

**Many people take up physical exercises, often exceeding their efficiency and soft tissue endurance, due to living in a hurry, lack of motoric activity and esthetic standards of the world today. In addition, easy access to and multitude of recreational classes and also the fashion to do various sports activities (extreme sports among them), increase the number of injuries.**

This is why, instead of bringing back good mood, physical activity often ends up with an injury. The reason behind is that people are often under prepared for making physical effort, they don't warm up, don't assess their physical capabilities properly and spend most of the time in static positions, which lead to lack of muscle and joint elasticity. The situation worsens when previous injuries (like sprain injury, contusion or overstretching) were ill-treated or neglected. Microinjuries deteriorate the condition.

## THE COURSE OF INJURY

Injuries result in tissue damage. Thus tissues invoke a multi phase process which presents itself with acute inflammatory condition and reparative processes aiming at restoring structure and function. Acute inflammatory condition causes: reddening, temperature increase, swelling, pain and tissue function limitation.

Tissue healing takes three stages:

- acute – inflammatory; lasts up to 48 hours;
- subacute – restorative and regenerative; lasts up to 6-8 weeks;
- chronic – scarification phase; lasts up to 12 months.

Healing is a biological process. Observation of the phases allows to control the process and choose the best treatment methods, without which full recovery is not possible. All injuries should be checked up by a doctor, who can diagnose the damage and administer suitable treatment. The aim is complete recovery of injured structures and function restoration. Both can be achieved either by conservative treatment or by surgical procedures and physiotherapy.

Conservative treatment includes:

- dressing,
- immobilization – most commonly avoided or neglected after spraining injuries,
- puncture,
- pharmacotherapy and physiotherapy,
- rehabilitation.

Sometimes there's a need for surgical treatment which aims to restore continuity and function of given tissues. Rehabilitation is always important as it allows for restoration of full possible efficiency with active participation of the patient.

Locomotor system injuries can be:

- acute – due to mechanical damage (eg. ligament tear),
- chronic – slowly developing as a result of multiple microinjuries (often asymptomatic to some point).

## ACUTE INJURIES

The PRICE rule is best observed after acute injuries. The symptoms of various body injuries are alike, thus the PRICE rule applies to all injuries.

**P** – protection – non- weight bearing, protection, immobilization (crutches, orthosis, cast, bandage)

**R** – rest – rest, general and local activity limitation

**I** – ice – ice from the first moments after an injury, for about 20 minutes a few times day and night

**C** – compression – with elastic bands

**E** – elevation – of the injured limb above the heart

**M** – medication – pharmacotherapy (anti inflammatory and other drugs)

**M** – modalities – modulating factors not earlier than 48-72 hours after an injury (physiotherapy: laser, magnetic field, electric current).

These rules are "first aid" for tissues. When they've been observed, a patient needs to see a doctor immediately. The doctor will examine the patient, diagnose them and administer suitable treatment.

In the subacute phase (of restoration and regeneration) we use various methods of post traumatic treatment. The method is chosen depending on what kind of injury it is (fracture or spraining) and what kind of tissues it affected (little finger joint capsule or ankle ligament).

## EXAMPLES OF MANAGEMENT

### Muscle injuries

Muscle injuries most often include tears and contusions. Tears (most often of muscle attachments) occur when the muscle isn't able to stretch under the contraction. Contusions (most often of the belly of the muscle, its medial part) occur due to strokes. Hematomas appear in both kind of injuries. We apply absolute immobilization up to about 10 days, compression and cooling for the first 72 hours to contract blood vessels and prevent hematoma recurrence and excessive scarification. For the next 3 weeks we still apply immobilization with short intervals of delicate active movements that prevent scar stiffness and movement limitation. In addition, we apply physiotherapy. Then we introduce more intense stretching and strengthening exercises. Remember that we must not massage the hematoma or do any physiotherapeutic exercises in the first 2 days as it's harmful. If we neglect immobilization or become active too soon, subsequent hematomas may occur and other damages may be brought about which, in turn, might lead to permanent muscle function damage. Ligament and joint capsule injuries occur when the joint is affected with rotating and bending forces that cause tension exceeding muscle endurance. Ligaments and the joint capsule fulfill protective (prevent maximum movements), nourishing (to the synovial membrane) and informative (neuro fibres)

endings of the ligaments and capsule and muscle fasciae send a lot of information about the limb location) functions. These functions make moving safe. Even a small spraining injury causes partial tear and permanent stretch of the ligaments, thus impairment of the function, and, finally, joint instability. The instability may, to some extent, be compensated with more intense muscle activity. Unfortunately, collective overloads to the locomotor system tissues cause cartilage damage, muscle and ligamentous connective tissue scars. All of the above may seriously impair natural function. This is why damaged tissues must be diagnosed and small injuries must not be neglected. When sprain injury occurs, there's a hemorrhage from the synovial membrane into the joint and various quantity of ligament collagen fibres. Sometimes also other structures are injured, for example menisci, cartilage or bones. The symptoms are as follows: intense pain, swelling, hematoma and reactive defensive muscle contraction. In that case we apply a few weeks' immobilization to allow the tissues to create and defend scarification. Sometimes even an insignificant injury evokes scarring. The scar might get stretched and so might require a surgical ligament reconstruction, as a stretched scar may lead to joint instability. The treatment method depends on numerous factors (the degree of spraining, age, profession, physical condition and so on).

### **Ankle injuries**

In the case of ankle spraining, the post injury management depends on the type of spraining:

- 1st degree – a small tear in the capsule, small swelling. Usually cool compresses for 48 hours and non-weight bearing will suffice. Then compression bands, sparing of the leg or stabilizers with gel or pneumatic inserts for 2-3 weeks are introduced.
- 2nd degree – a tear of the capsule, overstretching or tearing off some ligament fibres, considerable swelling, pain and hematoma. According to the PRICE rule we wait 2-3 days for the swelling to occur, then we introduce immobilization for 2-3 weeks. Having done that we introduce physiotherapy that improves scar elasticity and the range of joint motion. Non-weight bearing is absolutely obligatory for another 3-4 weeks. When in motion, the patient uses a stabilizer that doesn't hurt the freshly originated tissue.
- 3rd degree – ligament tear, excessive hematoma and swelling, sometimes subluxation. When the acute phase has remitted and the PRICE rule has been observed, surgical treatment is required in order to restore the tissue continuity. After the surgery the limb is immobilized in a special shoe for about 6-8 weeks. Using this orthosis allows to introduce physiotherapy and a little of exercises after about 2 weeks.

### **Knee joint**

The spraining injury of the knee evokes symptoms mentioned above. The symptoms' intensity depends on the amount of injured structures. However, sometimes the intensity of pain ailments does not correspond with the damage, thus the ailments are neglected at early stages. Only the feeling of "giving way" makes a patient to visit a doctor. There are three degrees of knee injury:

- 1st degree – joint laxity 3-5mm,
- 2nd degree – joint laxity 5-10mm,
- 3rd degree – joint laxity over 10mm.

The first two degrees can be treated conservatively, provided that patients are not young active people or professional sportsmen, in which case we'd perform ligament reconstruction. The procedure of conservative treatment is as follows: joint puncture, then, if hematoma is found, joint immobilization in flexion position for 4 weeks. At this time isometric exercises of the leg are recommended. After that, proprioception exercises are introduced together with continual muscle strengthening in closed muscle circuits. The stabilizer is used whilst moving. In the case of the 3rd degree injuries (total injuries), either torn ligaments are sutured (up to 10 days after the injury) or a planned surgery is performed, 12 weeks after the injury. Examples of management after ACL injury are discussed in another paper.

### **Calcanean tendon**

Another example of an acute injury is the calcanean (Achilles) tendon tear. When it's injured, a patient feels sudden pain, often hears a crack and isn't able to stand on his/her toes. Later appear: swelling, hematomas and palpable discontinuity. The leg requires non-weight bearing and observing the PRICE rule. When the injury is thoroughly diagnosed, the decision about the treatment is made, usually to suture the tendon. After the surgery, the foot and the lower leg are immobilized for about 4 weeks with a cast or a special orthopaedic shoe. The treatment completion is made up of two stages. The first one is done during immobilization and it's about physiotherapeutic procedures that reduce swelling and increase vascularization and about exercises that prepare for weight bearing. In the second stage, exercises are gradually intensified and weight bearing is introduced to the point of reaching full endurance and tendon elasticity.

## **CHRONIC INJURIES**

Another kind of locomotor system injuries are chronic, the so-called fatigue fractures. They develop slowly, as a result of multiple small injuries and gradually lead to tissue damages. They manifest themselves with intensified pain and atypical location of the inflammatory process, which may last for several months. The most common chronic injuries are:

- degenerative changes of the lumbar spine,
- overload of the patello femoral joint,
- plantar aponeurosis ("calcanean spur"),
- overload of muscles of the posterior thigh,
- Achilles tendonitis, patellar tendonitis,
- epicondylitis of the humeral bone (the so-called tennis or golfer's elbow),
- shoulder rotator cuff tendonitis.

The following preventive measures (especially among physically active people and professional sportsmen) can be taken against the above injuries:

- explaining the joint biomechanics rules, learning about the ergonomics of physical effort and proper movement patterns (for example positioning the spine segments),
- thorough learning of given discipline's techniques,

- following a universal training programme,
- following the rule of alternating exercises on a given body segment that balances muscle tension,
- warming up and stretching before doing exercises,
- doing exercises that reduce muscle tension (relaxing and stretching exercises) after training.

Another important element is choosing suitable training loads, depending on your age. There need to be intervals for regeneration between training sessions, so that microinjuries in soft tissues will self-heal. Medical treatment of the injuries consists in: activity limitation or total non-weight bearing, administering anti inflammatory drugs, introducing physiotherapy in order to eliminate the inflammatory process and doing exercises ordered by a physiotherapist that equate excessive tension or decrease stress on the overloaded tissues. If the changes in tissues are excessive (eg. damage of the patello femoral cartilage), the doctor decides to perform a surgical procedure. During conservative treatment, when the overload and inflammatory process symptoms are eliminated, gradual weight bearing is introduced. The exercises need to be done in an exact and correct way. If patients follow preventive measures in the future, the factors evoking tissue degeneration can thus be eliminated.

Written by Michal Kabzinski