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 flexion

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 (cont)
- 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.

**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
- Quadriceps 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

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

Osteochondritis Dissecans (OD)

- Unknown etiology
- Knee pain, tenderness, catching, locking, giving way, quadriceps atrophy