Overuse syndromes

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Assistant professor in Orthopedics, Medical School, University of Patras
Musculoskeletal Overuse syndromes

Hard tissues
- Bones
  - Fatigue fxs
  - Insufficiency fxs
    - Brittle fxs
    - Atypical fxs
  - Pathological fxs

Soft tissues
- Muscle, tendon, ligaments, nerves
  - Overuse injuries
  - Cumulative trauma disorders
  - Repetitive strain injury (RSI)
  - Entrapments
Lateral epicondylitis
  *Tennis elbow*

Medial epicondylitis
  *Golfer’s elbow*

Musician’s hand

Trochanteric bursitis
  *Ballet dancers, Runners*

Patellar tendinitis
  *Jumper’s knee*

Chondromalacia patellae
  *Runner’s knee*

Tibial periostitis, shin splints
  *Runners*

Pes anserinus tendinitis/bursitis
  *Runners*

Subacromial impingement
  *Throwers, Pitchers, swimmers*

Abductors’ syndrome
  *Football players*

ITB syndrome
  *Long distance runners*

Metatarsalgia
  *Pedal mechanics*

Tibial periostitis, shin splints
  *Runners*
Epidemiology

Activities

- Occupational
  - Ultrasonographers
  - Equestrian athletes
  - Ballet dancers
  - Bicyclists
  - Baseball players
  - Swimmers
  - Triathletes
  - Golfers
  - Bull riders
  - Martial artists
  - Sign language interpreters

- Recreational

- Habitual

Population

- Musicians
- Skeletally immature patients
- College students
- Heavy computer users
- Assembly line workers
- Tailors
- Surgeons
- Dentists
- Nurses
- Soldiers
Epidemiology

Mortality

Morbidity

Loss of livelihood
Economic impact
Health care expenses
Employment discrimination
Depression
Pathophysiology

Acute stress (heavy loads)

Repetitive micro-stresses (cyclic loads)

Acute mechanical failure

Fracture
Rupture

Mechanical fatigue

Overuse injuries
Moment of perceived tissue injury

Pain threshold

Subclinical episodes of failed adaptation

Period of abusive training

Attempted return to play

Period of vulnerability to recurrent injury

Time (weeks)
The rate of repetitive micro-stresses (cyclic loads) exceeds the rate of adaptation and healing of the tissue.

**Micro-stresses:** shear, tension, compression, impingement, vibration, contraction.

Cause micro-injuries to bone, tendons, muscles, ligaments, nerves.

**Adaptation:** the tissues attempt to adapt to the demands placed on them.
Pathophysiology

**Causative factors**
- Friction
- Stress
- Ischemia

**Tissues**
- Tendons
- Muscles
- Cartilage
- Nerves

**Pathology**
- Peritendinitis
- Bursitis
- Tenovaginitis
- Muscle tears
- Cartilage lesions
- Compartment syndromes
- Nerve degeneration
Pathophysiology

Repetitive stresses

Increase of PGL E2
- increase proliferation
- increase collagenase
- decrease collagen synthesis

Increase of NO (nitric oxide)
- affects vasodilatation

Muscle depletion of ATP
- reduction of Calcium
- phospholipase activation
- free radicals generation
- muscle fibers damage

Ischemic injuries to nerves
- axonal degeneration
Factors

**Extrinsic**

1. Training errors
2. Poor equipment
3. Poor training facilities
4. Environment
5. Inadequate footwear

**Intrinsic**

1. Demographic data
2. Physical status
3. Biomechanics
4. Anatomic factors
5. Hormonal factors
6. Nutrition
7. Medication and drug use
8. Systemic disorders
Demographics

Sex
- Hormonal differences
- Activity differences
- Elbow carrying angles
- Q-angles
- Femoral anteversion
- Lean body mass
- Psychosocial phenomena
- Cultural phenomena
- Nutritional disorders
- Different neuromuscular rhythm

- Age
- Race
Physical status

Strength
Flexibility
Laxity

At the beginning of a sport involvement the muscle tone increases rapidly. This causes imbalance between the increased muscle strength and the bone strength. The stress fracture risk is then increases.

Then, when the bone is also mechanically adapted to loads, the risk of a musculotendinous junction failure is higher.
Biomechanic and anatomic disorders

- Elbow: carrying angle
- Hip: anteversion
- Knee: Q angle, varus/valgus
- Tibial: torsion
- Hindfoot: varus/valgus
- Forefoot: hyperpronation/supination
Workup

Labs: CBC, ESR, C-reactive protein, RPR, Antinuclear antibody testing, B12, TSH, Liver function

Electrodiagnostic tests: EMG, nerve conduction studies

Radiography: bony avulsions

Bone scanning: stress fractures

U/S: soft tissue pathology

MRI scanning: subtle and chronic injuries

Usually not required for diagnosis but for differential....
<table>
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<tr>
<th>Phase</th>
<th>pathology</th>
<th>Differential</th>
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| **1st (2-5 secs)** Blood supply | • Cellulitis  
• Acute injuries | **Stress fxs**  
**Overuse injuries** |
| **2nd (5 mins)** Blood pool | • Acute pathology  
• inflammation and vasodilatation | **Stress fxs**  
**Overuse injuries** |
| **3rd (3hrs)** Bone metabolism | • Bone turn over rhythm | **Stress fxs**  
**Periostitis** |
Physical Therapy

Pt education
Supervised use of injured part
Appropriate use of modalities
Development of home exercise program
Psychosocial benefits

Occupational Therapy

Workplace modifications
Adaptive equipment

Physician

Conservative treatment
Surgery

Coaching

Evaluation / modification of ill-fitting equipment
Training modification
Corticosteroid injections

- suppresses migration of PMN leukocytes
- reverses increased capillary permeability
- reduces inflammation

Acute inflammatory cases
- more effective participation in P/T
- reduces likelihood of chronic pain syndrome
NAIDs

decrease the COX enzyme

decrease PGLs precursors & PGLs synthesis

reduces inflammation

in mild to moderate pain

* BUT… If tendinopathy is the case……there is no inflammation…. prescribe simple analgesics

if inflammation is the case…….LT B4 increase ….. PMN leukocytes accumulation
**Muscle relaxants:**  
*(cyclobenzaprine)*  
acts centrally:  
suppress vestibular cerebellar ptws  
inhibits parasympathetic NS  
reduces motor activity of tonic somatic origins

**Narcotic analgesics**  
hydrocodone, acetaminophen

**Tricyclic antidepressants**  
amitriptyline

**Anxiolytic agents**  
zoldipem, (benzodiazepine)

**AVOID “hangover effect”…**  
*Take the night time dose 2-3 hrs before going to sleep*

* adjuncitve therapy for:  
muscle strains  
chronic regional pain syndromes
Nitroglycerin patches

Vitamin C supplements

Procollagen to collagen
**Elbow epicondylar tendinosis.**
- significantly reduced pain
- multiple controlled studies support.

**Cartilage lesions**
- short-term, encouraging!

**Jumper’s knee.**
- short-term, encouraging!

**Rotator cuff tendinopathy**
- conflicting results based on PRP formulation, surgical technique, and size of tendon tear.
- re-tear rate reduction!!!

**Achilles tendinopathy.**
- no differences

**Treatment/management**

**PRPs injection**
**Treatment/management**

- If conservative approaches fail
- If injury is amenable to surgery

**Surgery**

- Nerve decompression
- Lax or failed ligaments repair
- Tendinopathy repair
- Constricted tendon release
- Fascial compartment decompression
- Periostitis elevation
- Osteotomies for axis correction

**Surgeries performed solely for pain relief in the absence of objective findings are notorious for suboptimal outcomes!!!**
**Prognosis**
mostly resolve after 3 to 6 months
recurrences are quite common if cause is not addressed

**Deterrence/Prevention**
Minimize repetition
Optimize technique of the offending activity
Minimize vibration and force
Avoid awkward positioning

Improve job satisfaction
Teach stress management techniques
Teach coping skills
Expert evaluation for equipment
External Impingement syndrome
Tendinitis of long head of biceps
Thoracic outlet syndrome
Shoulder instability
Internal impingement
Narrowing of the “supraspinatous outlet” is the most frequent cause of impingement
Neer CS, 1972
Clinical evaluation

- pain
- tenderness
- painful arc
- + impingement test
- Neer and Hawkins test +
Radiological evaluation

Supraspinatous “outlet” view
προσθιοπίσθια Α/α
διαμασχαλιαία Α/α
προσθιοπίσθια Α/α με
30ο κεφαλουραία κλίση
Υπερηχογράφημα και μαγνητική τομογραφία
Surgical treatment

- Open acromioplasty
- Arthroscopy
Types of acute injuries (mostly throwers)

Medial ligament rupture

Valgus-extension overload syndrome

Osteophyte formation-loose bodies

Medial epicondyle apophysitis (LLES)

Ulnar nerve neuritis

OCD epicondyle

Stress fractures

Avulsion fractures
Mechanism

Throwing = excessive valgus force + extreme extension

1. Tensile forces in medial compartment
2. Searing forces posterior compartment
3. Compression forces lateral compartment
The Thrower’s Elbow: Arthroscopic Treatment of Valgus Extension Overload Syndrome

James D. O’Holleran, MD • David W. Altchek, MD
Medial epicondyle apophysitis

A Clinical and Roentgenographic Study of Little League Elbow

David Wei Hang,* Chien Ming Chao,† and Yi-Shiong Hang,‡ MD
From the *Department of Orthopedic Surgery, Shin Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan, and the †Department of Orthopedics, National Taiwan University Hospital, Taipei, Taiwan

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<th>Separation %</th>
<th>Fragmentation n</th>
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<td>94</td>
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</table>

Stress fracture of the medial epicondyle
Nonunion of Olecranon Stress Fractures in Adolescent Baseball Pitchers

A Case Series of 5 Athletes

Arthur C. Rettig, MD, Todd R. Wurth, MD, and Paul Mieling, MS, OTR, ATC/L
From the Methodist Sports Medicine Center, Indianapolis, Indiana, and The Bone and Joint Clinic, Franklin, Tennessee

Avulsion Fracture of the Ulnar Sublime Tubercle in Overhead Throwing Athletes

John P. Salvo, MD, Louis Rizio III, MD, John E. Zvijac, MD, John W. Uribe, MD, and Keith S. Hechtman, MD
Overuse syndromes of the elbow

Tendinitis-rupture of biceps

Triceps tendinitis

Pronator syndrome

Radial nerve entrapment

Chondromalacie condyles

Olecranon impingement syndrome

Tennis elbow

Golfer’s elbow
Golfer’s elbow

Flexor tendons

Common in golfer’s, tennis players, swimmers, throwers

Repeated flexion/pronation of the wrist

50% ulnar neuropathy
Golfer’s elbow

Pain in medial epicondyle which appears with:

- resisted wrist flexion

- resisted forearm pronation

- + Tinnel sign

Calcium deposits 20%
Golfer’s elbow

Treatment

Mostly conservative

- rest
- pain
- NSAID
- Physiotherapy
- splinting
- cortisone injections
- ultrasound
- modification of throwing

Surgical
Tennis elbow

Extensor tendons lateral epicondyle

Common in tennis players (30%), but also in golf, badminton and heavy workers

Repeated wrist extension and supination
Pain in lateral epicondyle which appears with:

- resisted wrist extension or supination
- + chair test (elbow in extension)

Calcium deposits, fluid
Tennis elbow

Treatment

Mostly conservative

- rest
- pain
- NSAID
- Physiotherapy
- splinting
- cortisone injections
- ultrasound
- modification of throwing
Wrist-hand
Traumatic injuries

Fractures (scaphoid, lunate, radius)

Ligament injuries (SCL)

Fractures of hook of hamate (baseball, tennis)

Fractures of pisiform (tennis)

Wrist dislocations

Chondral injuries

TFCC ruptures
Overuse syndromes

Gymnastics, tennis, volley ball, hand ball

Dorsal radial impingement syndrome

Stress fractures

De Quervain, tendinitis

Carpal tunnel syndrome, ulnar nerve entrapment (Gyon’s canal)

Dislocation of extension carpi ulnaris
Wrist arthroscopy

TFCC rupture
Wrist arthroscopy

Scapholunate dissociation
Hip Arthroscopy

Surgical Goal: Restoration of normal anatomy
Modification of diagnosis in 176 patients (53%). New added diagnoses:
- arthritis (75),
- chondral injuries (34),
- labrum injuries (23),
- bursitis (11)
- loose bodies (9).

172 hips (52%) were treated surgically.
Labrum injuries

Usually no trauma

pain

Catching - block

Common in dysplastic hips,
Loose bodies

Pain and block
Chondromatosis
Condral fragments
Pipkin fractures
External snapping hip (coxa saltans)

Thick portion of posterior rim of iliotibial band or of the anterior part of gluteus maximus which slides over the greater trochanter

arthroscopic Z-plasty
Knee
Overuse syndromes

Jumber’s knee

Iliotibial band syndrome

Quadriceps tendinopathy

Patellar tendinopathy

Chondromalacia patellae
Jumber’s knee
Ankle-foot
Injuries

21% of all athletic injuries

Ligament ruptures

Impingement syndromes

Chondral injuries

Tendinitis

Fractures (talus, 5ou MT)

Stress fractures

Os trigonum

Plantar fasciitis
Type III ankle sprains
Chronic instability

Complete rupture  ATFL & CFL
Bröstrom-Could ligament reconstruction
Footballer’s ankle

a) repeated dorsal/plantar flexion during football

b) Micro chondral damage during contact with the ball
Thank you for your attention