

Managing Overuse Injuries

Objectives:

- Discuss the etiology of overuse injuries
- Describe common overuse injury forms
- Describe basic management principles
- Provide case study example of management

Important Concepts

(STOMP, STOMP)

- Making an accurate patho-anatomic diagnosis is critical
- For every injury (victim) there are underlying causes (culprits)--not limited to just “overuse”
- Rest and NSAIDs alone do not heal
- Rehabilitative exercise is the cornerstone for healing



Epidemiology of Overuse Injuries

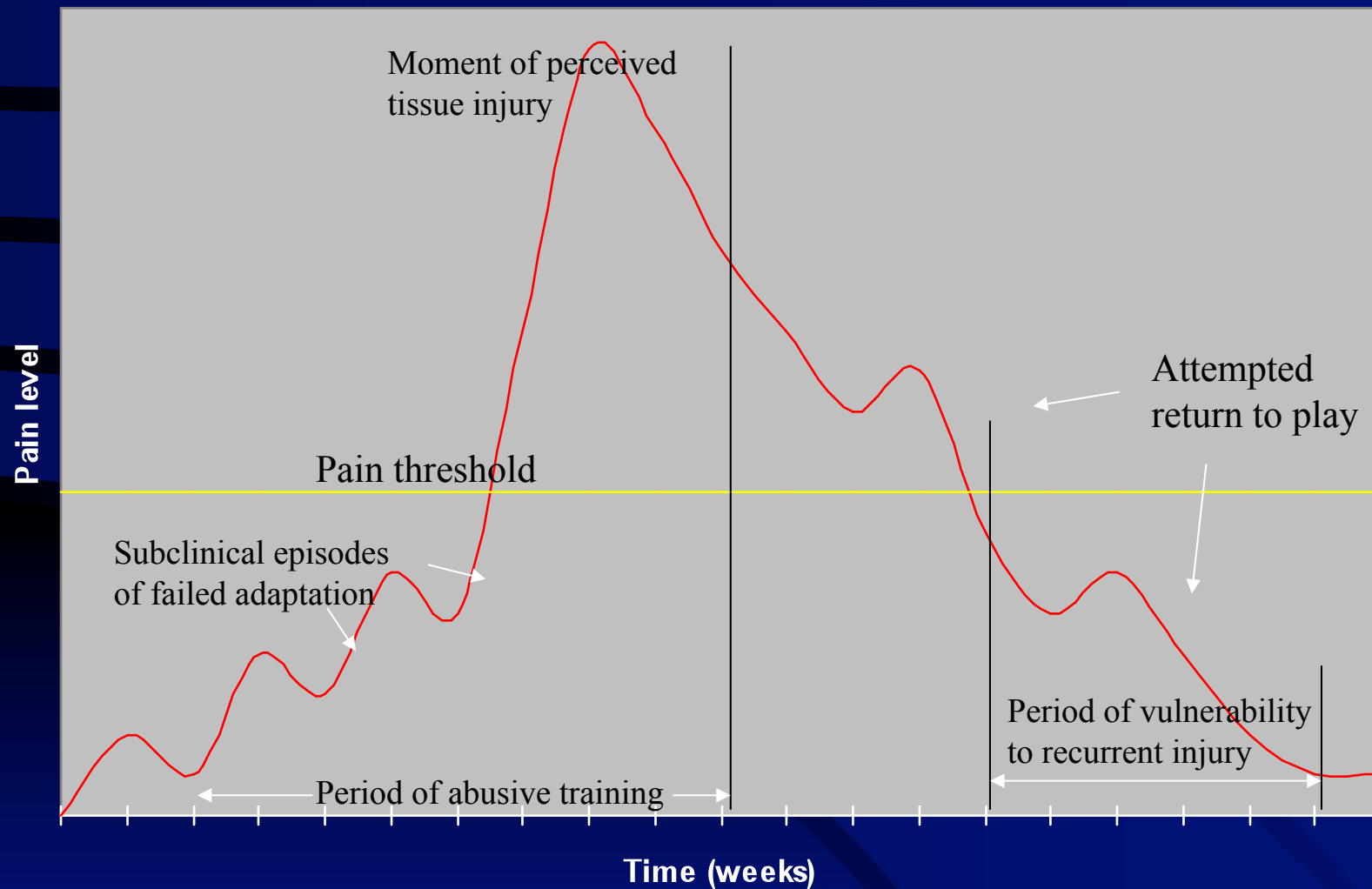
50-65% of sports injuries seen in primary care are secondary to overuse.



Two types of athletic injury

- Macrotrauma: specific episode of trauma with acute tissue disruption.
- Overuse: *microtraumatic* injury that results when an anatomic structure is exposed to a repetitive, cumulative force where the body's reparative efforts are exceeded and local tissue breakdown occurs.

Profile of Microtraumatic Soft-Tissue Injury



Key features of overuse injury

- Sub-clinical injury occurs before the patient feels it
- The normal soft-tissue repair process is aborted
- Degeneration cycle begins instead
- Soft-tissue degeneration is NOT inflammatory



Etiology of Overuse Injuries

KEY CONCEPT: VICTIM AND CULPRITS

- For every overuse injury (victim) there is an underlying cause (culprit)

Examples of Victim and Culprits

- Runner with knee pain
 - Culprit = inflexible iliotibial band; hill running
 - Victim = tender lateral femoral condyle
- Athlete with Achilles tendinosis
 - Culprit = foot hyperpronation; old shoes
 - Victim = overstretched Achilles tendon

Risk factors for Overuse Injury: The Usual Culprits

- Intrinsic abnormalities
- Extrinsic abnormalities
- Sports-imposed deficiencies

Intrinsic abnormalities

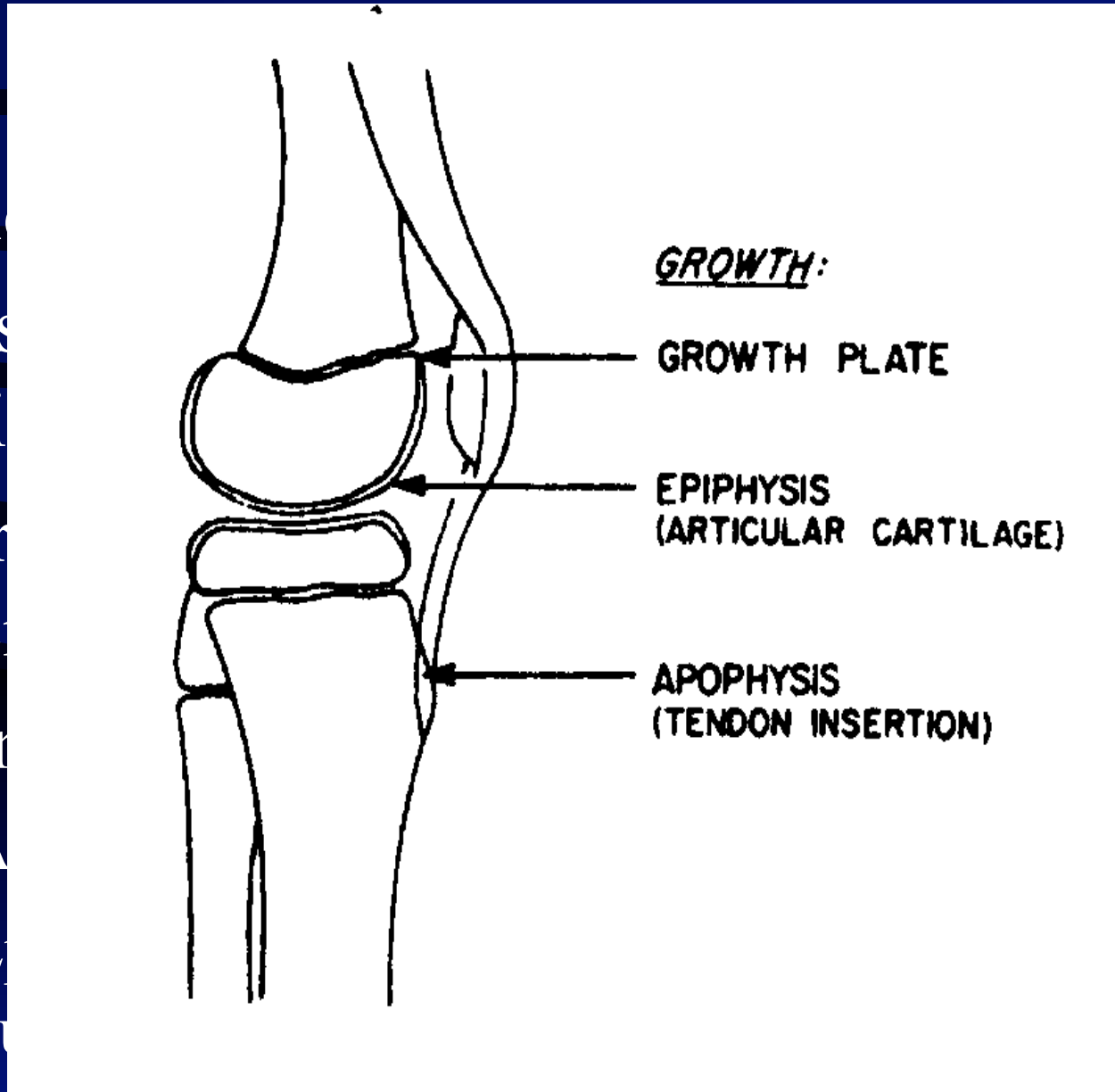
- Mal-alignment of body parts
- Instability of joints
- Imbalance of muscle strength
- Weakness of muscles
- Inflexibility
- Rapid growth

Examples of intrinsic abnormalities

- Foot morphology
 - high-arch (pes cavus) with highest risk (6x),
 - flatfoot (pes planus) with moderate risk
- Iliotibial band inflexibility-->ITB syndrome
- Genu valgum --> higher risk of PFS
- Rotator cuff weakness --> impingement

Growth: example of intrinsic risk

- Uni
- Mus
- rapi
- Incr
- mic
- Mar
- A
- E
- h



ds of

Extrinsic abnormalities

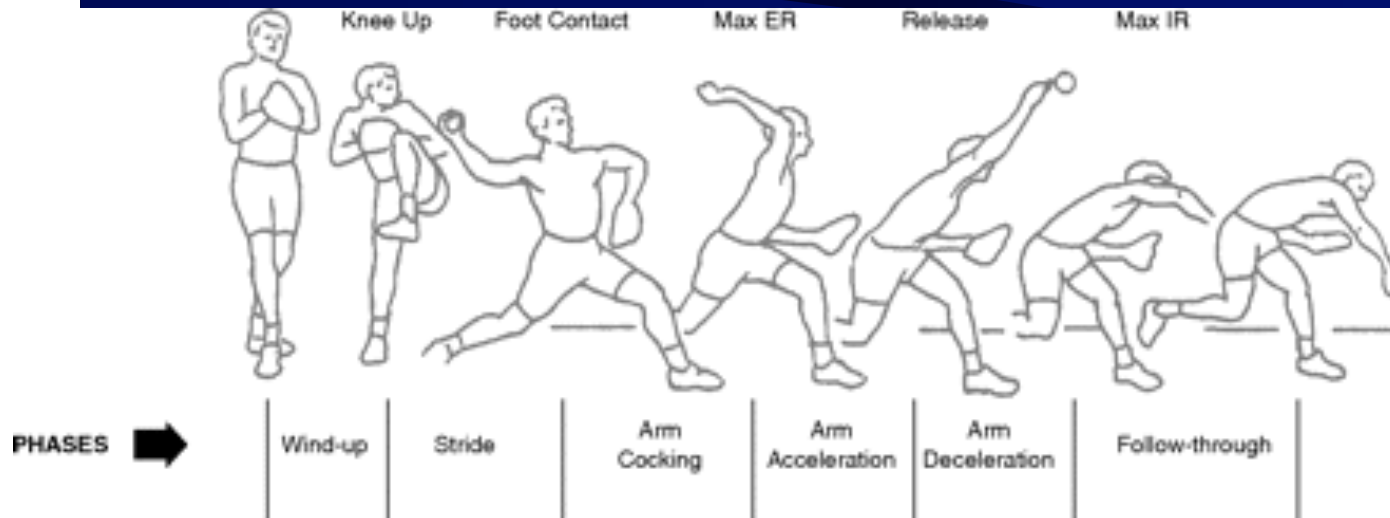
- Training errors
- Equipment mismatch/failure
- Technique errors
- Environment factors

Examples of Extrinsic risk factors

- Training error: running too fast, too soon
- Equipment mismatch: cycle poorly fitted, seat height incorrect
- Technique error: improper racquet swing
- Environment factor: running on pavement

Sports-Imposed Deficiencies

- Repetitive eccentric overload
 - Example: pitching → posterior structure damage



“Musculoskeletal adaptations and injuries due to overtraining”

Kibler WB et al. *Exercise and Sports Sciences Review* 1992,
Vol 20:99-126.

Vicious Injury Cycle of Overload

- Tissue overload, leads to...
- Tissue injury, leads to...
- Functional biomechanical deficit, leads to...
- Adaptive change in technique
 - leads to more tissue overload, and the cycle continues

Vicious Injury Cycle of overload

**Musculotendinous
tensile overload**

Clinical symptoms
Decreased performance

**Substitute
biomechanical
movements**

**Muscle
damage**

1. Microtears
2. Macrotears

Subclinical adaptations

1. Muscular weakness
2. Inflexibility
3. Scar tissue
4. Muscle strength imbalance



Example of overuse

1. Tensile load on posterior shoulder muscles

**Musculotendinous
tensile overload**

Clinical symptoms
Decreased performance

**Substitute
biomechanical
movements**

4. Alteration of
throwing
motions

**Muscle
damage**

2. Micro-tears to
Infraspinatus
and Teres minor

Subclinical adaptations

3. External rotation
strength imbalance



History of Present Illness

- Date of onset
- Changes in routine
 - intensity of workouts
 - equipment
 - location of activity
- Aggravating/relieving activities
- History of interventions

Looking for culprits - think of the risk factors again

- Intrinsic abnormalities
- Extrinsic abnormalities
- Sports-imposed deficiencies

The concept of “Transition”

- “Transition” - some change in the use of the involved body part
- Identify what changed before symptom onset
 - e.g. increased running mileage preceded knee pain
 - e.g. getting a new pair of boots/shoes led to plantar fascia pain

Evaluating biomechanics

- Limb examination
 - Flexibility, ROM, strength, ligament stability, leg length
- Examine patient while standing
- Watch patient walk/run/swing racquet, etc.
- Consider referral
 - Video gait analysis
 - Ergonomist evaluation
 - Professional coach/trainer



Assessing equipment

- Wear pattern of shoe soles
- How well a device fits the user
- Proper use of device



Common Overuse Injury Forms

- Musculoskeletal
 - Bone
 - Tendon
 - Muscle
 - Cartilage
 - Joint capsule
 - Nerve
 - Ligament
 - Bursa
- Non-Musculoskeletal
 - Overtraining Syndrome
 - Female Athlete Triad

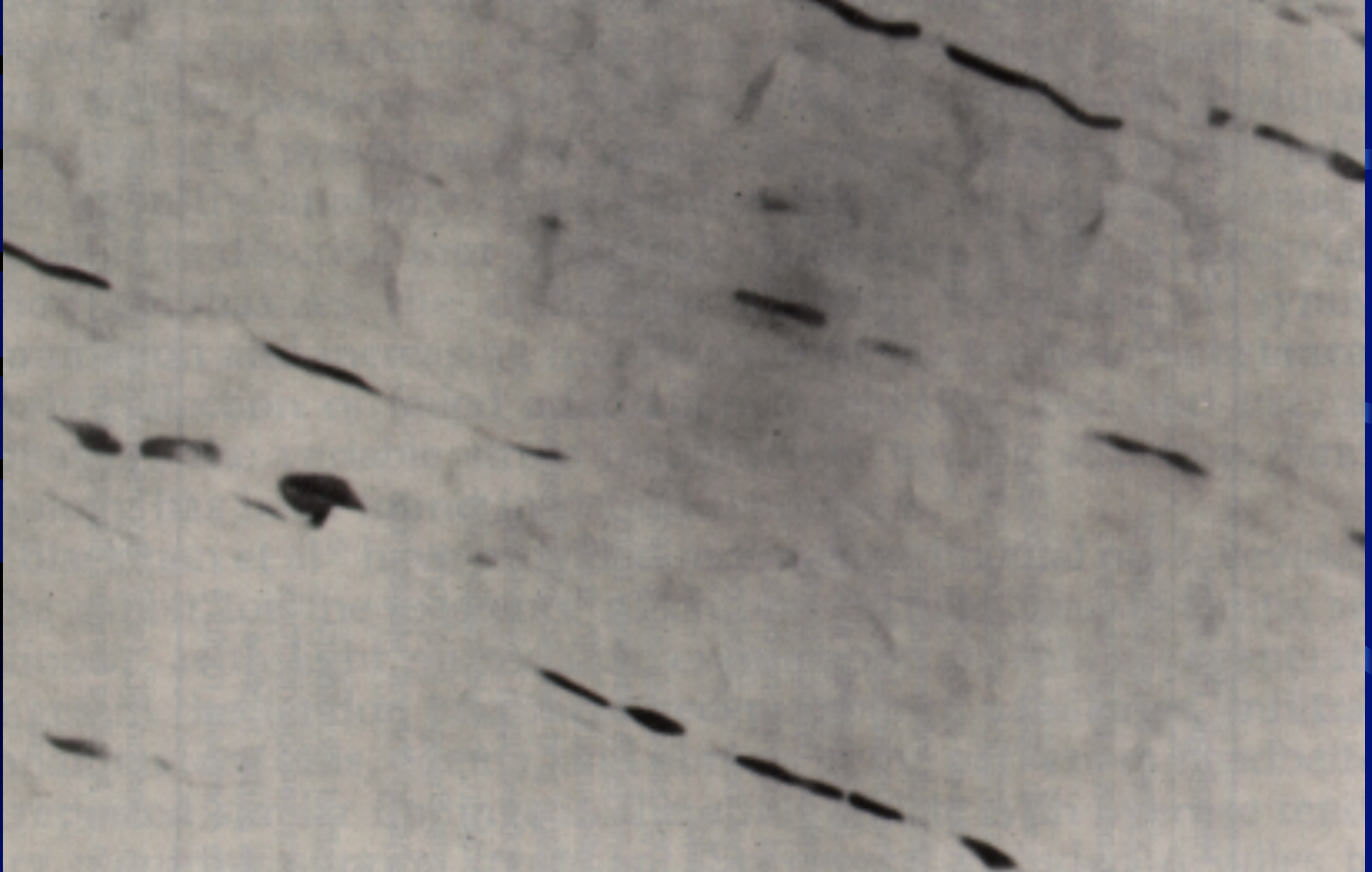
Examples of bone overuse injuries

- Stress fracture culprits:
 - muscle weakness
 - hypoestrogenemia
 - biomechanical problems
 - overtraining, etc.

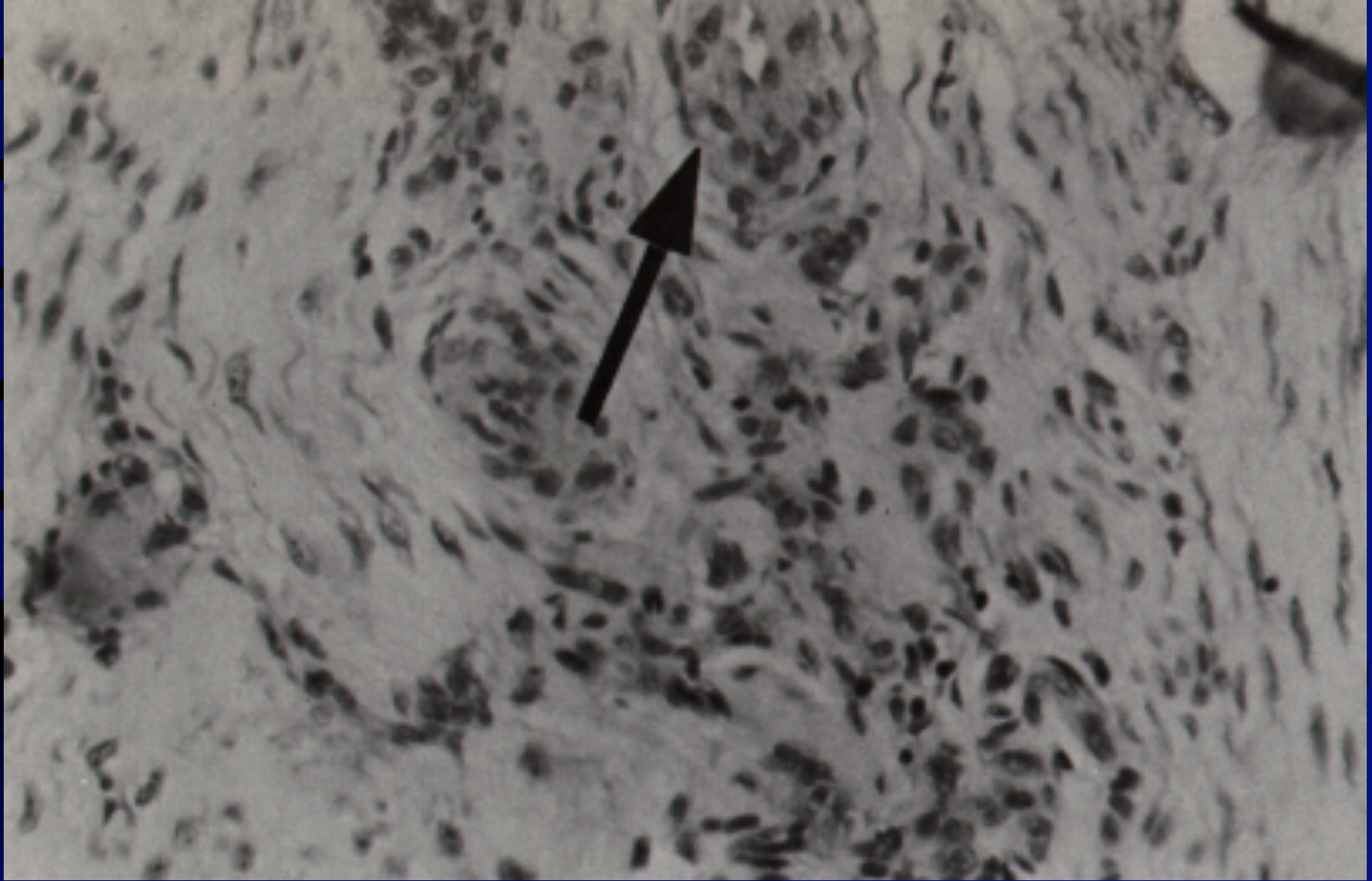
Tendon Overuse Injuries

- Tenosynovitis - inflammation in the tendon sheath
- Paratenonitis - inflammation of only the loose areolar tissue within the tendon compartment.
- Tendinitis - symptomatic degeneration with vascular disruption and inflammatory repair.
- Tendinosis - intra-tendinous degeneration from repetitive microtrauma; NON-inflammatory intra-tendinous collagen degeneration.





Normal tendon



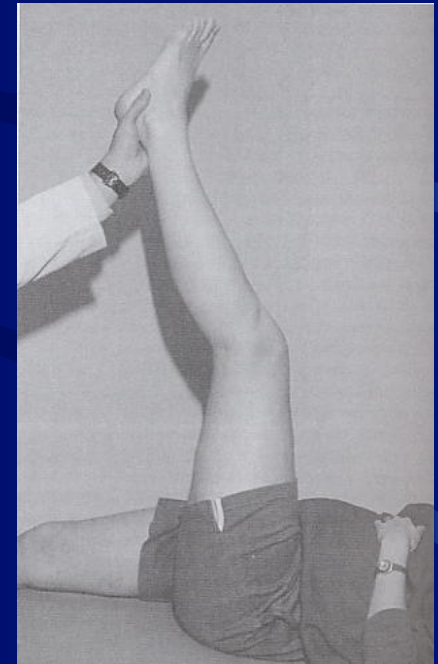
Tendinosis: collagen disruption and neovascularization

Examples of muscle overuse injury

- Muscle strains
 - Culprits
 - prolonged overtraining
 - weakness
 - opposing muscle tightness

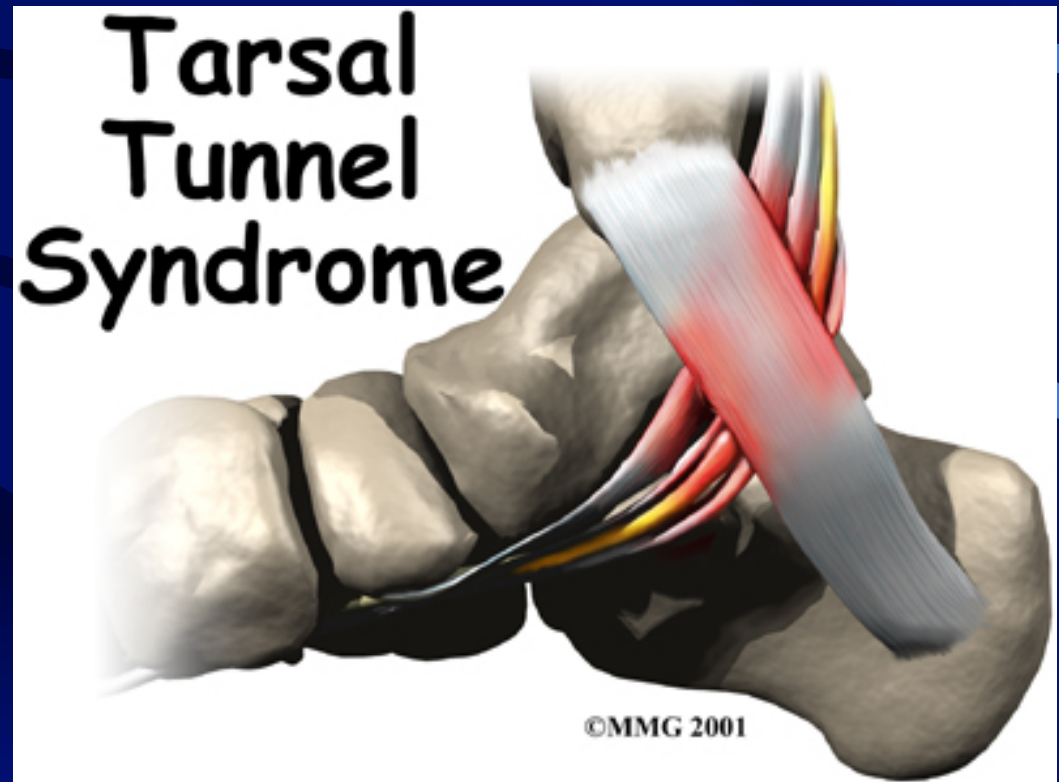
Example of cartilage overuse injury

- Patellofemoral syndrome culprits:
 - hamstring inflexibility
 - relative quad weakness
 - hyperpronation
 - lateral patellar retinaculum tightness
 - overtraining



Examples of nerve overuse injuries

- Tarsal tunnel syndrome culprits:
 - hyperpronation
 - overtraining
 - ganglions/lipomas



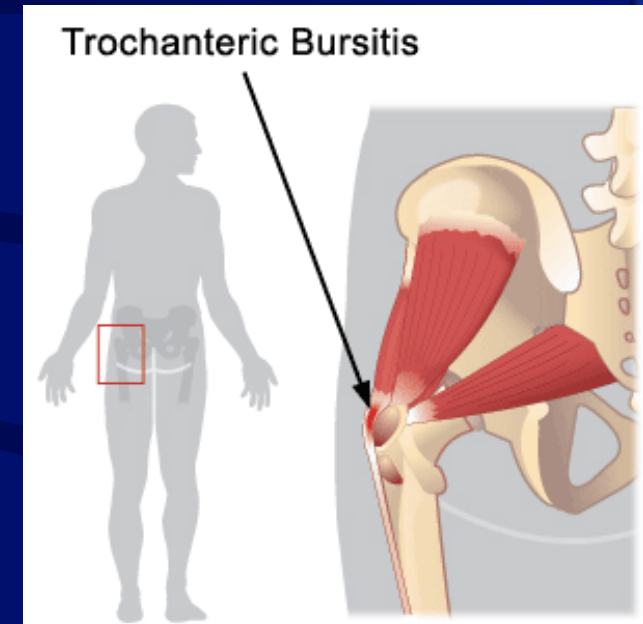
Examples of ligament overuse injury

- Plantar fasciitis culprits:
 - Achilles inflexibility
 - pes cavus/planus, hyperpronation
 - worn-out running shoes
 - leg length discrepancy
 - overtraining
 - intrinsic foot muscle weakness



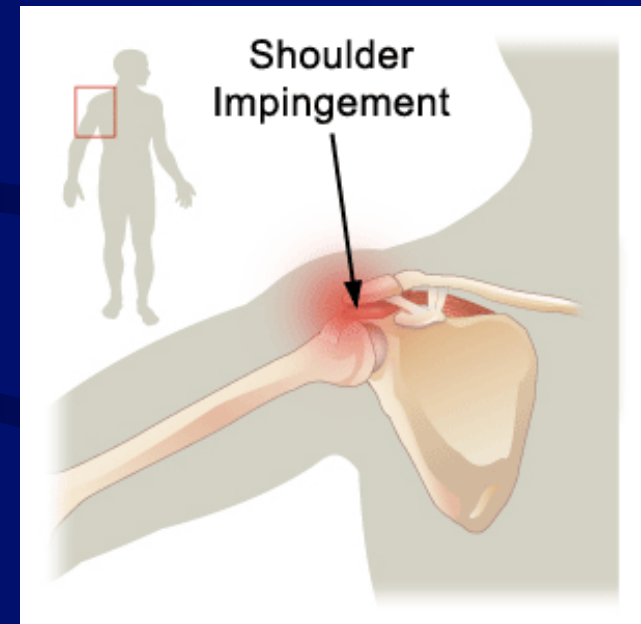
Examples of bursa overuse injuries

- Trochanteric bursitis culprits:
 - iliotibial band inflexibility
 - relative adductor weakness



Example of mixed overuse injury

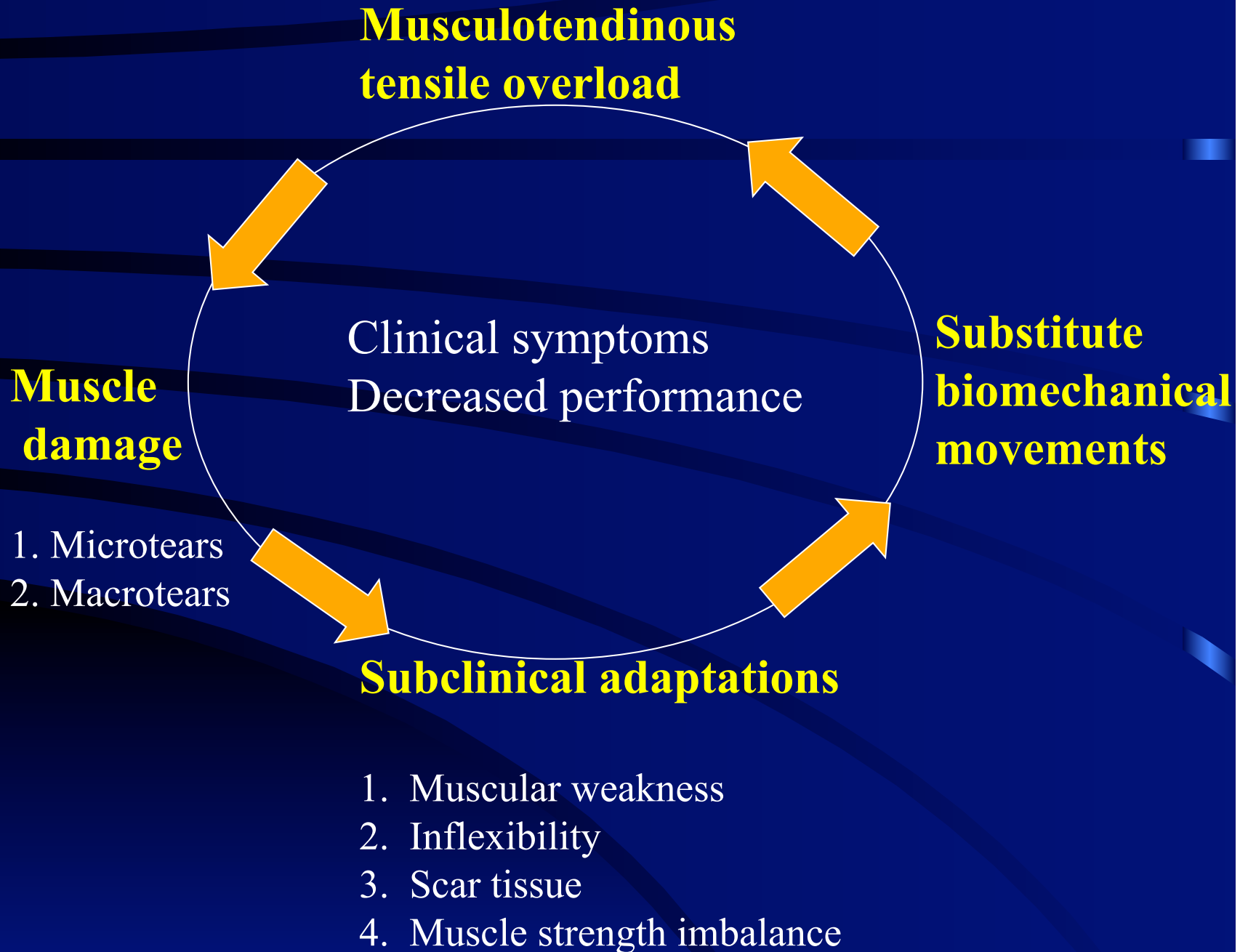
- Rotator cuff impingement
 - Muscle, tendon, bursa injury
 - Culprits:
 - RC weakness relative to deltoid
 - improper arm movements
 - overtraining
 - hooked acromion
 - Scapular dyskinesis



Management of Overuse Injuries



BREAK the Vicious Injury Cycle of overload



Overuse Injury Management Pyramid



1. Make accurate patho-anatomic diagnosis

- Accurate history
- Thorough physical examination
- Biomechanical evaluation
- Selected diagnostic tests

Possible diagnostic tests

- Plain radiographs
- Stress testing
- Selected lab tests
- Specialized tests
 - Bone scan
 - MRI



Overuse Injury Management Pyramid



2. Control of inflammation: “PRICEMM”

- P - Protect
- R - Rest (relative)
- I - Ice
- C - Compression
- E - Elevation
- M - Medications
- M - Modalities

PRICEMM: Protection

- Protect body part from further injury
 - *Splint
 - *Padding
 - *Orthotic



PRICEMM: Relative Rest

- Cease abusive activity temporarily
- Should be active rest
- Limit immobilization to minimum
 - Prevents atrophy and loss of ROM

PRICE-MMM:

Ice

- Minimizes swelling
- Decreases pain
- Application:
 - 20 min
 - Every 3 hours
 - 3 days



PRICEMM: Medications

- NSAIDs
 - No scientific support for long-term benefit in overuse injury
 - Adverse reactions common
 - Probably only benefit is analgesic
 - consider other analgesics
 - 7-14 days probably enough



PRICEMM:

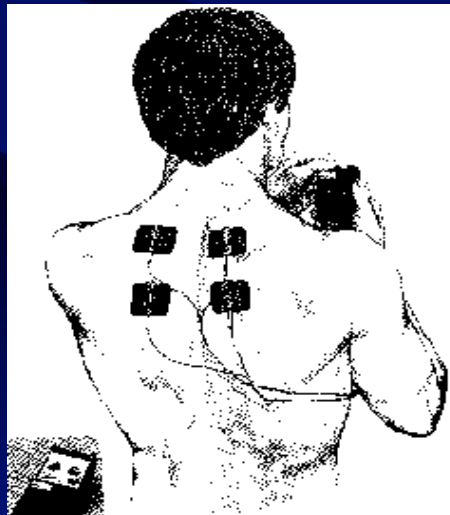
Medications (cont.)

- Corticosteroids - potent anti-inflammatory
 - Decrease collagen production and weaken tendons
 - Unclear role in overuse injury
 - Consider for:
 - Severe pain that limits rehabilitation
 - Refractory pain after other treatments
 - Limitations
 - Never into a tendon
 - Up to 3 times a year in one place



PRICEMM: Modalities

- Vague theoretic principles
- Analgesia
- ? Affect on inflammation
- May limit muscle spasm/atrophy



Overuse Injury Management Pyramid



3. Promote healing

- Therapeutic exercise
 - correct weakness or imbalance
- Healing injections
- Select surgical intervention



Therapeutic exercise

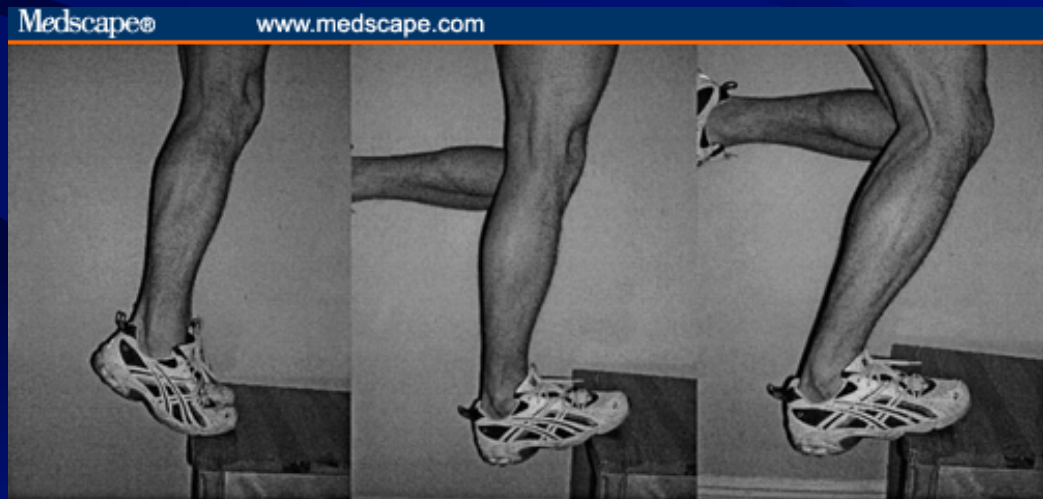


- Strength
- Flexibility
- Proprioception



Strength exercise types

- Isometric - useful if ROM poor
- Isotonic
 - Concentric - good initially once ROM restored
 - Eccentric - enhances strength, repairs tendons
- Isokinetic



A

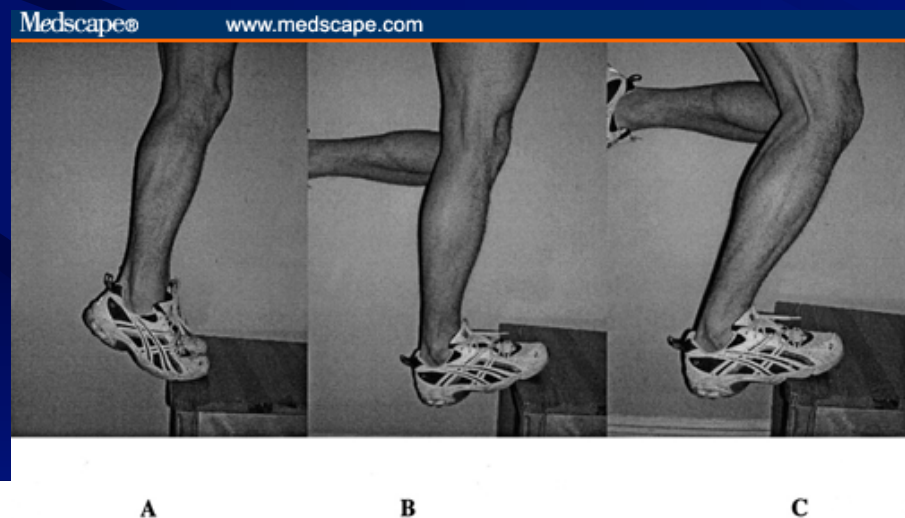
B

C

“Chronic Achilles tendinosis:
recommendations for treatment
and prevention.”

Alfredson H et al. *Sports Medicine*
2000 Feb (29): 135-146.

- Patients had failed other treatments such as PRICEMM, casting, rest, stretching, etc.
- Progressive heavy-load eccentric heel cord exercises BID, 7d/wk, 12 weeks
- 2-year f/u: 14 of 15 patients able to resume running without pain



Therapeutic Injections

- Autologous blood
- Platelet-rich plasma



Surgical Intervention--Indications

- Failed quality rehabilitation
- Unacceptable quality of life
- Persistent pain



Overuse Injury Management Pyramid



4. Fitness exercise

- Aerobic exercise
- Transition exercise
- Sport-specific exercise

Aerobic exercise

- Enhances peripheral oxygenation to speed healing
- Enhances psychological well-being
- Enhances return to sport

Aerobics



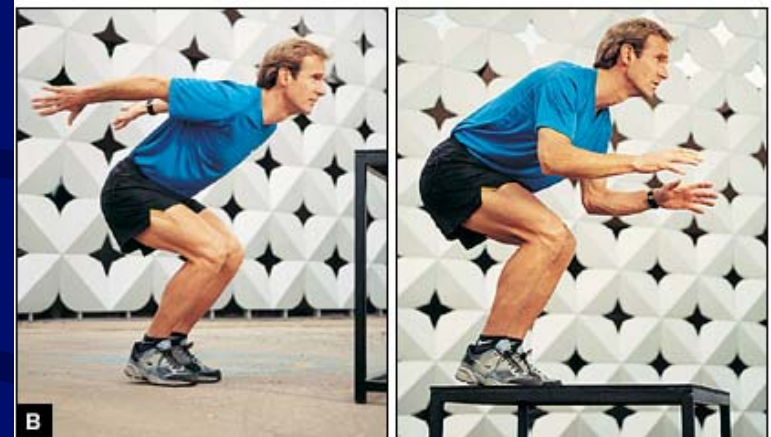
Transition exercise

- Activities closer to the goal activity
- Less stress on injured body parts



Sport Specific Exercise

- Training to fit the demands of sport, occupation, or hobby



Overuse Injury Management Pyramid



5. Control Abuse

- Modify extrinsic overload
 - technique
 - training
- Bracing and taping
- Proper equipment



“Prevention of common overuse
injuries by shock absorbing
insoles.”

Shwellnus NP, Noakes TD.
American Journal of Sports Medicine
1990, Vol 18(6).

- Prospective study involving military recruits
- Neoprene insoles vs controls with none
- Pts with insoles had significantly lower incidence of:
 - Overuse injuries overall
 - Shin splints



Overuse Injury Management Pyramid





The goal:

Activity Participation

- Sports
- Recreation
- Fitness exercise
- Maintain ongoing rehab program

Case Study: 28 year old elite taekwondo athlete with heel pain



1. Make accurate patho-anatomic diagnosis

- History: abnormal transition increase in training volume ($>10\%$ per week)
- Physical exam: pain at insertion of plantar fascia near medial calcaneal tubercle
- Diagnosis: plantar fasciitis

But on closer exam:

- Gastro-soleus inflexibility and weakness
- Pes planus
- Excessive pronation
- Weak toe flexors
- Running shoes old, excessive wear on medial aspect of sole

Gastro-soleus inflexibility & weakness, pes planus, hyperpronation.
Excessive eccentric overload of plantar fascia

**Musculotendinous
tensile overload**

Clinical symptoms
Decreased performance

**Substitute
biomechanical
movements**

Forefoot running,
slower pace,
decreased distance

**Tissue
damage**

Excessive tension
on calcaneal
insertion

Subclinical adaptations



2. Control inflammation (PRICE MM)

- Ice massage TID x 15 minutes
- 1 week course of NSAID

3. Promote healing

- Gastro-soleus stretching & strengthening
- Toe flexor strengthening

4. Fitness exercise

- Deep-water running
 - Pain with walking and palpation gone 2 wks
- Resume running
 - No hills or speed work at first
 - Increase mileage 10% per week
 - Cross train in pool

5. Control abuse

- Stop running initially; deep water running instead
- Fitted for orthotics
- New running shoes

Returned to full training at 1 month

- Continue flexibility and strength exercises
- Won national championship 2006

Summary/Review

- Overuse injuries are the most common and most challenging in athletics
- For every “victim” there is a “culprit”
- The H&P remain the key elements in management (1. Make accurate patho-anatomic diagnosis)
- Rest and NSAIDs alone do not heal
- Rehabilitative exercise is the cornerstone for healing

USA Boxing National Champion

DeAndrey Abron

