functional activities
Soft Tissue Mobilization

- All surrounding muscles:
  - Quadriceps
  - Hamstrings
  - Adductors
  - Popliteus
  - Tensor fascia lata
Joint Mobilization

- Superior tibiofibular joint: anterior and posterior glides
- Patellofemoral: position patient supine with a rolled towel under knee for support
- Tibiofemoral: most often used for improving ROM
Flexibility Exercises

- Short term: active vs. passive
- Prolonged
- Age of scar tissue
Strengthening Exercises

- Can begin early
- Include exercises for trunk, hip and ankle
- No pain or swelling during or after exercises
- Add exercises judiciously so can determine cause of inflammatory response
Proprioceptive and Functional Activities

- Proprioception: restore balance, agility and coordination (can begin when non-weight bearing to have patient move knee to designated angle)

- Functional: same as ankle, include running, hopping and cutting as well as sport specific drills and skill activities
Ligament Sprains

- Swelling occurs in 2-24 hours
- ACL most frequently sprained
- Two surgical techniques used now: patellar tendon, medial hamstring tendon
- Delayed or accelerated rehab
- Initially tissue avascular, but revascularizes at about 8-10 weeks
- Avoid patellar pain
Viewed Through Arthroscope

Torn anterior cruciate ligament
Collateral Ligament Sprains

- MCL sprained more often than LCL
- MCL rarely surgical
- Brace or support in conjunction with exercise
- Limit ROM from 0 – 90 degrees
Meniscal Injuries

- Isolated meniscal tears more likely degenerative
- Lateral repairs more successful than medial
- Meniscal repair better than meniscectomy in long run
Patellofemoral Injuries

- Patellar dislocations and subluxations
- Patella plica syndrome
- Osgood-Schlatter disease
- Patellar tendinitis
- Tendon rupture
Patellofemoral Dysfunction

- Must identify and correct causative factors
- Must relieve muscle imbalances
- Evaluate patellar alignment and tracking in weight bearing and non-weight bearing activities
- McConnell taping effective
Strains and Contusions

- Hamstring strain: tight hamstrings often cause problems
- Quadricep strain: often due to jumping or sudden change in direction
- Quadricep contusion: first goal limit pain and swelling, maintain flexibility (can result in myositis ossificans if treated improperly)
- IT Band syndrome: middle to long distance runners
Fractures

- Patellar fracture: direct blow
- Tibial fracture: often torsion or compression
- Epiphyseal plate injuries: adolescents
Figure 1

Patellar fracture

This plain film (lateral view) reveals a patellar fracture.
Transverse Fracture of the Epiphyseal Plate
Osteochondritis Dissecans (OD)

- Unknown etiology
- Knee pain, tenderness, catching, locking, giving way, quadricep atrophy
Figure 1. The most common locations of osteochondritis dissecans lesions of the knee. Lesions in the medial femoral condyle are most often seen on the lateral, non-weight-bearing condylar surface (a). Lateral femoral condyle lesions more likely involve the weight-bearing aspect of the joint (b). Patella lesions are typically seen in a mid-inferior location (c).