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
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

- Period of abusive training
- Subclinical episodes of failed adaptation
- Moment of perceived tissue injury
- Pain threshold
- Attempted return to play
- Period of vulnerability to recurrent 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

- Unique to the growing athlete
- Muscle-tendon imbalance during periods of rapid growth
- Increased susceptibility to repetitive microtrauma
- Manifestations:
  - Apophysitis - Osgood-Schlatter's, Sever's
  - Epiphysial traction injury - e.g. proximal humerus
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”

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
Clinical symptoms
Decreased performance

Musculotendinous tensile overload

Muscle damage
1. Microtears
2. Macrotears

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

Substitute biomechanical movements

Vicious Injury Cycle of overload
Clinical symptoms
- Decreased performance
- Subclinical adaptations

Musculotendinous tensile overload

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

Example of overuse
- 1. Tensile load on posterior shoulder muscles

Musculotendinous tensile overload

Clinical symptoms
- Decreased performance
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.
- **Tendonitis** - symptomatic degeneration with vascular disruption and inflammatory repair.
- **Tendinosis** - intra-tendinous degeneration from repetitive microtrauma; NON-inflammatory intra-tendinous collagen degeneration.
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
Clinical symptoms
Decreased performance

Musculotendinous tensile overload

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

Muscle damage
1. Microtears
2. Macrotears

Substitute biomechanical movements

BREAK the Vicious Injury Cycle of overload
1. Make accurate patho-anatomical diagnosis
2. Control inflammation
3. Promote healing
4. Fitness exercise
5. Control abuse
Activity participation
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

1. Make accurate patho-anatomical diagnosis
2. Control inflammation
3. Promote healing
4. Fitness exercise
5. Control abuse

Activity participation
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
PRICEMM:

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
• 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

1. Make accurate patho-anatomical diagnosis
2. Control inflammation
3. Promote healing
4. Fitness exercise
5. Control abuse

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

• 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

1. Make accurate patho-anatomical diagnosis
2. Control inflammation
3. Promote healing
4. Fitness exercise
5. Control abuse

Activity participation
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

1. Make accurate patho-anatomical diagnosis
2. Control inflammation
3. Promote healing
4. Fitness exercise
5. Control abuse

Activity participation
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
• 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

1. Make accurate patho-anatomical diagnosis
2. Control inflammation
3. Promote healing
4. Fitness exercise
5. Control abuse

Activity Participation
The goal: 

Activity Participation

- Sports
- Recreation
- Fitness exercise
- Maintain ongoing rehab program
Case Study:

28 year old elite taekwondo athlete with heel pain

- 2 months right heel pain
- Dramatically increased running 1 mo ago
- Pain worst on rising in AM, better when running on forefoot
- Pain with ADLs
- Competes in Nationals 2 months
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
Clinical symptoms
- Decreased performance

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

Musculotendinous tensile overload

Tissue damage
- Excessive tension on calcaneal insertion

Substitute biomechanical movements
- Forefoot running, slower pace, decreased distance
2. Control inflammation (PRICEMM)

- 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

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