PÉCSI TUDOMÁNYEGYETEM
ÁLTALÁNOS ORVOSTUDOMÁNYI KAR

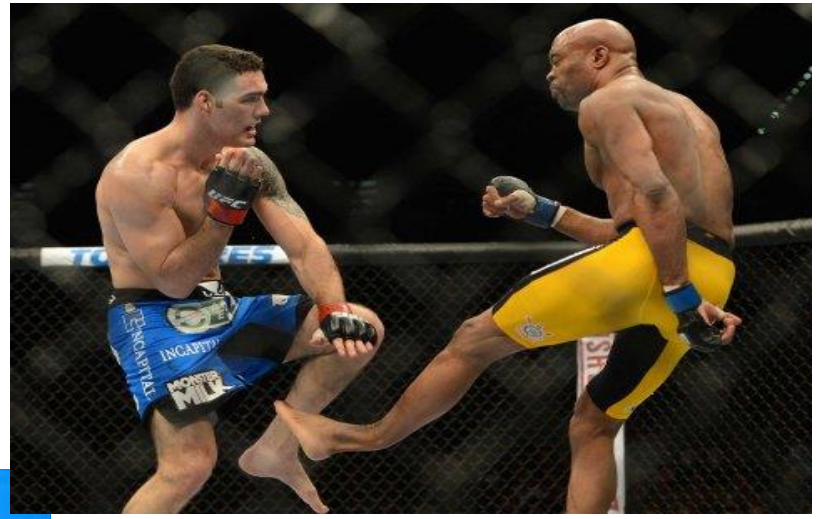
Sport-specific injury prevention

Type of injuries , injury registers

Pécs, 2023.09.12..

Sports injuries

- **Any injury that occurs during sport.**



Sports injuries (definition)

- „ Any type of injury occurs during sport activity and makes it impossible to participate in sport for at least one day”

  USA National Athletic Injury Registration System

- „Any kind of injury sustained during sport, which ...
  - reduces the level of sport activity for at least 1 day after the injury
  - requires medical treatment
  - has negative social or economic consequences

  Council of Europe

Categories of sports injuries

- **Acute injuries** (sport accidents)
- **Overuse injuries**
- Chronic injuries
- Re-injuries

Acute injuries

- **The consequence of a single, sudden macrotrauma.**
- **Bruises, sprains, dislocations, ligament injuries, fractures, muscle injuries, etc..**

Overuse injuries

- Caused by recurrent microtraumas
- Overload, incorrect load
- Regular sports activity over several years, increased stress
- Mainly localised to muscles, tendons, joints
- Can be sport specific

- Can become structurally and functionally irreversible if not properly treated

- Insertopathy-enthesopathy
- Tendinitis, peritendinitis, tendovaginitis
- Periostitis
- Myositis
- Bursitis
- Stress fracture
- Chondropathy, osteoarthrosis

Chronic injuries

- From acute or overuse injuries
- Which are not properly treated or not even recognised

Overuse injury ≠ Chronic injury

Re- injuries

- **Same injury within 1 month of playing sport at the same place**
- **Incorrect assessment of a primary injury**
- **Incorrect rehabilitation,**
- **Premature onset of exertion**

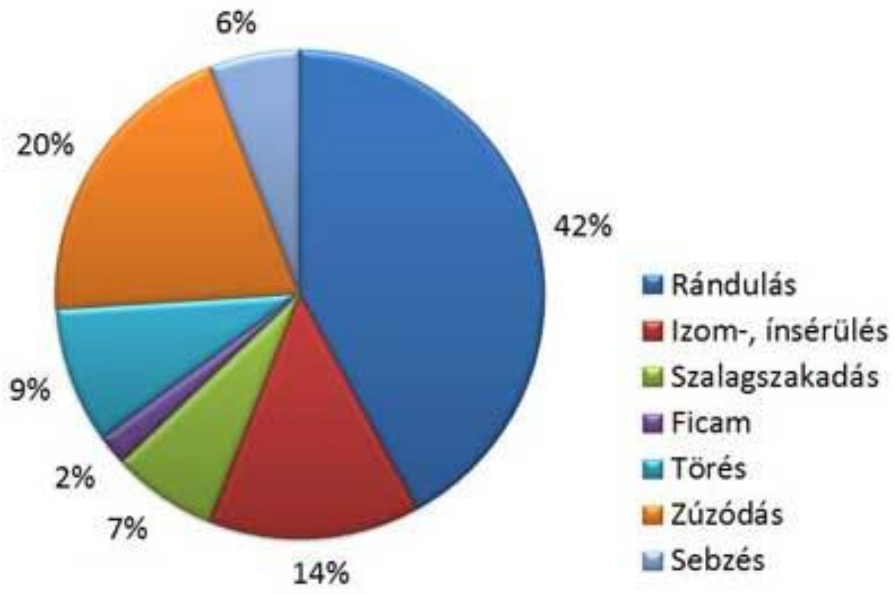
Distribution of sports injuries

- Sports injuries are more frequent (more active lifestyle, increased expectations, rules...)
- Sport-specific injuries vary by country
- More than 60% of injuries affect the lower limb
- Typically common in the 16-22 age groups
- Overuse injuries are resposible for 50-60% of injuries

Distribution of sports injuries

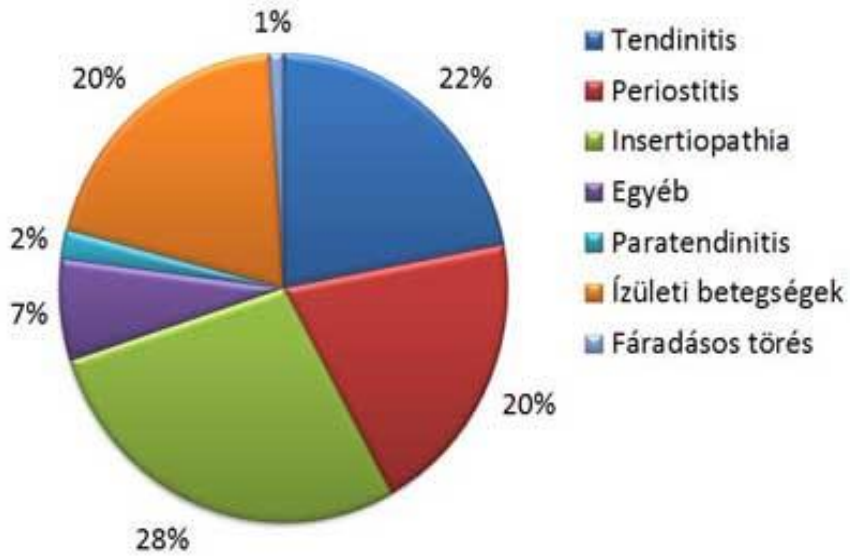
- **Acute injuries**

  (Hungary)



- **Overuse injuries**

  (Hungary)



USA Sports injury register 2019.

Sports Injuries By Number Of Injuries, 2019

A	A	Number of injuries by age				
Sport, activity or equipment	Injuries (1)	Younger than 5	5 to 14	15 to 24	25 to 64	65 and older
Exercise, exercise equipment	468,315	6,266	46,926	87,189	250,747	77,187
Bicycles and accessories	417,485	12,691	113,445	58,072	191,049	42,228
Basketball	403,980	1,250	139,733	185,316	76,066	1,615
Football	292,306	429	149,149	116,946	25,131	651
Playground equipment	222,527	54,372	148,577	7,256	10,376	1,946
ATV's, mopeds, minibikes, etc.	201,847	4,407	37,831	51,686	89,833	18,090
Swimming, pools, equipment	190,743	21,811	77,296	31,309	47,457	12,871
Soccer	188,336	2,060	84,938	71,030	29,569	739
Baseball, softball	157,164	2,380	65,058	48,188	38,211	3,327
Skateboards	148,921	2,837	46,071	51,864	44,891	3,257
Trampolines	123,029	23,979	74,378	12,711	11,625	336
Lacrosse, rugby, misc. ball games	74,326	163	28,310	22,613	13,371	9,869
Skating (excl. In-line)	67,008	833	31,293	12,980	20,611	1,291
Fishing	61,932	1,926	11,987	9,542	31,028	7,449
Volleyball	51,455	32	18,479	22,652	9,674	618
Horseback riding	43,469	963	8,200	9,650	20,563	4,093
Hockey	36,885	200	12,268	14,951	9,060	407
Track and field activities, equipment	28,048	0	11,287	12,274	4,189	298
Martial arts	27,008	288	7,720	6,868	11,583	549
Racquet sports	25,844	250	3,408	4,091	9,229	8,867
Beach, picnic, camping equipment	25,728	2,803	4,391	2,526	11,797	4,212
Water skiing, tubing, surfing	18,143	98	2,186	5,932	9,389	538
Bowling	16,615	938	1,293	2,478	7,762	4,145
Boxing	16,071	23	2,001	7,000	6,976	71
Nonpowder guns, BB'S, pellets	11,995	369	3,583	4,052	3,460	530

Scandinavian ACL register

Table 1. Variables in the registration forms reported to the Scandinavian ACL registries

Characteristics	Denmark	Norway	Sweden
Primary ACL reconstructions			
total number	4,972	5,329	7,331
annual average[b]	1,886	1,520	2,444
Hospitals	37	60	52
Age at surgery, median (range)	30 (10–71)	27 (12–67)	25 (8–67)
Age at injury, median (range)	27 (7–70)	25 (6–65)	23 (5–66)
Males	60%	57%	58%
Grafts:			
hamstring	71%	61%	86%
BPTB	22%	38%	14%
other	7%	< 1%	< 1%
Meniscal injuries			
total	1,939 (39%)	2,914 (55%)	2,536 (35%)
resection	1,591 (79%)	2,002 (69%)	2,007 (80%)
Cartilage injuries			
total	825 (17%)	1,456 (27%)	2,001 (27%)
treatment	482 (55%)	293 (20%)	401 (20%)
Duration of surgery[a], median (range), min	68 (30–210)	70 (10–240)	71 (14–330)
Time to surgery, median (range), months	9 (0–371)	7 (0–482)	10 (0–527)
Outpatient surgery	79%	38%	56%
Prophylactic antibiotics	99%	99%	99%
Prophylactic anticoagulation	17%	78%	41%
Activities that most frequently caused injury	Soccer 50% Team handball 20% Downhill skiing[c] 14%	Soccer 40% Team handball 15% Downhill skiing[c] 13%	Soccer 41% Downhill skiing[c] 13% Floor ball 8%

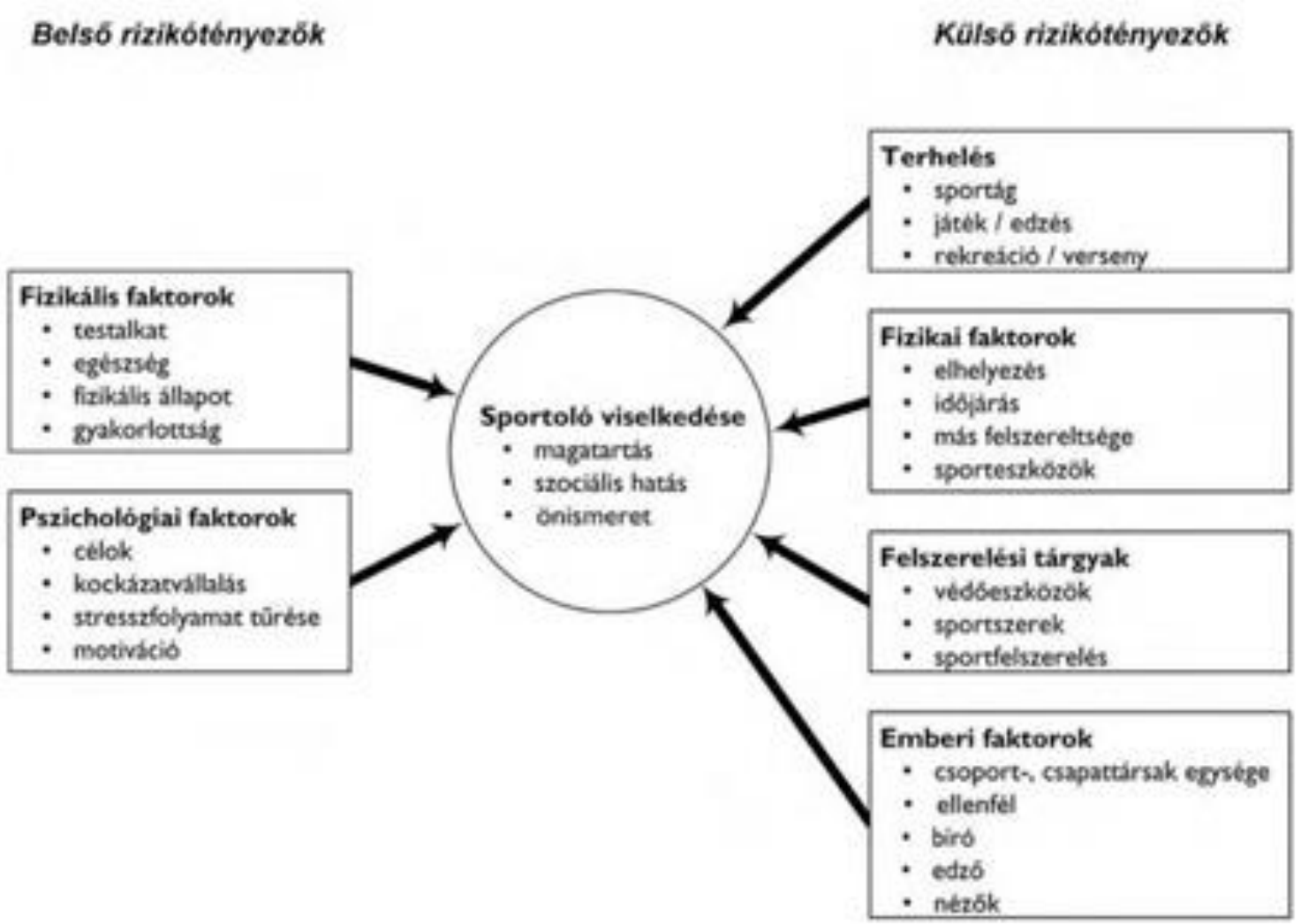
na: data not available.
[a] Skin-to-skin time for isolated primary ACL reconstructions.
[b] This average is lower than expected due to inclusion of the very first months of running time of the individual registries.
[c] Alpine skiing, telemark skiing, and snowboarding.

Severity of sports injuries

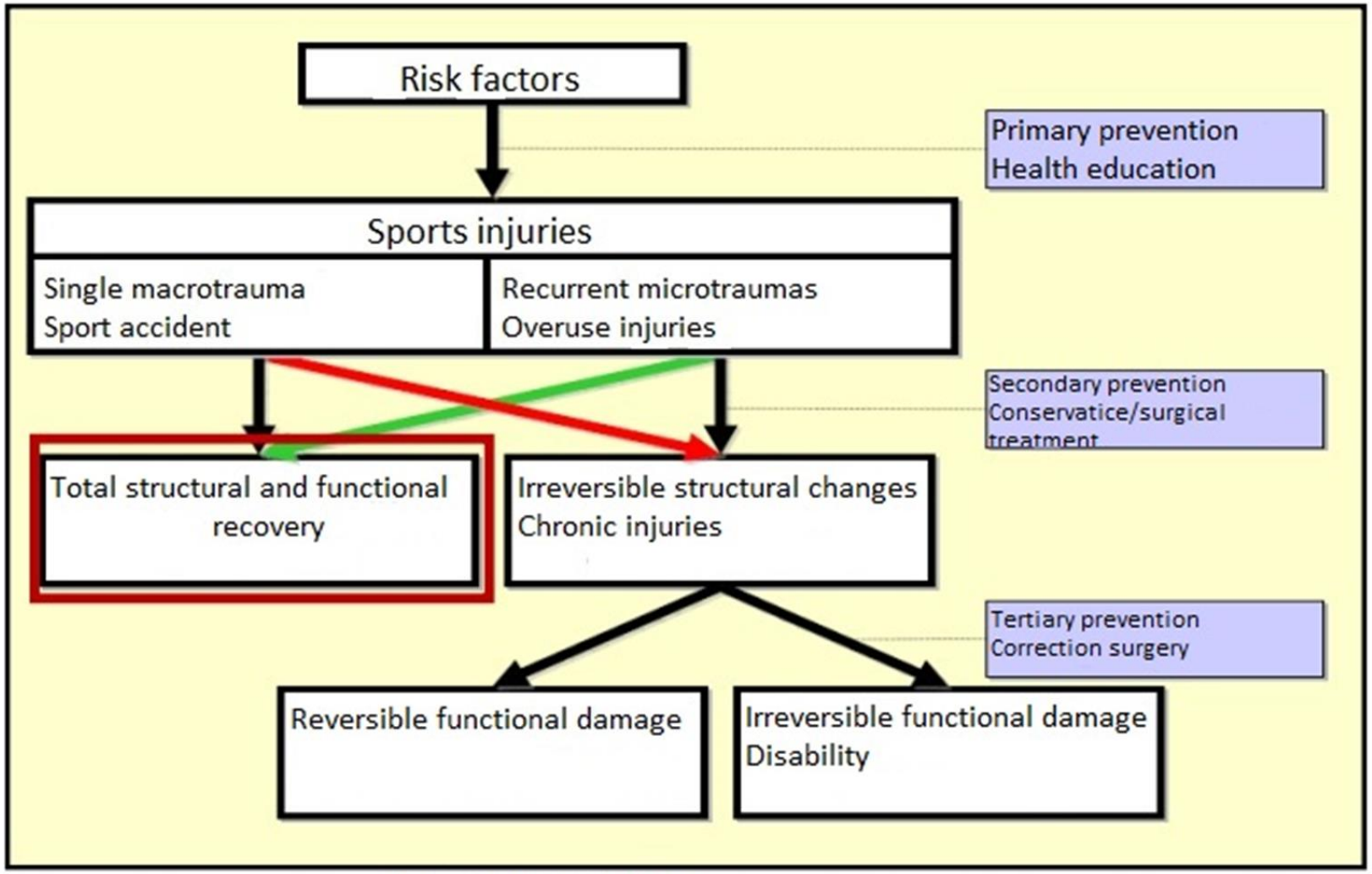
- Type of injury (fracture, dislocation, rupture, etc..)
- Duration, method of treatment
- Period of inability to doing sports
- Working time loss
- Residual extent of damage
- Cost of the treatment

- Based on the duration of the inability to doing sports:
  - Mild: 1-7 days
  - Moderate: 8-21 days
  - Severe: more than 21 days or permanent impairment

Aetiology of sports injuries



Sports injuries



Sportorvoslás alapjai, Dr Jákó

Primary prevention

- Screening tests (sports doctor)
- Elimination of risk factors:
  - **Learning appropriate movement patterns**
  - **Correct training planning**
  - **Physical and mental preparation of the athlete**

Primary prevention

- **Providing appropriate sports and protective equipment**
- **Sports field safety**
- **Compliance with rules**

Primary prevention

- Pre-season testing
- Targeted warm-ups
- Cool-downs
- Consistent incorporation of strengthening and stretching
- Adequate hydration
- Wearing appropriate clothing, footwear
- Appropriate floor quality and cleanliness
- Keeping children in good physical condition (active summer holidays)
- Consideration of temperature condition

- **"More is not always better" = preventing overuse injuries**
- **"Listen to your body" = reduce training time and intensity in case of pain or discomfort**
- **Injured player's return to play is allowed by the professional who guiding him through his recovery**
- **Developing an exercise program and integrating it into training**

Diagnosis of sports injuries

Medical history

Mechanism of injury:
- Localisation
- Limb position
- Force
- **Changes: training, technique, shoes, equipment**

Supplementary medical history:
- Previous injuries
- Family history
- Medications
- Developmental abnormalities

Symptoms:
- Localization
- Beginning
- Duration
- Frequency
- Restrictions
- Effect of rest

Diagnosis of sports injuries

- **Physical examination:**
  - Inspection
  - Palpation
  - Deformities
  - Swelling, warmth
  - Muscle strength
  - Range of motion
  - Circulation
  - Innervation

Special tests:
Ligaments, joint stability, impigement symptoms

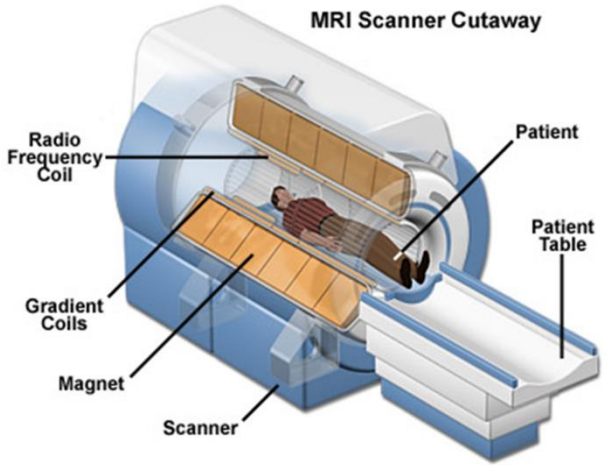
5- Normal muscle strength
4- Against low resistance
3- Against gravity
2- Without gravity
1- Muscle twitching, fibrillation
0- Completely paralysed muscle

Neutral 0° method
Active
Passive
Against resistance

Neurological examination
Reflexes

Diagnosis of sports injuries

- X-Ray
- Ultrasound
- Laboratory tests
- CT
- MR
- Scintigraphy, angiography
- EMG, ENG
- Hystology, biopsy
- Arthroscopy???



Acute injuries: Contusion

- Caused by direct force, mainly affecting soft tissues, may affect joints or surrounding soft tissues.
- Characteristics: pain, swelling, haematoma, loss of function, no deformity.
- Diagnosis: physical examination, radiological exams: US, CT, MRI

  Therapy: RICE (rest, ice, compression, elevation)

  Rest: 1 week – 10 days

Distorsion

It is most often associated with a (very) short duration of deformation due to indirect force (capsule)

During the indirect force, the joint surfaces move away from each other and then return to their original position.

The ligaments of the joint remain intact and no other structures are damaged.

Therapy: pain relief, rest, may immobilisation (1-2 weeks)

Dislocations

- The joint surfaces move away from each other and they’re fixed in abnormal, dislocated position

- Can combined with fracture
- Joint capsule and ligaments are always torn

- Shoulder, AC joint, elbow, finger, patella dislocations

Dislocations

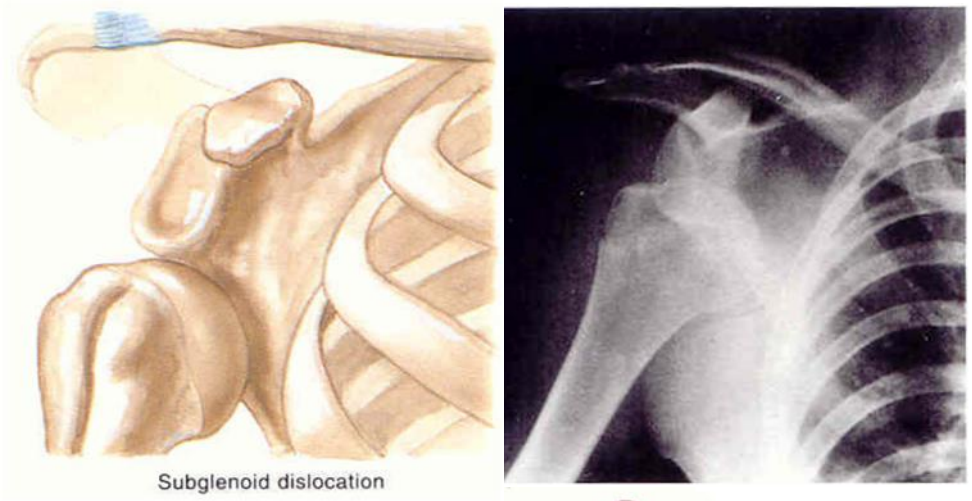
Symptoms: swelling, deformity, pain, tenderness, haematoma, loss of function, abnormal position

elastic rigidity

Diagnosis: bidirectional X-Rays, CT scan

<u>Conservative treatment:</u> closed reduction, immobilization in functional position (2-6 weeks), cast, Desault bandage, Gilchrist bandage, brace

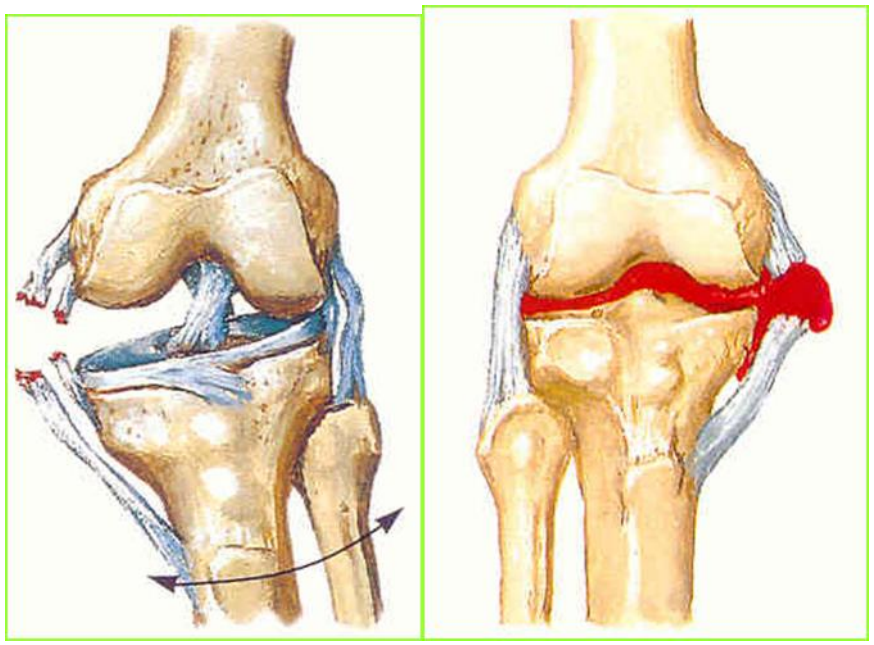
<u>Surgical treatment:</u> closed or open reduction, fixing with K-wire, ligament reconstruction surgery



Ligament injuries

- **Partial : (preserved joint stability)**
- **I. grade: some fibres are torn**
- **II. grade (low grade): less than half of the fibres**
- **Total: (joint instability)**
- **II. grade (high grade): more than half of the fibres**
- **III. grade: all of the fibres**
  - **Ligament rupture**
  - **Ligament adhesion detaches from the bone**
  - **Bony abruption**

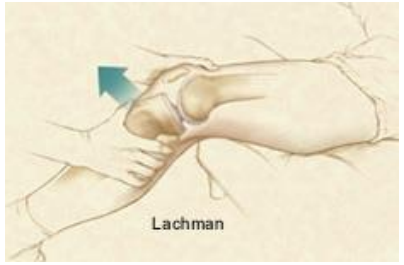
- **Joint capsule injury, tear**
- **Hyalin cartilage injury**
- **Haemarthros**



Ligament injuries (examples)

- **Ankle: Lig. Talofib. Ant (LTFA), Lig. Calcaneofib.**
- **Knee: ACL, MCL, LCL, PCL**
- **Elbow: Collateral ligaments (mostly ulnar)**
- **Fingers (hand) collateral ligaments (I. MCP)**

- **Physical examination, X-Rays (fixed), US, MRI**



- **Immobilization 4-6 weeks**
- **Surgery: ligament suture, reinsertion**

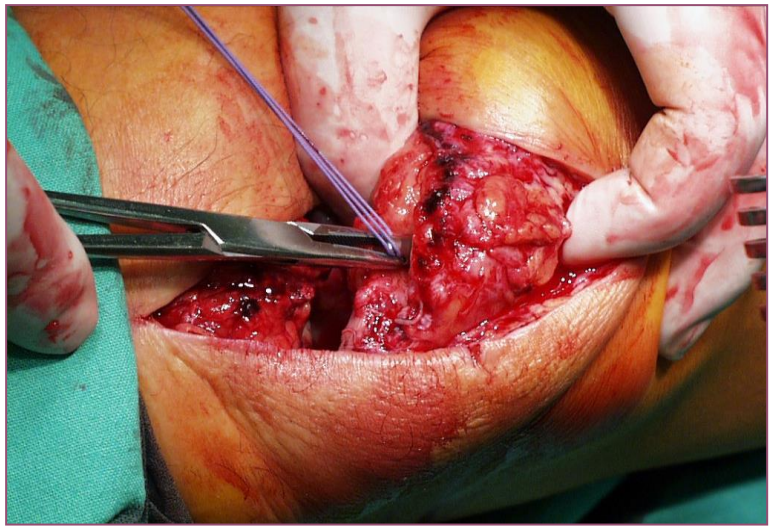
Tendon injuries

- Partial or total rupture
- Mostly affects degenerated tendon

- Sudden sharp pain, popping sensation

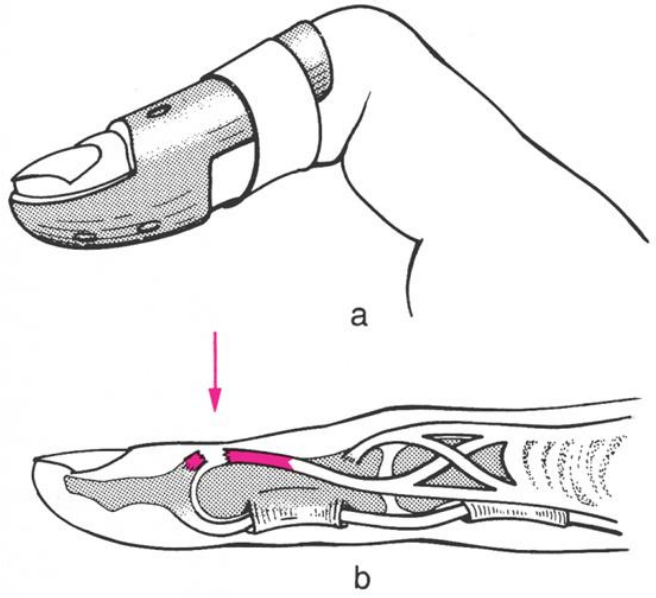
- Physical examination, loss of function, X-Rays, US, MRI

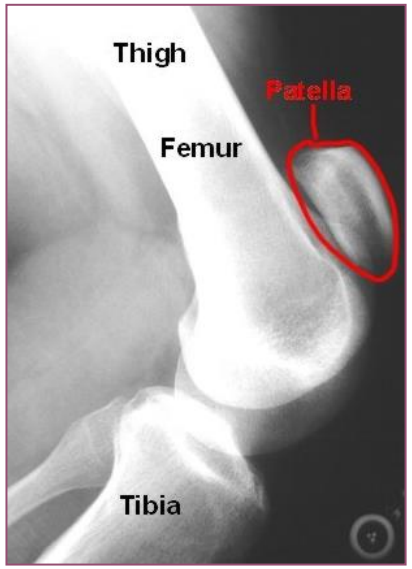
- Treatment is operative: tendon suture, reinsertion (anchors)
- Immobilization with casts or braces, rehabilitation



Tendon injuries (examples)

- Rotator cuff (supraspinatus tendon)
- Long head of the biceps
- Distal biceps tendon rupture
- Hand fingers flexor and extensor tendons
- Quadriceps tendon
- Patellar tendon
- Achilles





Muscle injuries

- **10-30 % of sports injuries**
- **Types:**
  - **Contusion**
  - **Rupture :**
    - **Partial (I.-II grade)**
    - **Total (III. grade, rupture of the fascia)**

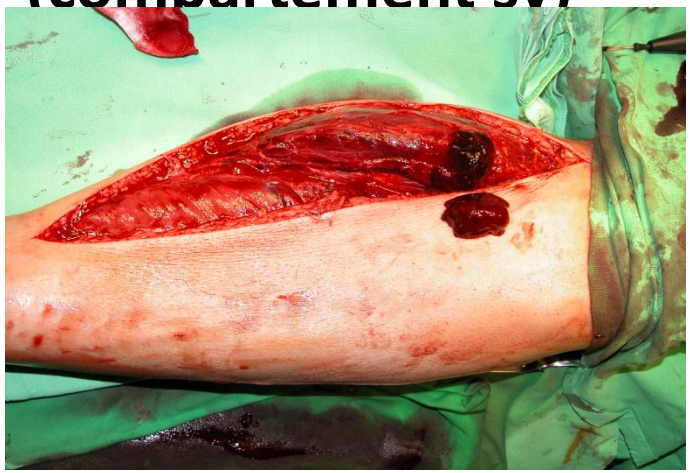
- **Distraction**
- **Compression (direct)**

- **Intramuscular haematoma**
- **Intermuscular haematoma**

Muscle injuries

Diagnosis:

- **Medical history, physical examination (swelling, muscle strength, muscle continuity, circulation)**
- **X-Ray, US, MRI**
- **Compartment pressure (compartement sy)**



Treatment:

<u>Conservative treatment</u>: immobilization, rest, ice, elasctic bandage, observation

LMWH?

<u>Surgical treatment</u>: only III. grade,total rupture treated surgically

Suture, reinsertion, haematoma evacuation

Recovery is 3-16 weeks

Complication: scar tissue formation, Myositis ossificans,

Muscle injuries (examples)

- Upper limb:
  - Rotator cuff
    - Subscapular muscle
    - Infra- et supraspinatus muscle
  - Biceps
  - Triceps
  - Pectoral muscle
- Lower limb:
  - Adductor muscles
  - Quadriceps muscle
  - Biceps femoris
  - Gastrocnemius muscles
  - Tibialis anterior muscle

Overuse injuries

- Caused by recurrent microtraumas
- Overload, incorrect load
- Regular sports activity over several years, increased stress
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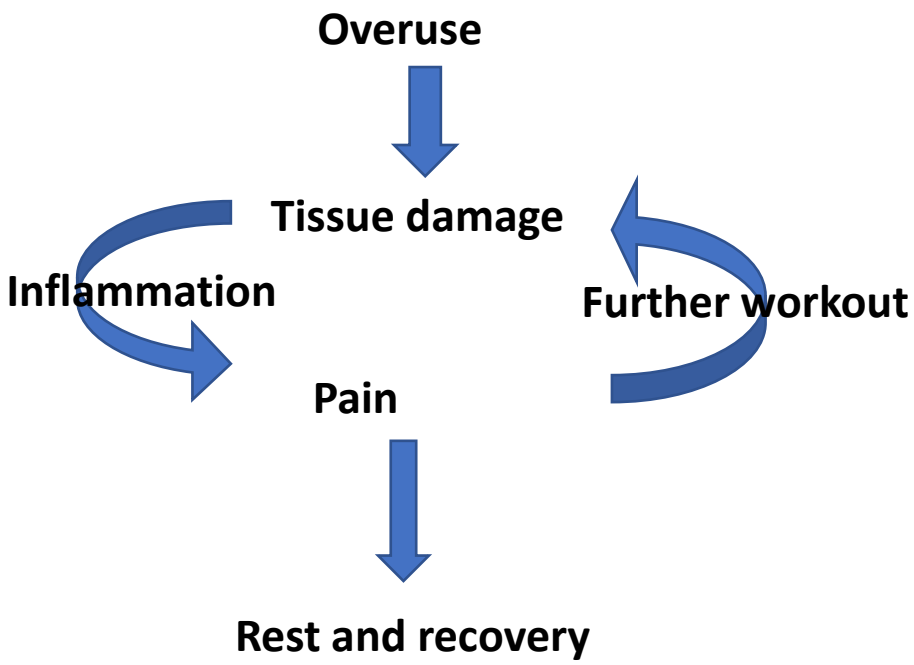
- Insertopathy-enthesopathy
- Tendinitis, peritendinitis, tendovaginitis
- Periostitis
- Myositis
- Bursitis
- Stress fracture
- Chondropathy, osteoarthrosis

Patophysiology of overuse injuries

- New training method, intensity or training time (often at the end of a base session)
- Recurring microtraumas

- Imbalance between workout and recovery (lack of time!)
- Tissue (cellular and extracellular) degeneration develops
  - Inflammating mechanisms (IL-1, MMP-1, MMP-3)
  - Hyperthermia, Hypoxia,
  - Oxidative stress,
  - Ischeamia-reperfusion (O free radicals)



Tendinopathies

- **Tendinitis** (acute inflammation)
- Tendovaginitis, Tenosynovitis
- Peritendinitis

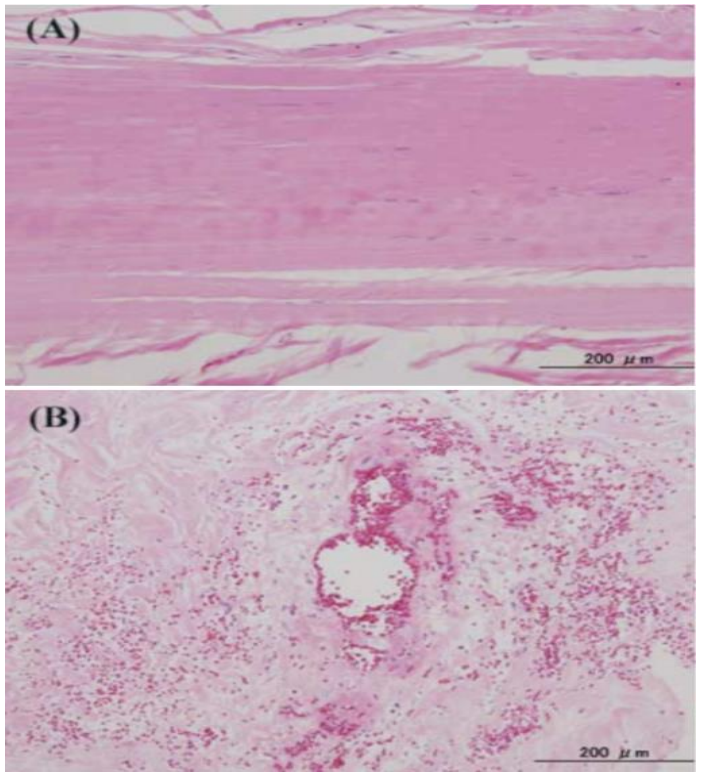
- **Tendinosis** (chronic degenerative disease)

- III. type collagene instead of Type I.
- Fibrosis, scar tissue formation, hypervascularisation

Fibers are loosened, oedema, fissures and microfragmentation can be seen instead of normal stucture

The lack of inflammatory cells

Thick, greyish colored tendon instead of shiny white



Overtraining symptoms

- Restlessness, sleeping disorder, irritability
- Fatigue, reduced resistance to illnesses
- Decreased motivation
- Loss of appetite, weight loss
- Menstrual and libido disorders
- Disproportionate increase in heart rate and blood pressure on exertion
- **Elimination: Reduction of training intensity, active rest, other types of excercises**

Thank you for your attention!