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INJURIES AND TEAM SPORTS

JOINT PATHOLOGY

Joint Pathology

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Joint: a joint is defined as the nexus that joins bone segments, which allows for mobility between the segments and is exposed to external loads. The main functions of the joints are:

- To transfer loads.
- To ensure stability.
- To allow for functional movement.
- To heal the tissues of which they are composed.
- To allow for spacial relationships (posture, movement, throwing objects or bringing them closer).

Joint stability depends on several factors:

- Bone configuration.
- Ligament integrity.
- The muscle-tendon complex.

The bone structure of the joint is the passive rigid stabilizer on which joint congruence is based and which provides greater stability, in accordance with the extent of coverage (for example, the shoulder or hip joints).

Ligaments are passive stabilizers that are less rigid than bones and tend to restrict movement when they are stretched. The disposition of the ligament is what really determines the movement that it is capable of withstanding.

Musculotendinous structures are dynamic stabilizers.

Joint movement is determined by:

- Functional axes.
- Range of movement.
- Friction between joint surfaces.

Main parts of the joint:

- Joint cartilage.
- Intra-articular synovial fluid, a true lubricant.
- The secretory membrane of the synovial fluid.
- The joint capsule that maintains the relationships between bones and reinforces ligaments.

There are 2 types of cartilage:

- Hyaline cartilage.
- Fibrocartilage.

Hyaline joint cartilage is very absorbent, it covers the bones of the extremities, giving them a very polished smooth surface, and it is highly capable of withstanding the forces of friction.

Fibrocartilage is more fibrous and has more load resistance. It tends to be found in areas such as the meniscuses, rings of the intervertebral discs, and the pubic symphysis. It is a very absorbent tissue, very innervated, avascular and does not heal naturally very well.

Sprain

A sprain is a twisting or violent distention of a joint that can be accompanied by partial or full injury to the tendons in that joint. Here is an example of the grading system for ankle sprains.

GRADE	Structural injury	Swelling/bruising/pain	Anterior drawer test	Functional repercussion
I	Partial injury to the ATFL	Positive	Positive	No mechanical instability
II	Full injury to the ATFL Partial injury to the CFL	Positive	Moderate	Mechanical instability
III	Full injury to the ATFL Full injury to the CFL	Positive	Variable	Mechanical instability

The prognosis and recovery time for an ankle sprain depend on its impact on the syndesmosis, in which case it would be considered a high ankle sprain, which tends to occur in 5 to 18% of ankle ligament injuries.

The syndesmosis is made up of 3 ligaments:

- The anterior tibiofibular ligament.
- The interosseus ligament.
- The posterior tibiofibular ligament.

Diagnosis:

- Visual exploration.
- Ottawa indications and manipulation of the area around the metatarsals to rule out bone injuries.

Additional tests:

- If positive for any Ottawa indication, taking an x-ray must be considered.
- If the exploration is compatible with a syndesmosis injury, performing an NMR scan must be considered.

Treatment

- In all cases, the initial treatment is POLICE (Protection, optimal load, ice, compression, elevation).
- In all cases, immobilization can be achieved using:
  - A plaster splint.
  - Compression bandaging.
  - A walking boot.

Progress should be monitored every 5-7 days.

Synovitis

Synovitis is an inflammation or irritation of the synovial membrane that coats joints. In sports, it is most frequently caused by injury or overloading.

Treatment:

- Load modification.
- Ice.
- NSAIDs.

Dislocations and subluxations

Dislocation is a traumatic injury that occurs when a bone is displaced beyond its anatomical limits after a relatively serious injury.

In subluxations, this displacement is partial.

These are highly incapacitating injuries which are associated with an almost complete loss of function and very obvious deformity. They can be associated with a rupture of the stabilizing elements, capsule, ligaments or bone joints. They may occasionally be related to injuries to nearby nerve and vascular structures.

The pain caused by dislocation is a result of muscle strains and inflammatory processes.

Assessment and treatment follow up by an expert are urgently required, as is the reduction of the dislocation without aggravating existing injuries.

After the reduction of the dislocation, the athlete needs treatment, including immobilization in a sling, for 2-3 weeks and, afterwards, physiotherapy.

Fibrocartilage injuries

The fibrocartilage structures include: the meniscuses, rings of the intervertebral discs, and the pubic symphysis.

The injury mechanism for fibrocartilage occurs with an anomalous movement or rotation that compresses or pulls it, engaging it beyond its capsular resistance and causing its rupture or disinsertion.

Treatment.

- POLICE (Protection, optimal load, ice, compression, elevation).
- Prognosis is uncertain due to the limited abilities of this tissue to heal.

The functional repercussions depend on the function of the injury itself or the secondary repercussions of the surgical solution (extraction or suturing – reattachment when possible)

Joint injuries caused by overload

Osteochondrosis

The cause of osteochondrosis is unknown, but one of the hypotheses is that a circulatory disorder causes ischemia of the bone tissues.

Another hypothesis would be that repetitive microtrauma can cause a lack of blood flow and lead to the disease.

It usually appears during growth spurts accompanied by symptoms of pain, functional impotence, and, in some cases, the swelling of the joint.

The prognosis of this pathology is uncertain, but, young people usually return to their normal levels of physical activity.

Treatment.

- Modification of training loads or withdrawal from athletic activity.
- Ice.
- NSAIDs.

Post-traumatic arthritis

Traumatic arthritis is the inflammation of a joint and of the surrounding tissue. The principal cause of traumatic arthritis is direct injury or repetitive microtrauma.

Repetitive microtrauma causes the thickening of the synovial fluid and of the nearby bones and leads to pain, muscle spasms, and crepitus.

The return to intense sporting activity will depend on the symptoms, but can begin before the periarticular soft tissues have completely healed after a major injury.

Treatment.

- POLICE (Protection, optimal load, ice, compression, elevation).
- NSAIDs.

Bursitis

Bursitis is an inflammation of the small sacs, called bursas, that help to reduce any friction between the bones, tendons, or muscles.

Treatment.

- Modification of training loads.
- Ice.
- NSAIDs.

Capsulitis

Capsulitis is an inflammation of the joint capsule which is usually caused by trauma but may also have metabolic or rheumatological causes.

Depending on the cause of the injury, an x-ray to rule out associated bone injuries is recommended.

Treatment.

- In all cases, the initial treatment is POLICE (Protection, optimal load, ice, compression, elevation).
- Immobilization using orthosis.
- NSAIDs.

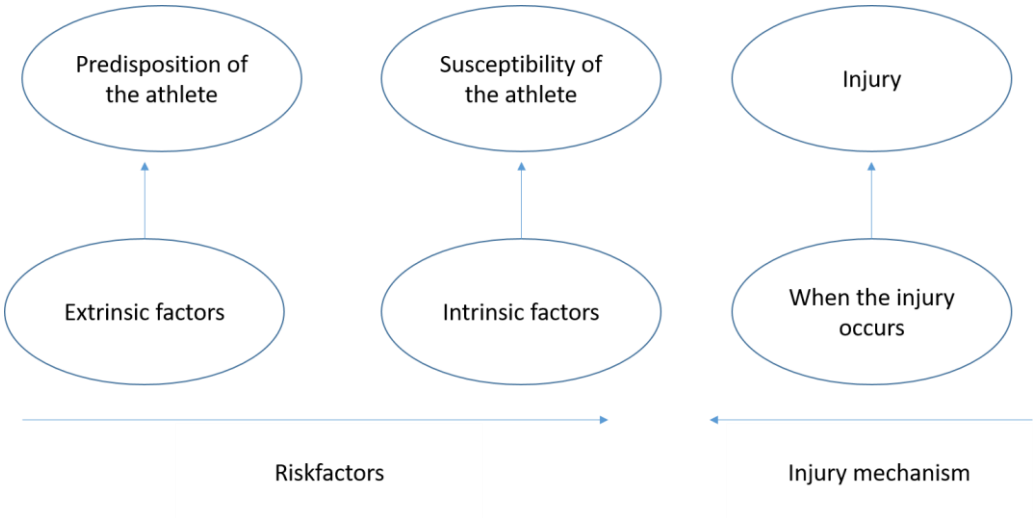
Injury mechanisms

Risk factors

Although many injuries are the result of accidents, there are a number of factors that also increase the likelihood of injury. Athletes may be predisposed to one or another injury. For example, intrinsic factors such as sex, age, physical condition or fatigue. Other risk factors may be extrinsic, such as the sport itself, humid conditions, floor friction... It has been

demonstrated that women are at greater risk of injuries to the ACL, and it has also been shown that, in handball, risk increases when friction between footwear and the floor is high. Thus, during a handball match in which floor friction is high, women will be more vulnerable to knee injuries.

Figure 1



Source: Prepared by the author

Intrinsic factors:

- Age
- Gender
- Body composition
- Injury history
- Physical condition
- Anatomical characteristics
- Sporting level.
- Psychological factors
- Fatigue

Extrinsic factors:

- Sport factors (rules, referees...)
- Protection (helmets, gloves...)
- Athletic wear (footwear, underwear...)

- Setting (humidity, temperature, floor friction...)

When the injury occurs

- Game situation
- Player vs opponent
- General biomechanics
- Biomechanics of the motor pattern
- Movement

Wrist injuries

Carpal instability

This is a secondary, non-traumatic injury that stems from a congenital laxity or a injury that results in the bones being unable to maintain their correct alignment and which causes persistent pain in the wrist that tends to sharpen with use.

Imaging tests such as an NMR do not tend to provide much information because they are (highly) dependent on the equipment and on the radiologist.

Patients will require x-rays of both wrists:

- Posterior-anterior projection and profile view;
- Posterior clenched fist projection.

Initially, treatment is usually physiotherapy with specific exercises to reinforce the musculature of the wrist.

In order to prevent this type of injury, it is very important to be in satisfactory physical condition and to warm up the musculature of the wrist prior to physical activity.

Injuries to the triangular fibrocartilage complex

This is a specialized three-dimensional structure located between the radius, the ulna, and the first row of the carpus which allows for the smooth rotation both of the carpus, as well as of the forearm.

Its principal functions are:

- To stabilize the distal radioulnar joint.
- To stabilize the ulnocarpal joint.
- To distribute forces between the ulna and the carpus.

Symptoms:

- Pain in the radial face of the carpus
- A “click” in the radiocarpal area
- A possible feeling of pain during resisted pronosupination.
- Increase in the tuberosity of the distal epiphysis of the ulna.

Symptoms tend to begin after a fall on a hyperextended wrist, or after a movement involving abrupt pronosupination of the forearm.

Pain tends to appear in the ulnocarpal face of the joint capsule when the forearm experiences full supination. The pain tends to increase during passive resisted pronosupination of the forearm and with active resistance. Occasionally, pronosupination may be associated with an audible “click.”

Patients will require x-rays of both wrists:

- Posterior-Anterior projection and profile view
- Posterior clenched fist projection.

An arthrogram increases the sensitivity and specificity of the topographic diagnosis.

Initially, treatment is usually physiotherapy with specific exercises to reinforce the musculature of the wrist. Treatment can be reinforced by saturation with PRP. If conservative treatments fail, surgery is recommended.

In order to prevent this type of injury, it is very important to be in satisfactory physical condition and to warm up the musculature prior to physical activity.

Elbow impingement

Elbow impingement is a rare injury in sports but can be encountered in sports like tennis, baseball, and among goalkeepers in soccer and handball.

The diagnosis of this injury is clinical. It leads to an alteration of articular movement limiting movement in the last degrees of extension and pain with hyperextension.

Additional tests, such as x-rays, can confirm the presence of osteophytes in the olecranon, and an NMR scan will provide more information about the state of the cartilage.

Initially, treatment is conservative: FST, which may also be associated with saturation with corticoids, hyaluronic acid, or PRP.

Afterwards, surgical treatment would have to be assessed.

To prevent this type of injury, it is important to monitor the athletic motor pattern and to maintain adequate muscle tone.

Scapulohumeral luxation

The shoulder is an extremely mobile and very stable joint. Its stability depends on flexible structures.

The luxation mechanism occurs when the normal range of motion is exceeded, with the arm abducted and, above all, in external rotation, which, when forced backwards, projects the head of the humerus beyond the cavity and shifts it below the coracoid process. Example: fall.

Symptomatically, it presents as severe functional impotence with deformation of the joint. It tends to be associated with injuries to the labrum.

Management:

- Immediate reduction and immobilization. The duration of the immobilization period will depend on whether or not the labrum is injured.
- X-ray before and after reduction.
- NMR to rule out injury to the labrum.
- Suggesting delayed repair is recommended.

The initial treatment is physiotherapy, but there are studies that suggest a 90% risk of relapse in young athletes after their first episode of dislocation.

In order to prevent this type of injury, it is very important to be in satisfactory physical condition and to warm up the musculature of the shoulder prior to physical activity.

Prevention for this pathology consists of:

- Working on muscular compensation.
- Strengthening the rotator cuff.
- Strengthening of the glenohumeral ligaments.

Acromioclavicular dislocation

This injury usually occurs after a fall that results in impact to the deltoid area (motorcycle, bike spill...).

There are different classification systems, from capsular distension to the rupture of the coracoclavicular ligaments.

Types of acromioclavicular dislocations, according to the Rookwood classification:

STRUCTURES	I	II	III	IV	V	VI
Acromioclavicular ligament	Distended	Complete rupture	Complete rupture	Complete rupture	Complete rupture	Complete rupture
Acromioclavicular joint	Intact	Disorganized, widened	Dislocation and displacement, anterior surface of the clavicle	Dislocation and displacement, posterior surface of the clavicle	Dislocation and displacement of the clavicle, highly evident	Dislocation and displacement, inferior surface of the clavicle
Coracoclavicular ligament	Intact	Distended and swollen	Full rupture with swelling	Partial or complete rupture with swelling	Full rupture with swelling	Intact
Deltoids and Trapezius	Intact	Possible partial detachment	Possible partial detachment of the distal segment of the clavicle	Possible partial detachment of the distal segment of the clavicle	Possible partial detachment of the distal segment of the clavicle	Possible partial detachment of the distal segment of the clavicle

Treatment:

- POLICE (Protection, optimal load, ice, compression, elevation).
- Grade I and II dislocations are treated conservatively, immobilized in a Gill-Christ sling for two weeks, and then weight and loads should not be applied to the extremity for another eight weeks.
- Grade III, IV, V, and VI dislocations will require surgical treatment.

Prevention for this pathology consists of:

- Working on muscular compensation.
- Strengthening the rotator cuff.
- Strengthening of the glenohumeral ligaments.

Hip Injuries

In athletes, inguinal pain is often connected to hip injuries. Generally, they will not hurt during exercise but will afterwards. The pain tends to be felt at the inguinal level, or in the trochanter and the gluteal region over extended periods of time. They tend to occur in kicking sports or during anterior flexion.

Femoroacetabular impingement is one of the causes of early-onset arthrosis of the hip, especially in young and active patient groups. Its prevalence is estimated at 10-15%.

During exploration, patients present a limited range of mobility, especially flexion and internal rotation. In anterior impingement, screening is positive when the patient feels pain at the manipulation of the hip flexors and during the internal rotation of the hip with forced adduction. And, in posterior impingement, if pain is felt again when manipulating external rotators and during the full extension of the hip.

There are three forms of impingement (Pincer, Cam, and mixed Pincer-Cam).

Pincer-type impingement tends to result from an increase in the coverage of acetabulum.

Cam-type impingement results from an overgrowth on the spherical formation in the region between the neck and the head of the femur, causing this element to bump against the acetabulum.

In mixed-type impingement, there is an increase in the coverage of acetabulum and an increase in the thickness of the neck of the femur.

An undiagnosed impingement can cause an injury to the acetabular labrum. This is the first structure that tends to become injured in any type of impingement. In most cases, injury to the labrum tends to occur in the anterior and superior area of the acetabulum. The maintenance of the labrum is very important for hip stability and to protect joint cartilage.

Plain x-rays of anterior-superior projections of the pelvis, Dunn's view, and lateral projection are used to diagnose femoroacetabular impingement. NMR provides more information and an arthrogram NMR detects labral or chondral injuries in the anterior-superior region.

There is currently no effective conservative treatment that can correct a mechanical defect. Surgical treatment is required as soon as possible.

Knee injuries

Knee injuries have the following characteristics:

- Knee in semiflexion, valgus stress, and external rotation of the tibia (possible injury to the ACL, the LCL, and the MM)
- Knee slightly flexed, varus stress, and internal rotation of the tibia (possible injury to the ACL, the LCL, the MM and the LM).
- Knee extended with valgus stress (possible injury to the LCL, the ACL, or the PCL.)

- Knee extended with varus stress (possible injury to the LCL, CFL or the ACL.
- Abrupt hypertension or direct impact to the anterior face of the knee (possible injury to the PCL and distension of the posterior knee capsule).

Injuries to the ligaments of the knee

Incidence: from 4% to 7% of sports injuries.

The sports with greatest incidence are those that involve numerous abrupt shifts in support (indoor sports, soccer, skiing).

Time missed due to injury tends to vary depending on severity.

The causes are multi-faceted.

Possible injuries to the ligaments of the knee:

- Medial collateral ligament.
- Lateral collateral ligament.
- Anterior cruciate ligament.
- Posterior cruciate ligament.
- Injuries to the capsule of the knee.

Also, the meniscuses can be included in the category of injuries to the fibrocartilage of the knee:

- Medial meniscus.
- Lateral meniscus.

Diagnosis:

When examining the initial symptoms of the injury it is very important to assess the instability of the knee and hemarthrosis:

Manipulations to test for instability in the knee

- Articular movement.
- Lachman test (to assess ACL injury).
- Anterior drawer test (to assess ACL injury).
- Posterior drawer test (to assess PCL injury).
- Valgus stress (to assess MCL injury).
- Varus stress (to assess LCL injury).

NMR: preferred imaging test that can confirm or rule out a possible injury.

Treatments:

Slight sprain of the MCL:

- Use of orthosis.
- Ice.
- Rest.
- NSAIDs.
- Physiotherapy.

In cases where there is a full injury to the MCL, the LCL, or the ACL treatment will involve surgery.

Objectives of surgical treatment:

- Pain control
- Prevent swelling
- Recover joint mobility (primarily extension)
- Recover muscle strength
- Recover proprioception
- RECOVER JOINT FUNCTION
- Allow time for the ligamentation period
- Protect the ligament from loads

Start physiotherapy the day of the injury and continue until complete return to activity (walking, running, or sports activity). This includes recovering:

- Articular movement
- Muscular tone

- Proprioception
- Training specific to their activity

Meniscal injuries

The meniscuses are located between the condyles of the femur and the tibial plateaus. The medial meniscus is “C” shaped and the lateral meniscus is “O" shaped.

The medial meniscus is injured more frequently than the lateral meniscus. Sports such as soccer, track and field, and skiing tend to produce more meniscal injuries.

Symptoms of an injured meniscus:

- pain at the intercondylar line
- limited movement or complete blockage of the joint
- clicking
- a sensation of instability
- intra-articular effusion.

Types of meniscal injuries:

First, they are classified as complete or incomplete.

Then as:

- Vertical
    - Longitudinal (simple or bucket-handle)
    - Transverse or radial
    - Oblique
- Horizontal
    - Fish-mouth
- Complex or mixed
    - Parrot-beak in the lateral meniscus
    - Horizontal pedicle
    - Vertical pedicle
    - Bucket-handle, double or multiple

Some manipulations for meniscal exploration:

- Steinman I - in the supine or sitting position with the knee flexed at 90º, internal and external rotation is applied to the tibia, checking for pain at palpation of the intercondylar line of the affected meniscus.
- Steinman II - in the supine or sitting position with the knee flexed at 90º, internal and external rotation is applied to the tibia with flexo-extension, observing the posterior movement and checking for pain during flexion and whether pain shifts forward during extension.
- Bragard - in the supine position with the knee flexed at 90º, internal and external rotation is applied to the tibia with extension, checking for fluctuating pain during palpation of the intercondylar line of the affected meniscus.
- Apley - in the prone position with the knee flexed at 90º, internal and external rotation is applied to the tibia with axial compression of the heel. This way we can check for pain in the intercondylar line of the affected meniscus.

For a diagnosis, the preferred imaging test is an NMR, which can determine the location and type of meniscal injury.

The choice of treatment depends on the type of injury, its location, the sport, and the individual characteristics of the athlete:

- Conservative treatment, in the event of a asymptomatic injury;
- Surgical treatment using arthroscopy (suturing of the meniscus, partial meniscectomy, meniscal transplant, collagen meniscal implant).

Injuries of the ankle ligaments:

Acute ankle sprains are the most common injury and their recurrence is common.

In the United States, 23,000 sprains occur every day.

They account for between 15% and 40% of sports injuries.

They are most common in sports that require abrupt changes in support (basketball, handball, volleyball...).

Most sprains are a result of the forced inversion of the ankle and impact to the LCL.

Strains of the LCL and the syndesmosis are less common but are more serious.

Individuals who suffer numerous ankle sprains demonstrate functional instability, chronic instability, and residual instability.

It is the most stable mobile joint.

Stabilizing structures of the ankle:

- Fibular collateral ligament:
  - Anterior talofibular ligament (tenses during plantar flexion),
  - Calcaneofibular ligament (tenses during inversion),
  - Posterior talofibular ligament (low risk of injury)
- Lateral collateral ligament
  - Deltoid ligament:
    - provides internal stability
    - requires a large amount of energy for injury to occur
    - they are injured before bone structures are.

- Syndesmosis (superior tibiofibular membrane and anterior tibiofibular ligament)

Ankle stabilizers:

- Intrinsic
  - Joint orientation
  - Ligaments
- Extrinsic
  - Muscles
- Neuromuscular coordination

Ankle Sprain

Injury Mechanisms

- Inversion of plantar flexion: Sequential injury (ATFL-CFL-PTFL) caused by stretching one or more fascicles of the fibular collateral ligament.
- Anterolateral or posteromedial contusion: osteochondral injury
- Dorsiflexion during external rotation: distension of syndesmosis

GRADE I

- Distension of the ATFL or CFL
- Slight pain
- Slight swelling
- No functional loss
- No mechanical instability

GRADE II

- Partial rupture of the ATFL or CFL
- Moderate swelling and bruising
- Intense pain in the injured structures
- Functional loss and incapacity with variable loads
- Slight instability

GRADE III

- Complete rupture
- Variable pain

- Significant swelling and bruising
- Functional loss and incapacity with variable loads
- Evident instability

Diagnostic methods

- Anamnesis
- Clinical exploration
- Plain X-ray and stress view
- Static and dynamic ultrasound
- NMR

Diagnosis

- History of the injury: mechanism, situation, and injury history.
- Exploration:
    - Inspection: deformity and swelling
    - Palpation: Ottawa indications (malleolic crests, syndesmosis, base of the 5th digit, scaphoids, neck of the fibula, intercondylar line, squeeze test. Can reduce unnecessary x-rays by 28%
    - Load Capacity
    - Exploration: laxity (anterior drawer, varus).
- X-ray: provides 100% sensibility to malleolar fractures and to fractures in the midfoot.

Treatment:

Principal objectives of the treatment are:

- PREVENT SWELLING
- MAINTAIN OPTIMAL RANGE OF MOTION

Orthopedic:

- During the first days, depending on the severity of the injury, rigid immobilization with compression bandaging or a walking boot for a few days or weeks.
- For Grade II-III sprains, rigid immobilization with a walking boot for two to four weeks is recommended.
- For sprains with partial injury to the syndesmosis, rigid immobilization with a walking boot for four to six weeks is recommended.

Surgical

- For sprains with associated injuries, such as full ruptures of the syndesmosis or fractures of the malleolus.

Assessment indications for the traumatologist:

- Fracture or dislocation;
- Neurovascular disorder;
- Rupture or subluxation of tendon
- Penetrating injuries with open joints
- Full rupture of the syndesmosis
- Joint blockage

Treatment objectives:

- Pain control
- Prevent serious swelling
- Recover joint mobility
- Recover muscle strength
- Strengthen proprioception
- Recover joint function
- Allow time for the scarification period
- Protect the ligaments from loads.

Guidelines for initial treatment:

- REST (immobilization)

- ICE immediately for 10' and every 1-2 h
- COMPRESSION
- ELEVATION (of 15 to 15 cm above the heart)

Treatment guidelines to follow:

- Analgesic immobilization. Period of immobilization will depend on the severity of the injury.
- Crutches during the initial period.
- Discharge during the initial period.
- Analgesics or NSAIDs if needed during the initial period.
- Physiotherapy (start of treatment will depend on the severity of the injury and the need for immobilization, but can always begin by treating the swelling).

Physiotherapy

- Monitor swelling during the first days
- Articular movement
- Muscular tone
- Proprioception
- Training specific to their activity

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