Physiology of Common Injuries in the aging Athlete

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Disclosure

- I, M. Susan Guyer, speaking at the 32nd Fall symposium at the New Hampshire Musculoskeletal Institute have:
  - no relevant financial relationship to disclose

  and
  - will not discuss off label use or investigations used in my presentation.

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Objectives

- 1.Describe the physiological changes associated with aging, including alterations in bone density, musculotendinous junctions, and joint flexibility.
- 2.Identify and differentiate common injuries in aging athletes, including osteoarthritis, tendinopathies, meniscal abnormalities, and stress responses.
- 3.Formulate a differential diagnosis for musculoskeletal conditions commonly seen in the aging athletic population.

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Physiologic Changes over Time

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Editors' notes

AAOS: sports-related orthopedic injuries in seniors projected to grow 123 percent by 2040

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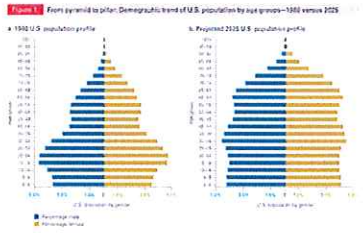

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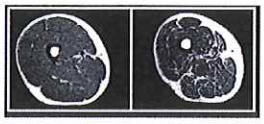
STAR – Pathological Triad

Cross-sectional images of a thigh in a 25-year-old (left) and a 65-year-old (right) man. MRI shows significant loss of muscle fibers and fat infiltration in the older, sarcopenic muscle (right)



Giuseppe Serge, Caterina Trevisan, Nicola Veronese, Paola Lucato, and Enzo Manzato. Imaging of sarcopenia, European Journal of Radiology Volume 85, Issue 8, 2016, Pages 1518-1524, ISSN 0720-048X,https://doi.org/10.1016/j.ejrad.2016.04.009

- A pathological triad of inter-related disorders that are highly prevalent in elderly subjects consists of the following main "components":
  - Sarcopenia
  - Tendinopathies
  - Arthritis

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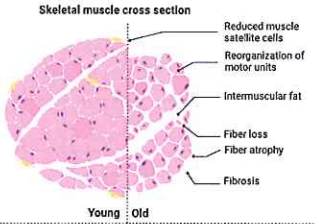
Aging Muscles

Atrophy of FT fibers
Loss of motoneurons
Degradation of NMJ



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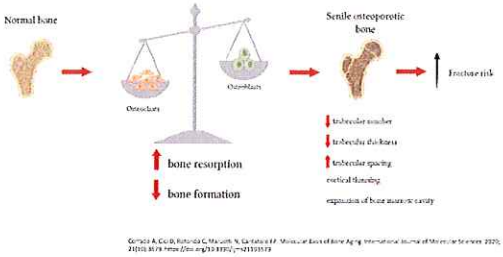
Bone Changes



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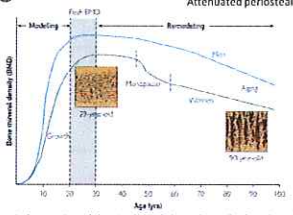
Bone

Decreased cellularity of periosteum
More empty osteocytes lacunae
Fatty infiltration of bone marrow
Attenuated periosteal response to growth factors



Skeletal changes in bone mineral density (BMD) throughout the female and male life span, including representative micrographs of cadaveric bone from 29-year-old and 90-year-old women showing the progressive loss of bone with aging.

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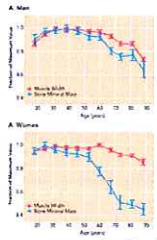
Bone Changes



- Aging-related changes in bone mineral mass of the radius and muscle width in the forearm in adult men and women
- Peak value for bone and muscle to show relative changes across the lifespan for men (A) and women (B).

Physiology (Bethesda). 2015 Jan; 30(1): 8–16. doi: 10.1152/physiol.00033.2014

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Changes with Age – Ligaments

- Less elastic and able to resist load.
- Changes on the cellular level, with less cellularity and alterations in the extracellular matrix.
- Changes to microarchitecture such as more disorganization of collagen fibers.
- Vascular changes.
  - These age-related changes put ligaments at risk for rupture and affect the ability of the ligaments to heal.

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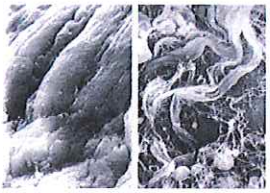
Tendon - Changes with Age

- Tendons undergo changes at the cellular level.
- The healing ability is then compromised.
- On a macroscopic scale, tendons become more stiff and less able to respond normally to mechanical load.
- All of these changes put tendons at risk for frank injury or to tendinopathic and degenerative changes.



Collagen Bundles from a Young (L) and Old Tendon (R)

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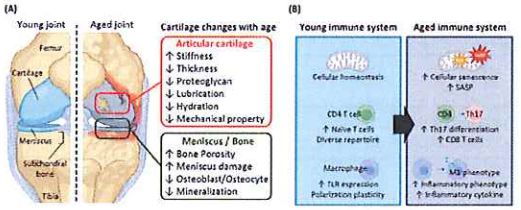
Joint Changes with Aging



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Injuries

- The most common injuries seen in the older athlete are muscle and joint injuries.
- Seventy-five per cent of these injuries involve the lower extremities, with the knee being the most commonly injured body site followed by the foot and ankle.
- Athletes involved in strength or power sports sustain mostly acute sprains.

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Differential diagnosis

- Broader and more nuanced
- Older athletes have different risk profiles
- Older athletes have more atypical presentations.

- Age
- Previous injuries
- Structural alignment
- Structural integrality
  - Muscle health
  - Bone health
- Overall physical fitness
  - Type of training
- Chronic diseases
- Medications
- Nutrition

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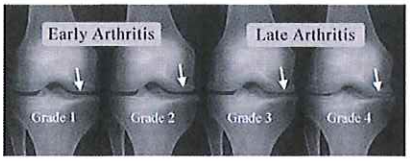
Osteoarthritis

- Affects 1/3 of middle aged and older adults
- Chronic pain
- Classic Knee presentation
  - Unable to fully extend the knee
  - Varus knee(s)
  - Unable to discern the patella
  - Medial Joint line pain



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Chondrocalcinosis

- Chondrocalcinosis, also known as calcium pyrophosphate deposition disease (CPPD), is a type of arthritis in which calcium crystals accumulate in joints, most commonly in the knee.
- The deposits cause irritation that leads to inflammation, joint degeneration, and cartilage damage.
- Symptoms of chondrocalcinosis are similar to gout and other types of arthritis.
- The condition can be diagnosed by examining joint fluid. Treatments include oral painkillers, joint fluid extraction, and injected steroid drugs.

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Osteonecrosis of the Knee

- Spontaneous vs. Secondary
- Superficial necrotic lesion vs. numerous lesions
- Occurrence increases with age
- Medial femoral condyle most common

X-ray shows osteonecrosis at the lower end of the femur (straight) in the medial femoral condyle. *Reproduced from JF Sarwark, ed: Essentials of Musculoskeletal Care, ed 4. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2010*

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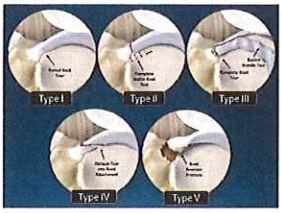
Posterior Meniscal Root Injury



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Summary

- Understanding the biological and physiological factors involved with healing is critical.
- Appreciate the nuance of the history and differentials.
- Aging adds complexities that significant influences the healing process.

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