IMPACT ON JOINTS AND LIGAMENTS ON HURDLING EVENTS AND ITS TREATMENT

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Introduction

Hurdling is one of the most demanding event in the athletics. It is complicated because of a continually changing movement pattern between sprinting and hurdling clearance actions at maximum speed. Hurdling is a sprint with obstacles to be cleared with greatest possible speed and with as little interruption to the normal running action as possible. This requires certain modifications to the sprinting actions on each clearance stride and since the hurdles one 3" 6' high this not easy. The hurdler requires qualities of speed, flexibility, co-ordination and length of leg which only a few men possess.

Technique and impacts

Efficient hurdle clearance is defined by the length of the stride before hurdle clearance and after hurdle clearance. According to the studies (La fortune 1991, Mclean 1954, Jarver 1997, Salo and Grimshaw 1998, Kamp miller 1999) the optimal ration between take off and landing point is 60:40

The quality of the hurdle clearance is directly correlated with the height of CM in the take off phase. from the aspect of biomechanics an efficient hurdle race is the one in which vertical oscillations of the CM are as small as possible (Schulter 1981,Dapena 1991,Mcfarlene 1994, Salo and Grimshaw 1997,Kampmiller 1998). The athlete must maintain a high position of the CM during takeoff.

The landing phase is one of the most important elements of the hurdling technique. This phase has the largest reserve potential for improving the competition result. In the landing phase it is necessary from hurdle clearance to mainly between the hurdles.

This transition from acyclic movement into cycle movement requires a high degree of technical knowledge and a high level of motor abilities such as speed, strength, coordination, timing and balance.

Ankle injuries (Abduction injury)

The talus is forcibly abducted in the ankle mortise producing a traction force on the medial structures and compression force laterally. The medial traction force may cause a complete tear of the deltoid ligament of pull – off fracture of the medial malleolus. In most cases the medial injury just proceeds the lateral injury and failure is represented by an isolated fracture of the medial malleolus. If the abduction force continues to act, it

will then produce a fracture of the fibula at the level of the junction of the lower shaft and lateral malleolus with characteristics communication of the lateral cortex.

External rotation injuries with diastalsis of the inferior tibio-fibular joint (pronation external rotation injury)

Abduction injuries

Diagnosis

The full abduction failure can be seen by the valgus deformity with swelling both medially and laterally. Radiographs reveal the typical fibular fracture with varying degrees of commintion of the lateral cortex.

Treatment

A total of six weeks immobilization is required. During the last two weeks weight bearing in the cast is permitted. After removal of plaster, physiotherapy can be given for restore.

Abduction injuries

Sprained ankle

The injury is caused by the eversion twist of the planter flexed foot producing a fear of the anterior fibular ligament.

Diagnosis

Swelling over the lateral aspect of the ankle joint, maximally in front of the distal to the malleolus.

Treatment

It may be treated by bandaging to control inversion. First to apply an aversion stirrup. After two weeks the dressing may be removed and a firm crepe bandage worn. Swelling and oedema can be controlled by the use of a supportive bandage, elevation of the limb and early active exercise.

Complete avulsion of the lateral ligament

A complete tear of the anterior and medial fascicule of the ligament should be suspected in every violent inversion injury of this joint.

Diagnosis

The lateral surface of the talus can be felt just in front of the lateral malleolus and it remains in close contact with the malleolus. Under radiography, with the heel forcibly held in the fully inverted position. If it is a simple sprain the talus stable in the mortise.

Treatment

Complete immobilization in plaster is essential. The patient may weight bear in the cast, which must be retained for six to eight weeks.

Abduction fracture of the lateral malleolus

This can be occurred when the joint is typically horizontal with a “clean break” of the lateral fibular cortex.

Diagnosis

It always have pain and swelling over the outer aspect of the ankle. Bony tenderness is present at the base of the lateral malleolus

Treatment

The leg should elevated for 10 days after which walking non weight bearing is permitted provided a check x-ray. A walking heel may be applied after 4 weeks and the plaster removed at 8 weeks.

Oblique fracture of the lower fibula

Diagnosis

This injury is damaged to the anterior -tibio fibular ligament. It is diagnosed by finding acute local tenderness.

Treatment

Immobilization for six weeks in a plaster cast. A light elastic support to control any swelling should be worn for a few weeks and short programme exercise can be ordered.

Fracture –dislocation without inferior tibio-fibular joint diatsais

After causing an oblique fibular fracture ,, the talus then impinges against the posterior lip of the tibial articular fracture and may fracture it.

Diagnosis

The ankle joint is greatly deformed and swollen. Prominence of the heel with shortening of the forefoot denotes a posterior dislocation. Radiographs are essential to appreciate all components of the bony failure.

Treatment

The only acceptable result of treatment of fracture dislocations of the ankle is union in an anatomical position and nothing of perfect reduction should satisfy the surgeon.

Vertical compression injuries

This joint is designed to bear weight and supports up to three times body weight during the push off phase of normal gait. The talus splits the lower tibia into a number of fragments of varying size and impacts into the calcaneous bone of the supra malleolar region.

Diagnosis

Swollen with widening of the body diameter in the malleolar area.

Treatment

Injuries lead to secondary degenerative arthritis and where possible surgical reconstruction of the joint should undertake by surgeon.

Miscellaneous ankle injuries

Recurrent sprain of the inferior tibio- fibular joint

A partial tear of the anterior tibio fibular ligament represents a “form freste “supination external rotation failure. 70% of the recurrent ankle sprains are due to injury of the anterior tibio-fibular ligament and have recommend screw fixation of the tibio fibular joint for persistent disability.

Treatment

Strapping encircling the limb immediately above the malleoli and keep them in position for about six weeks. Raising the heel of the shoe by about ¼ inch may prevent recurrence.

Knee injuries (Meniscus injuries)

The menisci of the knee are clearly designed structures to share the load bearing through the joint surfaces. The menisci take 50% of the weight passing through the knee. Their location and function puts them at risk in any activity involving weight bearing and twisting, particularly if this is performed with the knee flexed. If a bucket handle bear in produced and flips into the centre of the joint there is immediate pain and an inability to straighten the knee.

Anterior cruciate ligament injuries

Rupture of the ACL is the common ligament injury an any sport that involves turning or changing and direction of weight bearing leg. External rotation of femur in tibia produces the injury. ACL is vulnerable in jumping sports such as triple jump and hurdles while landing and turning.

Posterior cruciate ligament injuries

This injuries usually occurs with the blow to the front of the tibia or fall on a flexed knee. They are often thought of as minor injuries and it can be possible to play on far a short while before swelling occurs.

Medial ligament injuries

This injury occurs with the sudden valgus stress to the knee and are common in contact sports. Usually a medial pain , swelling and a reluctance to a straight the knee can be found.

Cartilaginous injuries

This injuries to the knee , which is one of the largest joints in the body , produce lesions that are painful, debilitating and difficult to diagnose and to treat.

Osteochondral factures and Peripheral meniscus rupture

When athletes fall against hard surfaces or receive impact on the joint a piece of bone with its underlying cartilage is sheared off. This condition immediately develops into hemarthorsis or blood in the joint. The meniscus is the knee’s shock absorber which helps to stabilize the joint. Lateral meniscus injury is more serious than a medial one because the lateral meniscus is of greater functional significance to the knee joint instability.

Dislocation of the joint

Direct violence applied to the head of the tibia or indirect twist or hyper tension strain causes more severe injury and the tibia is dislocated backwards ,forwards or laterally and does not slip back into position spontaneously

Treatment

The treatment of this condition is same as the treatment of ligament turning isolation.

Allusion of the patella ligament from patella

It is a rupture of the quadriceps tendon and the fear involve not only those fibres which are attached to the patella itself, but the whole of the lateral quadriceps expansion. The patella is displaced upwards by retraction of the quadriceps muscle.

Lateral dislocation of the patella

The capsule of the joint is lax and the lateral femoral condoyle is poorly developed so that the patellar groove is shallow, the patella may be so mobile that relatively slight pressure is sufficient to displace it over the margin of the femoral condyle.

Treatment

Joint should be immobilized on a back split for two months and wasting of the quadriceps being prevented by regular active exercises.

Recurrent dislocation of the patella

When the muscle contrasts it tends to form a straight line between its origin and insertion so that the angle is obliteneated and the patella is displaced outwards.

Treatment

This is connected by the lower most fibers of the vastus interus which lie in an almost horizontal axis. The vastus internus contracts simultaneously with the other muscles of the quadriceps group so that it would otherwise displace over the lateral femoral condoyle.

Fracture of the Tuberostities of the tibia

The most common injury is to the lateral side. A blow on this side of the extended knee forces the joint into the abducted tears the medial ligament and stretch the cruciate ligaments.

Treatment

Restoring the smoothest possible joint surface. To prevent wasting of the quadriceps muscle by active non weight bearing exercise begun can continued throughout the period of immobilization.

Methodology

In this chapter the method adopted for obtaining the information pertaining to the present of the topic is described. To collect the required information related to the study, documentary analysis and techniques were used. Apart from library sources internet facilities were also utilized.

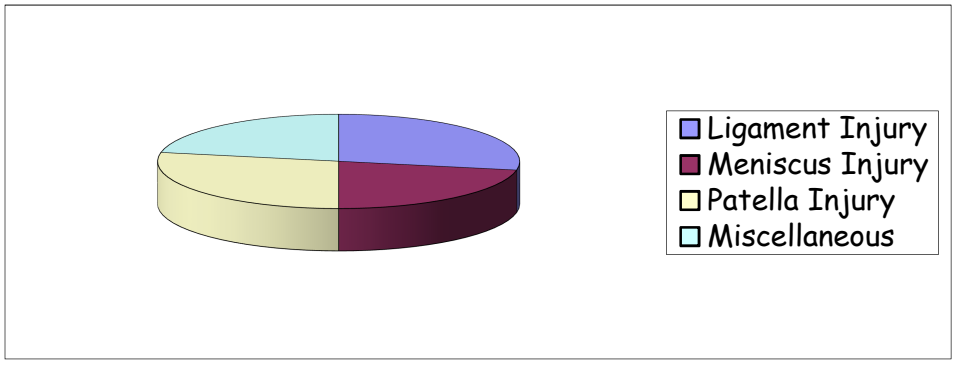

Figure. 1 Indicates the degree of various injuries at knee

The knee is the most commonly injured joint in sports activity. This is perhaps not surprising when one considers its complexity and vulnerable position. In the landing phase many authors like “Myaska” views that ligament injury were found to be more common than meniscal injuries. The serious of an impact depends on the landing height. The height and the landing are directly proportional to the landing impact.

Vertical ground reaction force and the moment data were reduced to eight variables responding impact peak(PK) impact impulses(IMP), vertical ground reaction force(VRF) ,ankle joint moment(AM),knee joint ,moment(KM),hip joint moment(HM), positive bio mechanical strategy(PB),negative biomechanical strategy(NB).

All peak impulse variables were normalized to landing momentum in order to account for both differences in mass and landing velocity due to differences in landing height. Landing momentum was estimated using the product of body mass multiplied by his/her landing velocity.

$$V= (2.g.h)1/2$$

Where V estimated landing velocity, g = acceleration due to gravity, h=landing height.

The magnitude and direction force changes due to landing heights.

Conclusion

After clearing the hurdle , the hurdler maintain a high position of the C.M(1.15 m) which is above all due to the full extension of the leg in the hips and knee. The C.M. is exactly above the foot. The foot is in complete planter flexion, thereby neutralizing the ground reaction force that occurs at landing after clearing the hurdle. The ground reaction force at that moment (vertical force) is 2400 – 3300 N (MClear 1994). In addition to the correct technique, the ability of muscular system known as short range elastic stiffness (Goll Hofer and Kyrolaninen. 1991) is important in order to enable the hurdler to neutralize such a large ground reaction force at landing. Overuse injuries of the lower extremity are common during dynamic athletic activities such as running, jumping, and landing events. Knee and ankle injuries can be prevented by strengthening of particular joints and muscles. Rehabilitation of the particular joint should be done

before practising for hurdling event after the major injuries to the joints. The impact force is determined by mechanical events and no biological accommodation occurs. A biomechanical response results when an increase in impact forces at a rate less than the rate of increase of the applied stressor. Finally, impact force could increase with an increase the applied stressor, suggesting a super accommodation. Similarly, the impact force could increase at an average rate higher than the rate of increase of applied stressor, resulting in force magnitudes greater than those determined mechanically by the stressor.

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