Orthopaedic care of the mature athlete

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Objectives
- Review basic principles of musculoskeletal aging.
- Discuss common problems and current orthopaedic treatment.

Basic principles

DEMOGRAPHICS
- By 2030, 20% of the population in the United States will be older than 65 years.
- Older individuals interested in sports and exercise.
- Unclear data to guide recommendations.
- Guidance and treatment should be individualized.
- Age related structural and biochemical changes.
- Athletics are used for coping, time management, and social support.

Physiologic consequences of aging may be reversed by regular exercise.

Performance Decline in Elite Senior Athletes
- Age related performance decline 2.6-4.4% per decade in 50-69 year old athletes.
- 2001 senior Olympics:
  - Minimal performance decline from age 50 to 75 years.
  - 7% decline per year after 75 years.

SYSTEMIC CHANGES WITH AGING
- Biologic
- Genetic
- Aging clock
- Societal Theories

Basic Science of Aging
- Differentiated cells have limited capacity to divide.
- Decrease synthesis of proteins.
- Hormonal decrease:
  - Testosterone
  - Insulin-like growth factor
- Senile sarcopenia.
- Loss of blood supply to collagen
  - Meniscus
  - Rotator cuff
    - Reduction VO2 max
    - Decline lactate threshold.

Muscle Aging
- One third muscle mass loss between 50-80 years.
• Loss of motor neurons.
• Loss of satellite cells (direct cellular regeneration).
• Increase total collagen content.
• Decreased mitochondrial activity.
• Increase cross linking in the actin-myosin chain.
• Decrease blood supply to muscle.

• Result:
  o Muscle become stiffer and susceptible to injury
  o Less able to regenerate
  o Reduced exercise capacity
  o Anorexia of aging

Tendon and Ligament
  o Ligament insertion changes to fibrocartilage
  o Fewer fibroblasts and Ruffini mechanoreceptors
  o Decline in structural properties (Modulus of elasticity).
  o Failure to load less than one third of younger patient.
  o Decreased blood supply to tendon (watershed areas).
  o Rotator cuff tendinitis, lateral epicondylitis and posterior tibialis dysfunction.
  o Micro tears lead to structural failure.

Articular Cartilage
  o No new chondrocytes are produced in the adult.
  o Decrease matrix production
  o No blood supply.
  o Water content decrease with aging.
  o Decrease in chondroitin.
  o Collagen is less flexible.

Meniscus
  o MRI tears in 40% of asymptomatic patients older than 50 years.
  o Fewer fibroblasts and decreased production of matrix.
  o Increased crosslinking of meniscal collagen.
  o Decreased blood supply from 100% at birth to 25% at 50 years.

Exercise is Medicine
  o Exercise improves muscle mass, tendon and ligament strength.
  o Individualize exercise prescriptions.
    ▪ Frequency.
    ▪ Intensity.
    ▪ Duration.
    ▪ Progression.
Modification.
  o Include:
    • Neuromuscular training to improve balance, agility, and coordination.
    • Flexibility.
    • Core training.
    • Strength.
    • Aerobic exercise.

common problems and treatment options

Glenohumeral Arthritis
• PT
• Steroid Injections:
  o only 26% reach the joint when done guided by superficial landmarks. Ultrasound increases accuracy to 88%.
• Surgical Treatment:
  o Sparing the cartilage is the priority
  o Capsular release
    □ Increases joint volume, decreases glenohumeral joint pressure.
  o Arthroscopic Microfracture and debridement.
    □ 80% excellent and good results at 2 years.
  o Interposition arthroplasty.
    □ Anterior capsule, Achilles tendon allograft, lateral meniscus allograft
  o Limited resurfacing arthroplasty
    □ Evidence support is weak.

Rotator Cuff tears
• 22-54% of patients older than 65 years.
• 50% become symptomatic in 2 years.
• Older age and size of the tear associated with retears.
• Partial tears (Fukuda):
  ▪ Bursal side.
  ▪ Intratendinous.
  ▪ Joint-side tears.
• Arthroscopic debridement, subacromial decompression, tear completion and repair.
• Double row repair for large (>3cm) and massive tears.
• 23 of 29 mature golfers return to play to a competitive level.

Massive Rotator Cuff Tear
  ▪ Treatment
    o Biceps tenotomy and rotator cuff debridement
    o Partial repair
    o Tendon transfers
Biologic augmentation
- Reverse shoulder arthroplasty

**Hip Arthroscopy**
- Femoroacetabular Impingement.
- Labral Tears.
- Ligamentum Teres Lesions.
- Chondral lesions.
- Loose Bodies.
- Internal Snapping Hip.
- Lateral Trochanteric Syndrome.
- Joint space narrowing of 2mm or more predicts poor outcome.

**Total Hip Arthroplasty**
- The number of THA is expected to increase to 500,000/year in 2030.
- 90% survival at 15 to 20 years.
- Joint arthroplasty has positive effect on maximum oxygen consumption, workload, and exercise duration.
- Dislocation, infection, loosening and wear are common causes of failure.
- 50 of 52 patients returned to preop activity level.

- Cross-linked UHMWPE is the most widely used bearing.
- Osteolysis threshold of 0.1 mm/y of linear wear.
- Hip Resurfacing
  - Metal on metal.
    - ALVAL, pseudotumors, Ion increase, loosening.

- Less invasive Surgical approach:
  - Anterior Intermuscular
  - Mini-posterior.
  - Faster initial return to unrestricted physical activity
  - No long term differences.

**Knee Osteoarthritis**
- Sex and race
- Obesity
- Occupational
- Sport participation
- Injuries/surgeries
  - Retired British soccer players: 32 to 49% incidence of OA.
  - Retired NFL: 38% incidence of OA.
  - Runners: 14%.
- **Nonsurgical Treatment:**
  - Flexibility
  - Strength
  - Decrease load: weight loss.
  - Education
  - Unloader braces
  - Nutritional supplements:
    - Glucosamine Sulfate + Chondroitin
  - Steroid injections
  - Viscosupplementation

**Non Arthroplasty Treatment of OA**
- Microfracture
- ACI
- Osteotomy
- Meniscal debridement, repair, transplantation.
- Tissue engineering:
  - Signaling molecules (TGF-B, BMP-2)
  - Scaffolds (HA, polymers)

**Total knee Arthroplasty**
- 90% survival rate at 18 years.
- Unicompartmental Knee Arthroplasty
  - Decrease LOS
  - 10 year survival 95%.
  - Revision risk higher in patients younger than 65 years.
- High Flexion Knee:
  - Design to flex 155 degrees.
- Mobile Bearing Design
  - Two contact surfaces.
  - Low contact stress.

**Athletic Activity After Arthroplasty**
- Most surgeons have concerns about unrealistic patient’s expectations to return to extremely high levels of activity.
- Higher activity, higher wear.
- High rate of return to tennis, golf, hiking.
- Higher activity in males, younger than 70 yo, BMI less than 30 kg/m2, unilateral TKA, no other joint limitations.
- Increase in tibial forces greater than 4 times BW in lead leg during golf swing and tennis in instrumented TKA.

**Consensus Guidelines for Return to Activities After THA (The Hip Society and AAHKS)**
CHALLENGES

- We need to prepare for the increase number of mature active patients.
  - Customize exercise prescriptions based on research.
  - Prevent injuries.
  - Individualize programs and equipment for specific sports and patients.
  - Improve neuromuscular training and flexibility.
  - Tissue engineering and non arthroplasty treatments.

THANK YOU