

SPORTS MEDICINE CTQ'S FOR REVIEW

I. BASIC SCIENCE LECTURE

a. ACL

- i. Anteromedial bundle tight in flexion
- ii. Posterolateral bundle tight in extension
- iii. Primary blood supply
 1. CTQ: Middle geniculate artery (primarily)

b. PCL

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c. Menisci

- i. Peripheral 20%-30% of medial meniscus contains blood vessels mostly from medial genicular artery
- ii. Peripheral 10%-25% of lateral meniscus contains blood vessels mostly from lateral genicular artery
- iii. Medial meniscectomy
 1. No effect on AP translation with an intact ACL
 2. Significant increase in AP translation with ACL insufficiency – posterior horn

d. Articular Cartilage

- i. Type II collagen
- ii. Four zones
 1. Superficial
 2. Transitional/middle – largest
 3. Deep
 4. Calcified Cartilage – Tidemark
 - a. Microfracture and healing with TYPE 1 Fibrocartilage
- iii. Water content decreases with age but increases in OA
- iv. Proteolytic enzymes concentrations elevated in OA
 1. Metalloproteinases
 2. Inflammatory cytokines
- v. Depth of injury - major determinant affecting healing potential and long-term prognosis.

e. Ligaments

- i. Avulsion injuries typically occur between demineralized and mineralized fibrocartilage layers of deep direct insertions
- ii. Viscoelastic – time dependent behavior
 - 1. Creep
 - a. Viscoelastic property where deformation increases without loss of material when subjected to a constant force
 - 2. Stress Relaxation
 - a. Viscoelastic property where a decrease in stress occurs under a constant strain by way of internal molecular management

f. **Muscles Contractions**

- i. **Concentric** (moving a load as joint moves with muscle shortening)
- ii. **Eccentric** (controlling a load as joint moves with muscle lengthening)
 - 1. Most efficient technique of skeletal muscles strengthening
 - 2. Usually later in rehab the period - generates large muscle forces
- iii. **Isokinetic** (load varies at constant joint velocity)
- iv. **Isometric** (fixed load, no joint motion)
- v. Closed chain exercises more closely simulate functional activities and minimize shear forces across joints by increasing joint reaction forces
- vi. Plyometrics
 - 1. Convert muscle from eccentric contraction to concentric contraction to produce forceful movement in short period of time

g. **Basic Sports Knowledge**

- i. Orthopaedic history is most effective means of identifying musculoskeletal problems during PPE
- ii. Idiopathic hypertrophic cardiomyopathy
 - 1. Most common cause of death in athletes (12-32 years of age)
 - 2. H & P most cost-effective screening tool in PPE for detecting cardiovascular abnormalities

II. **Upper Extremity**

- a. Glenohumeral ligaments
 - i. IGHL
 - 1. Major stabilizer of arm when ER and abducted between 45° to 90°
 - 2. Limits anterior and posterior translation
 - ii. MGHL

1. Limits anterior instability in ER and abducted to 45°
- iii. SGHL and CHL
 1. Limit inferior instability in adducted arm
- iv. Rotator interval
 1. Deficiency leads to inferior instability with arm in adduction
- b. Axillary artery (3 parts in relation to the pec minor)
 - i. Medial to pec minor
 1. Supreme Thoracic
 - ii. Deep to the pec minor
 1. Thoracoaromial
 - a. Acromial
 - b. Deltoid
 - c. Pectoral
 - d. Clavicular
 2. Lateral thoracic
 - iii. Inferior to pec minor
 1. Anterior humeral circumflex
 2. Posterior humeral circumflex – Quadralateral space w/ axillary
 3. Subscapular
 - a. Thoracodorsal
 - b. Circumflex scapular
- c. Brachial Plexus
 - i. C5 – T1 roots
 - ii. Trunks – upper, middle, lower
 - iii. Division – each trunk has an anterior and posterior division
 - iv. Cords – posterior, lateral, medial
 - v. Branches – innervate upper extremity
 1. Long Thoracic – Serratus anterior and medial winging
 2. Spinal Accessory – Trapezius and lateral winging
 3. Suprascapular – Suprascapular notch (SS and IS) and spinoglenoid (IS)
- d. Shoulder Instability
 - i. Patients AGE and CONTACT sports most important factor for recurrence
 - ii. IGHL main restraint to anterior in the abducted and external rotation
 - iii. < 25 years of age, the recurrence rate is between 55-95 %
 - iv. >40 years of age, the recurrence rate is much lower, but higher incidence of rotator cuff injury
 - v. Posterior – seizure or electrical shock key words
 - vi. MDI(multidirectional instability) – nonoperative and rehab for a length of time
 1. Swimmers
 2. Surgical after failure conservative – Capsular shift
 - vii. Recognize bone defects >25%; Engaging Hill Sachs
 - viii. Thermal Capsulorrhaphy wrong answer
 - ix. Internal impingement - increased anterior capsular laxity allows increased external rotation impinging the cuff on the posterior labrum
 1. Pitchers

- a. GIRD – glenohumeral internal rotation deficit; compare to contralateral side and >18 degrees
 - i. Tx: Posterior capsular stretching
 - 2. SLAP Tears
 - a. Nonoperative first line of treatment
- x. Rotator Cuff Tears
 - 1. Incidence of tears increased with age
 - 2. Repair acute injuries in young patients
 - 3. Older chronic patients – nonoperative treatment
 - 4. Ability to lift off – subscapularis
 - a. Can be injured in open stabilization procedure
 - 5. Advantages of arthroscopic repair
 - a. No deltoid detachment
 - 6. Massive Tears –
 - a. Initially nonoperative treatment for older individuals
 - b. If surgery: PRESERVE CORACOACROMIAL ARCH
- xi. AC joints
 - 1. Types I to III – non operative acutely
 - 2. Types IV to VI – surgical
 - 3. Chronic III - questionable
- xii. SC joints
 - 1. Anterior – nonoperative
 - 2. Posterior – nonoperative
 - a. Surgical if compression posteriorly
 - b. THORACIC SURGEON
- xiii. Adhesive Capsulitis
 - 1. Women and associated conditions (DM or Thyroid and etc.)
 - 2. PROM and AROM approximately equal
 - 3. NON OPERATIVE MANAGEMENT
- xiv. Nerve Entrapment
 - 1. Suprascapular nerve
 - a. Volleyball players
 - b. Cysts associated with SLAP
 - c. 2 locations
 - i. Spinoglenoid notch
 - 1. IS only
 - ii. Suprascapular notch
 - 1. Affects both SS and IS
 - 2. Axillary nerve
 - a. Quadralateral Space – with posterior humeral circumflex

III. Lower Extremity

- a. ACL
 - i. AM – flexion
 - ii. PL – extension
 - iii. Middle geniculate artery

- iv. Knee motion should be restored before ACL surgery
- v. Bone bruise – posterolateral tibia and middle third lateral femoral condyle(deepened sulcus)
- vi. ACL Complications
 - 1. Loss of stability
 - a. early: fixation failure up to 4 – 6 weeks
 - b. late: graft failure
 - 2. Loss of motion
 - a. arthrofibrosis: timing
 - b. graft malposition
 - 3. Infection
 - 4. Patellofemoral pain
- vii. ACL Technical errors
 - 1. #1- anterior femoral tunnel
 - a. loss of flexion
 - b. graft rupture
 - 2. #2- anterior tibial tunnel
 - a. graft impingement and loss of extension
 - b. graft rupture
- viii. Females two to six times higher risk of injury
 - 1. 2-6X higher risk
 - 2. Smaller ACL
 - 3. notch width
 - 4. Decreased protective role of knee dynamic stabilizers
 - 5. ACL size
 - 6. hormonal influences
 - 7. Landing mechanics – valgus motion and in knee extension

b. PCL

- i. AL – flexion; larger; reconstructed in single bundle reconstructions
- ii. PM – extension
- iii. Middle geniculate artery
- iv. Long term PCL laxity - Medial & P/F arthrosis
- v. Isolated PCL injuries – rehab and PT(EMPHASIZE QUADRICEPS)
- vi. Immobilize in extension post surgical and nonoperative management
- vii. Surgery – tension AL bundle at 90°
- viii. Combined – surgical indications

c. Physical Examination Tests

- i. Lachman most sensitive – ACL
- ii. PCL – Posterior drawer most accurate
- iii. Varus/Valgus at 0 and 30 degrees
- iv. Isolated collateral ligament injury at 30 only
- v. Combined usually at 0° with cruciate injury
- vi. Dial Test – 30° only PLC and at 30° and 90° PLC and PCL injury
- vii. Pivot shift – ACL correlates best with results

d. Menisci Tears

- i. LOCATION OF TEAR #1 FACTOR
- ii. Stable Tears:
 - 1. short: \leq 1cm long

2. stable: ≤ 3 mm displacement with probing
3. partial thickness
- iii. Partial meniscectomy – predictors of long term success
 1. < 40 years of age
 2. Normal alignment
 3. Minimal arthritis
 4. Single fragment
- iv. Meniscal Repair
 1. Peripheral third tears
 2. Ligamentous unstable knees decrease success rate of repair from 70 to 95% to 30 to 70%
 3. Inside Out GOLD STANDARD
 - a. Medial – Saphenous
 - b. Lateral – Peroneal nerve
 - c. VERTICAL MATTRESS – STRONGEST
 4. Meniscal Allograft
 - a. Indication: young (<50 yrs) with pain, s/p total meniscectomy, stable, grade 3 or less chondral damage
 - b. Contraindication – uncorrected extremity alignment, instability, sig chondral changes
- e. Articular Cartilage Treatment
 - i. *Correction of instability and malalignment critical to success of any procedure*
 - ii. Microfracture should be considered primary treatment option for full thickness defects
 - iii. OATS
 1. Defects up to 2.5 cm²
 - iv. Allograft – medium to large lesions
 - v. Autologous Chondrocyte Implantation
 1. Medium to large lesions (2 – 10 cm²)
- f. Patellofemoral
 - i. Restraints
 1. MPFL – STATIC
 2. VMO - Dynamic
 - ii. Treatments
 1. PF syndrome
 - a. Physical Therapy
 - b. VMO, Hip abductors, hamstring stretching, core strengthening
 - c. Lateral compression syndrome – nonoperative
 - i. If nonop fails after at 6 months – lateral release (patella tilt only with NO subluxation)
 2. PF instability
 - a. 1st time nonoperative
 - b. Previous dislocation biggest risk factor
 - c. If non operative fails then:
 - i. No malalignment – soft tissue procedure (MPFL recon)

- ii. Large Q angle $> 20^\circ$ or Tibial Tubercle Trochlear groove distance > 20 mm

- 1. Osteotomy

- a. Fulkerson – anteromedialization of tubercle

- g. Knee dislocations and Multiligamentous injury

- i. Irreducible dislocation

- 1. Posterolateral dislocation - surgical

- ii. 25% Peroneal nerve injury

- iii. 25 to 40% popliteal artery injury

- 1. > 8 hrs of ischemia high amputation rate
- 2. Any multiligament injury should be admitted with serial monitoring
- 3. Normal exam follow for 48 hours
- 4. If any abnormality - angiogram

- iv. Literature supports operative management of multiligamentous injury

- v. Posterolateral Corner – goal is to repair collaterals within first three weeks

- 1. LCL
- 2. Popliteus muscle tendon unit
- 3. Popliteal fibular ligament – attachment fibular styloid

- h. Hip Injuries in athletes

- i. Hip arthroscopy

- 1. Portals and risks

- a. Anterolateral - Superior gluteal nerve
- b. Anterior - lateral femoral cutaneous nerve
- c. Posterior – sciatic

- 2. Pudendal nerve – traction injury

- a. Limit traction to < 2 hrs

- ii. Femoroacetabular impingement

- 1. Cam - abnormalities that are femoral based, such as aspherical head, reduced head neck offset
- 2. Pincer – acetabular-based disorders such as acetabular retroversion: abnormal contact between acetabular rim and femoral neck
- 3. Treatment

- a. Femoroacetabular osteoplasty

- iii. Sports Hernia

- 1. Mechanism – abduction and extension
- 2. Groin – adductor longus tear
- 3. Most often in Hockey players

- iv. Snapping Hip Syndrome

- 1. External – *iliotibial band* tracks over greater trochanter - most common
- 2. Internal - *iliopsoas tendon* over femoral head; audible snapping with extension of a flexed, abducted, and externally rotated hip
- 3. Intraarticular - *labral tears* - usually clicking rather than snapping

- IV. Stress Fractures

- a. More common in WB bones of lower extremity

- b. Female Triad – runners, figure skating, and gymnastics
 - i. Eating Disorder
 - ii. Amenorrhea
 - iii. Osteoporosis
- c. Specific Sports
 - i. Humerus – throwing sports
 - ii. Ribs – golfers and rowers
 - iii. Spine – gymnastics
 - iv. Lower extremity – runners
 - v. Foot – gymnastics, basketball, runners
- d. High Risk
 - i. Femoral Neck
 - 1. Tension side – ORIF
 - 2. Compression side – protected weight bearing
 - ii. Tibia
 - 1. Anterior – high risk – NWB and possibly IM nail
 - 2. Medial and Posteromedial –PWB
 - iii. 5th metatarsal – athlete
 - 1. Screw fixation

V. Overuse syndromes

- a. Patella tendonitis – jumpers knee
 - i. nonoperative
- b. IT band syndrome
 - i. Down hill running and 30° of flexion
- c. Medial Tibial Stress syndrome
 - i. Shinsplints
 - ii. Posteromedial tibia
- d. Chronic exertional compartment syndrome
 - i. Anterior compartment > lateral
 - ii. Compartment pressure diagnosis
 - 1. At rest - greater than 15 mm Hg
 - 2. Immediate post-exercise - greater than 30mm Hg
 - 3. 5 minutes greater than 20 mm HG
 - 4. Failure to return to baseline levels 15 minutes post-exercise
- e. Overuse injuries typically occur from a training error

VI. Other Important Areas for study

- a. Malialignment
 - i. Know indications and contraindications for osteotomy
 - ii. Mechanical Axis
 - iii. TKA after osteotomy
 - 1. Patella baja and increased need for lateral release
 - 2. Survivorship not affected
- b. Nerve compression
 - i. Saphenous – surfers
 - ii. Meralgia Parasthetica
 - 1. Lateral femoral cutaneous nerve