

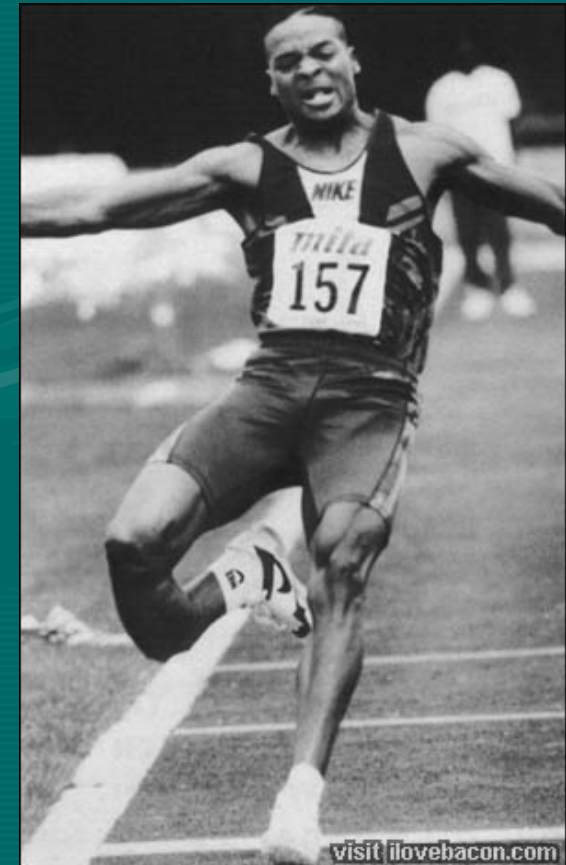
www.fisiokinesiterapia.biz

Sports Injuries and Conditions



Sports Injuries and Conditions

- Commonly encountered sports injuries and conditions include:
- Fractures
- Concussion
- Bleeding
- Joint injuries
- Soft tissue injuries
 - Muscle injuries
 - Tendon and ligament injuries
- Skin damage
- Dehydration
- Hyperthermia (heat stroke) and hypothermia



What is Injury?

- Injury = cellular damage,
- Local network of blood vessels is damaged,
- Damaged vessels bleed,
- Lack of oxygenated blood = cell death,
- Injured soft tissues consist of dead cells, extracellular substance and blood.

Evans 1994, Association of Chartered Physiotherapists in Sports Medicine (ACPSM) 1999

Injury Classification

- **ACUTE**: rapid onset, traumatic event with a clearly identifiable cause.
- **SUB-ACUTE**: period between acute and chronic, usually 4-6 weeks post-injury.
- **CHRONIC**: slow insidious onset, gradual development of structural damage.

Clark, 2004

Inflammation

- Heat:
 - Increased blood flow to the injured area causes an increase in temperature;
- Redness:
 - With increased perfusion comes a red/pink hue to the skin;
- Pain:
 - Caused by chemicals released by dying cells acting on nerve endings;
- Swelling:
 - Increases in blood flow and extracellular fluid - inflammatory exudate.

Repair and Regeneration

- Healed tissue never returns to pre-injury state
- Fibrous connective tissues will be replaced but will not have the same structural properties;
- Damaged muscles heal by scar tissue;
- Joint capsules thicken when healing due to the high levels of fibrin in the exudate;
- Generally soft tissues heal by fibrous repair.

Healing

- You cannot accelerate the healing process.
- We can provide optimum conditions for healing to occur;
- Reduce limiting factors.
- Limiting factors
 - Oedema
 - Haemorrhage
 - Poor vascular supply
 - Separation of tissues
 - Muscle spasm
 - Muscle atrophy
 - Infection
 - Health, age, nutrition

Classification of sporting injuries

Site	Acute Injuries	Overuse Injuries
Bone	#, periosteal contusion	Stress #, “bone strain”, “stress reaction”, osteitis, Periostitis, apophysitis
Articular Injury	Osteochondral/ chondral #'s, Minor osteochondral injury	Chondropathy (e.g. softening, fibrillation, fissuring, chondromalacia)
Joint	Dislocation Subluxation	Synovitis Osteoarthritis
Ligament	Sprain/tear (grades I-III)	Inflammation

Site	Acute Injuries	Overuse injuries
Muscle	Strain/tear (grades I-III), contusion, cramp, acute compartment syndrome	Chronic compartment syndrome, DOMS, Focal tissue thickening/fibrosis
Tendon	Tear (complete/partial)	Tendinopathy (includes paratenonitis, tenosynovitis, tendinosis, tendinitis
Bursa	Traumatic bursitis	Bursitis
Nerve	Neuropraxia, minor nerve injury/irritation	Entrapment, adverse neural tension
Skin	Laceration, abrasion, puncture wound	Blister, callus

Conditions masquerading as Sports Injuries

Bone and soft tissue trauma Osteosarcoma Synovial sarcoma Synovial chondromatosis Pigmented villonodular synovitis Rhabdomyosarcoma Osteoid osteoma Ganglion cyst	Vascular Venous thrombosis (e.g. deep vein thrombosis (DVT), axillary vein thrombosis) Artery entrapment (e.g. popliteal artery entrapment) Peripheral vascular disease (PVD)
Rheumatological Inflammatory monoarthritis Inflammatory polyarthritis Inflammatory LBP (e.g. sacroilitis) Enthesopathies (e.g. psoriatic, reactive arthritis etc.)	Genetic Marfan's syndrome Haemochromatosis
Disorders of muscle Dermatomyositis Polymyositis Muscular dystrophy	Granulomatous diseases Tuberculosis Sarcoidosis

Conditions masquerading as Sports Injuries

Endocrine

Dysthyroidism
Hypercalcaemia
Hypocalcaemia
Hyperparathyroidism
Diabetes
Cushing's syndrome
Acromegaly

Infection

Osteomyelitis
Septic arthritis
Shingles

Regional pain syndromes

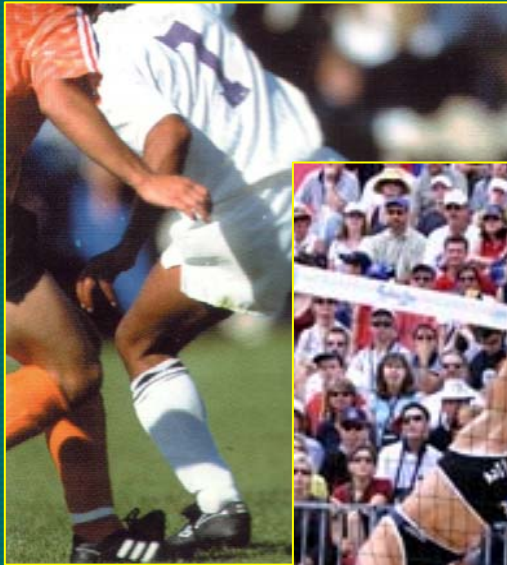
Complex regional pain syndrome/reflex
sympathetic dystrophy
Fibromyalgia/myofascial pain syndrome

“Occasional exercise is sometimes fatal, often injurious,
and almost always painful”

Williams JPR 1974 Wales and British Lions fullback



ouch6_1.jpg



Concussion

- Best described as the shaking of the brain leading to a brief loss of consciousness
 - Direct force such as a blow to the head
 - Indirect force as with whiplash in a car accident
- Recognition
 - Brief loss of consciousness, possibly delayed
 - Dizziness & mild headache
 - Nausea
 - Loss of memory
 - Disturbed vision
 - Pale, cold, clammy skin
- Seek medical assistance
- Do not allow the casualty to drive or play sport until seen by a doctor

Bleeding

- Open and closed wounds
 - **Incised**; a cut from a sharp edge
 - **Laceration**; rough tear or crush to the skin
 - **Abrasion**; graze or superficial wound from a rough surface
 - **Contusion**; bruise or internal bleeding
 - **Puncture**; an object entering the body
 - **Velocity injury**; a puncture wound at velocity will cause extensive damage, there may be an entry and exit wound

Sevett 2006

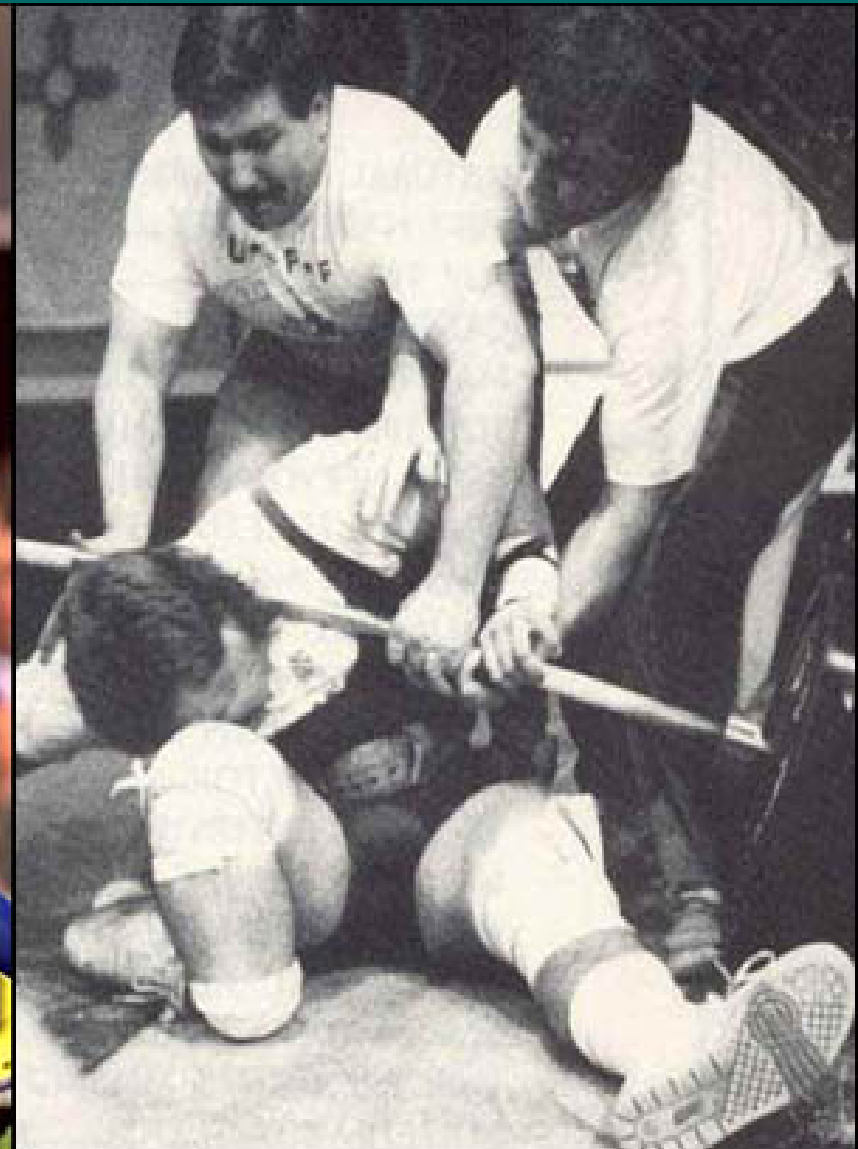
Types of bleeding

- **Arterial:**
 - Bright red; pumping ,will lead to shock, unconsciousness and death within minutes
- **Venous:**
 - Dark red; gushing or pooling at the site of the wound, depends on size of the vein
- **Capillary:**
 - Oozing at the site as with an abrasion or perhaps internally from a contusion to muscle or internal organ
- When a blood vessel is torn or severed, blood loss and shock will cause the blood pressure to fall and the injured vessel will contract
- *At all times prevent cross infection*

Fracture

- **Fracture:** a break or rupture in a bone
- A deformity that can be seen or felt
- Pain on stressing the limb
- Abnormal movement in a limb due to movement at fracture site
- Crepitus or grating between bone ends
- Impaired function
- Swelling and tenderness at the fracture site

Deformity and Abnormal movement



Impaired function



Causes of fractures

- **Direct trauma**
 - external forces which exceed the strength of the bone.
 - direct violence e.g. RTA, a blow
- **Indirect trauma**
 - twisting or rotational forces being applied to the bone
 - e.g. football studs planted, rotation force applied to the limb resulting in spiral # of the tibia
- **There is always some element of soft tissue damage with a fracture**
 - Muscle
 - Ligaments
 - Neurovascular structures





Causes of fractures

- **Pathological fracture (A)**
 - bone is already weakened or diseased
 - fracture because bone internal structure is weakened
- **Stress fracture**
 - Caused by repeated excessive loading of a bone cumulated forces result in fracture
- **Avulsion fracture (B)**
 - Sudden muscle pull “pulls off” a small piece of bone, e.g. Peroneus Brevis muscle at the base of 5th metatarsal
 - High forces across a joint,
 - ligament is pulled from its insertion with a piece of bone.
 - Avulsion fractures may be associated with subluxation or dislocation of the joint

McRae 1994



A



B

Classification of Fractures

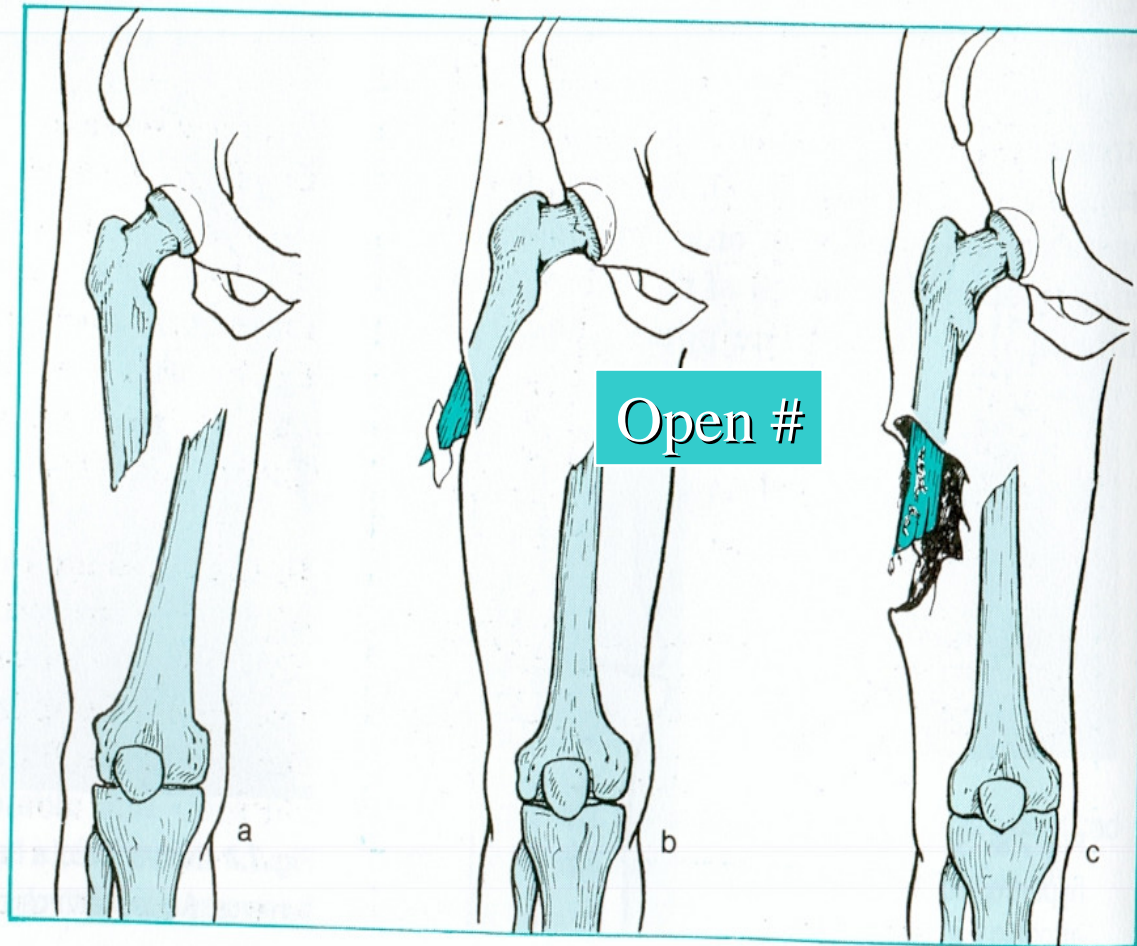
- **Skin damage**
 - **Open fracture** (compound fracture dated term)
 - skin broken
 - external source
 - internal source (compound from within)
 - **Closed fracture** (simple fracture)

McRae 1994

Closed #

Open #

Fig. 7.8 Open and closed fractures:
(a) closed fracture; (b) 'compound
from within'; (c) an open fracture with
contamination.



Fracture Treatment and Management

- Restore the patient to optimal functional state
- Prevent fracture and soft-tissue complications
- Get the fracture to heal, and in a position which will produce optimal functional recovery
- Rehabilitate the patient as early as possible
- Reduction of the fracture
- Immobilisation of the fracture fragments
- Rehabilitation of the soft tissues and joints

McRae 1994; Brukner and Khan 2001; Milanese 2004

Fracture Management

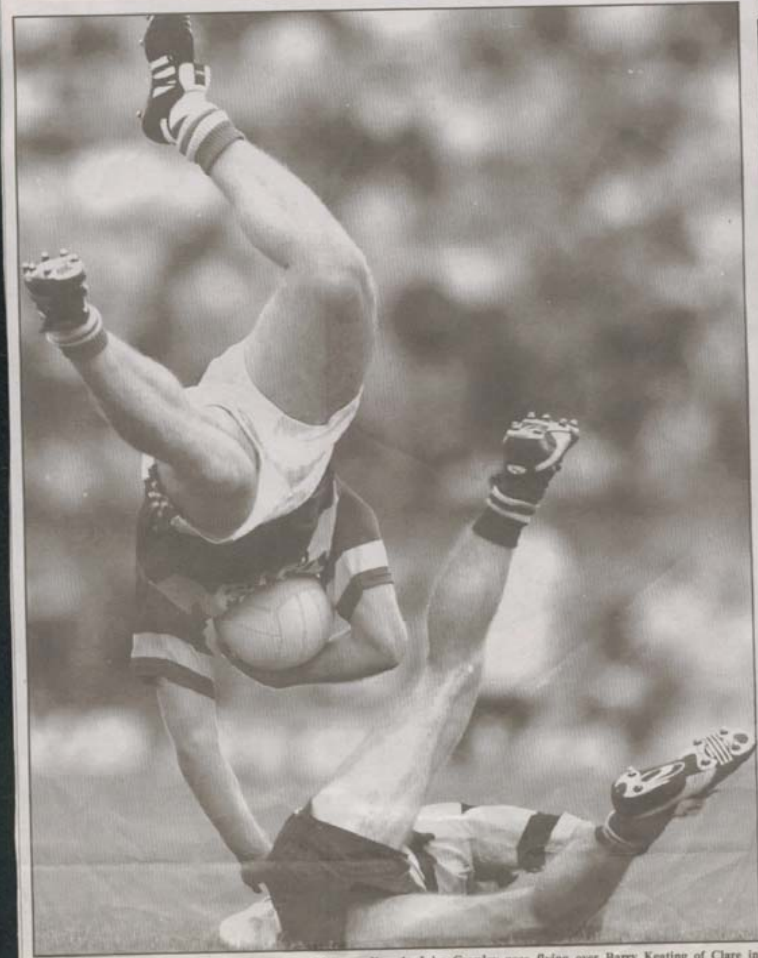
- Priorities of Treatment
- Treat life threatening injuries first
- If fracture only injury ... treat fracture
- Primary aim
- Attain sound bony union
- Full restoration of function

McRae 1994; Sevett 2006

Specific Traumatic Event



Kerry cruise on in



Kerry's John Crowley goes flying over Barry Keating of Clare in



The challenge by Gareth Gorman which has almost certainly ended Pascal Vaudequin's season.
(Photo: Paddy Gallagher)





Joint Injuries

- High energy impact
- Traumatic knee injuries
- Damage to:
 - Menisci
 - Ligaments
 - Joint capsule
 - Bony structures
- Knee “big three”
 - Anterior cruciate ligament (ACL), medial meniscus, medial collateral ligament (MCL)

Pitmann and Frankel 1995; Clark 2003

Joint Injuries

- Shoulder
- Subluxation: an incomplete or partial dislocation
- Dislocation
- Associated damage to soft tissues in and around the joint
 - e.g. Rotator Cuff Tear
 - Stinger
- Acromioclavicular Joint (AC joint)

Brukner and Khan 2001

What are the Soft Tissues?

- Muscles & Tendons
- Ligaments and Joint Capsules
- Cartilage
- Nervous Tissue
- Connective Tissue
 - adipose tissue
 - dense connective tissue (tendons and ligaments)
 - elastic connective tissue

Types of soft tissue injuries

- TRAUMATIC:
 - Specific cause is identified
 - Cause of injury easily identified
- OVERUSE:
 - Develop slowly cannot be attributed to one incident
 - Specific injuries associated with a particular sport

Overuse Injury





Overuse Injuries

- Swimmers 10yr age
- 4 session per week (minimum)
- 1 session = 3000m
- 120 lengths per session
- estimated elite swimmers

1.2 - 2 million swimming strokes per year

Bruckner and Khan 2001

Causes of Soft Tissue Injuries

- Intrinsic causes of injury
 - factors within the sports person
- Extrinsic causes of injury
 - factors outside the sports person

THE IRISH TIMES, TUESDAY, JULY 25, 2000

ATHLETICS/US Olympic trials

How the mighty have fallen

Tom
Humphries
in
Sacramento

Y thing happened on the way to
sics. The US, bound up in its
life, liberty and the pursuit of
misaid half-a-dozen of its medal
Fidelity to principle and spec-
ever come at as high a price.

ghlight, of course, was strictly
in anti-climax; but after the long
and the a week of name-calling,
Michael Johnson and Maurice
pulling up wounded on the
o tartan provided a finishing
a moral straight out of Greek
re punishment for a warrior's hu-
greater spectacle than any world
st have been.

tion rate in the 200 metres —
rummond and Mike Marsh fail-
the final, with Brian Lewis
it of the final before it began and
on and Greene being blighted
ough — means the event will be
th the Olympic champion and
ampion when it gets under way

Johnson, who had the entire
endar shifted to facilitate his
lanta, spoke early in the week
reference for a scheme whereby
like him were automatically in-
pete in the event next time out,
been experiencing a chilly pre-

and Greene both had plenty to
y had been patched up and leed

did all learn from this," said
e built this up, the media, me
and it ended up pissing those
and they ran really fast."
aid he'd felt both hips starting
the time he hit the starting
final. Greene, who pulled up
th hamstring, felt nothing out

"I," he said, speaking about the
se. "I've been putting a lot of
everybody else because I'd been



earn
s up,
urice,
ing
and
"nson

l said
pen.

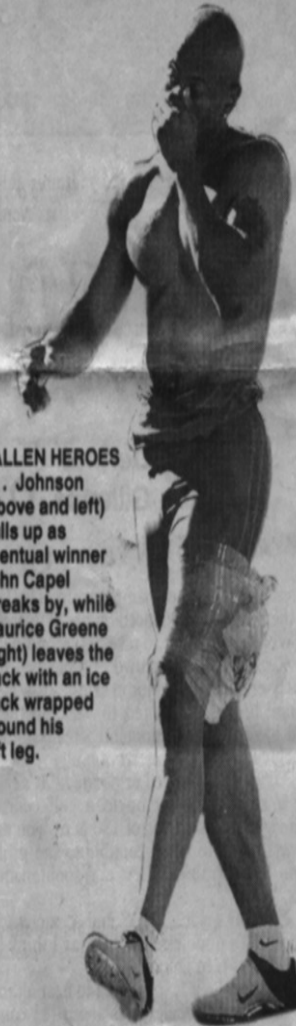
world
eat
e and
e to
W

eeene

usband JJ
res.
re cham-
been her
and Stacy
and every-



FALLEN HEROES
... Johnson
(above and left)
pulls up as
eventual winner
John Capel
streaks by, while
Maurice Greene
(right) leaves the
track with an ice
pack wrapped
around his
left leg.



thing
best w
Fr
most
wome
was w
Jacob
little
Athen
Jac
leaning
metre
isher
will go
that n
go to
In
unfold
metre
Cheru
champ
tion) t
Sydne
Sally
metre
In
was M
with h
medal
she ha
cruisin
and C
be the
Jon
will be
and fir
she wi
has eve
"Th
she sai
time be
and I s
He just
Olymp
New

Intrinsic Causes of STI

- Lack of warm-up.
- Inadequate fitness or physical weakness.
- Anatomical factors.
- Tight muscle groups
- Muscle imbalance
- Previous injury.

Clark 2004

Extrinsic Causes of STI

- Faulty technique.
- Inappropriate training: training errors; mode; duration; intensity
- Inappropriate clothing.
- Inappropriate footwear.
- Lack of protective safety equipment.
- Inappropriate environment.

Clark 2004



Some soft tissue injuries are easier to diagnose than others

Types of injuries

- **MUSCLE**: haematoma, strains, tears,
- **LIGAMENT**: partial tear, complete rupture
- **TENDON**: tendinitis, tendonosis, tenosynovitis.
- **BURSAE**: acute, chronic
- **SKIN**: abrasions, blisters, lacerations

SHE WAS JUST GOING FOR A SHORT RIDE.

A sweatshirt and jeans didn't protect
Brittany when she fell off a motorcycle
and tumbled 500 feet down the highway.
(And she was the passenger.)

SAVE YOUR SKIN.

Ask your dealer about the latest styles in protective gear.

Brought to you by Dealernews, the Voice of Powersports Retailers, and your local motorcycle dealer.





3





Intermuscular haematoma.
Damaged fibres and broken
blood vessels have leaked blood
into surrounding tissues.



Intramuscular Haematoma
Caused by blow from another player

Effects of Heat and Cold

- Normal body temperature 36.9°
- Affected by extremes of heat or cold, dehydration, head, or spinal injury
- Heat is gained by conversion of food into energy, from external heat sources and by muscle activity

Sevett 2006

Effects of Heat and Cold

- Hot conditions cause blood vessels to dilate (vasodilatation) allowing excess heat to be lost through sweating and increased the breathing rate
- Cold conditions cause blood vessels contract (vasoconstriction) reducing sweating
 - Blood vessels in the skin shut down, stopping internal or core heat escaping
 - Prolonged exposure to cold, wet, and windy conditions the core temperature may drop below 35°, normal bodily functions slow and eventually stop.
 - This is *Hypothermia*

Sevett 2006

Hypothermia

- Recognition
 - Shivering at first but will stop as condition progresses, usually when body temperature is between 29° and 34°
 - Cold, pale, and dry skin
 - Slow shallow breathing
 - Slow weak pulse
 - Strange irrational behaviour
 - Lethargy
 - Unconsciousness leading to coma and cardiac arrest

Dehydration

- Dehydration or Heat exhaustion
- Body temperature exceeds atmospheric temperature, particularly in humid conditions
- Often takes place with strenuous exercise
- Causes the loss salt and water
- Reduced fluid component of the blood, can lead to shock
 - **Recognition**
 - Headache
 - Confusion
 - Sweating with pale clammy skin
 - Muscle cramps in the abdomen and limbs
 - Rapid weakening pulse
 - Temperature around 39°

Hyperthermia

- Body temperature exceeds 40°
- Uncontrolled heat exhaustion, prolonged exposure to high temperatures or as a result of illness or fever
- This is known as *Heatstroke*

Sevett 2006

Heatstroke

- **Recognition**
 - Headache
 - Confusion and general discomfort
 - Hot, flushed, and dry skin
 - Body temperature of $40^{\circ} +$ (the brain starts to swell)
 - Rapid deterioration
 - Full, bounding pulse
 - Slow, noisy breathing
 - Response levels deteriorate rapidly
- Serious condition that can deteriorate rapidly so urgent medical attention is required

Sevett 2006

Preventive Measures

- Healthy balanced diet
- Adequate hydration
- Basic physical fitness
- Correct technique
- Obey the rules of the sport
- Understand the requirements/demands of your sport

Peterson and Renström, 1986

Preventive Measures

- Adequate warm-up including stretching
- Preparation for sport and prevent injury
 - At rest the blood flow to the muscles is relatively low, approximately 15-20%
 - Activity progressively opens the blood vessels, after 15-20minutes this flow increases to around 70-75%
- Progressive warm-up leads to a marked decrease in risk of injury and an enhanced performance

Peterson and Renström, 1986

Preventive Measures

- Cool-down
 - e.g. gentle jogging
 - Stretching
- Protective equipment
- Appropriate clothing
- Appropriate and functional equipment required for the sport

Peterson and Renström, 1986

Preventive Measures

- Correct training
- Effects on the musculoskeletal system
 - Skeleton
 - Cartilage
 - Connective tissue
 - Muscles
 - Isometric
 - Concentric
- Mobility and flexibility

Pollock et al 1998; Milanese 2004; Prentice 2004

Effects on the Musculoskeletal System

- **Wolff's law** states the bone remodels according to the forces imposed upon it. Increasing the force transmitted through bone causes increased density and strength. Site specific e.g. Neck of Femur – controlled force must be imposed on that bone or the muscles that cross it.
- **Davis' law.** Inert tissue (e.g. ligament) remodels along the lines of mechanical stress placed upon it – better quality and tensile strength due to appropriate orientation and organisation of collagen fibres.
- **Sensorimotor control.** “The control of both movement and posture”. Joint stability refers to the ability of a joint to maintain alignment and resist displacement, sensorimotor control of joint stability refers to the co-ordination of different muscle groups to control movement and posture.
- **Specificity of muscle training.** Muscle performance is highly specific to the type of training performed. Research demonstrates that the effects of exercise are mode specific – Open Kinetic Chain v Closed Kinetic Chain, muscle groups, ROM, muscle action, intensity, and velocity

Preventive Measures

- Co-ordination and proprioception
- Sports specific training
- Weight training
 - Drawn up individually with regard to the subjects age, sex, build, physical fitness, and sport
 - Great caution is advised when strength training programmes are prepared for the growing young person

Pollock et al 1998; Ashe and Khan 2004

References

- Ashe M, Khan K 2004 Exercise Prescription. Journal of the American Academy of Orthopaedic Surgeons 12; 21-27
- Association of Chartered Physiotherapists in Sports Medicine 1999 Clinical guidelines for the management of soft tissue injury with protection, rest, ice, compression, and elevation (PRICE). Chartered Society of Physiotherapy, London.
- Brukner P, Khan K 2001 Clinical Sports Medicine. Revised Second Edition. McGraw-Hill Australia Pty Sydney, pp 229-233
- Clark N 2003 Functional rehabilitation of the lower limb. SportEX Medicine 18; 16-21.
- Clark N 2004 Principles of injury rehabilitation. SportEX Medicine 19; 6-10.

References

- Evans P 1994 The healing process at cellular level: a review. *Physiotherapy* 6; 256-259.
- Milanese S 2004 An approach to screening the recovering athlete. *SportEX Medicine* 19; 17-21.
- McRae R 1994 *Practical Fracture Treatment*. Third Edition. Churchill Livingstone. Edinburgh, pp 25-44, 62, 75-95
- Petersen L, Renström P 1986 *Sports Injuries. Their prevention and treatment*. Martin Dunitz Ltd, London, p 10-12.
- Pittman M, Frankel V, 1995 Biomechanics of the knee in athletics. In: *The lower extremity and spine in sports medicine*, Jackson D (ed). Raven Press, New York.

References

- Pollock M, Gaesser G, Butcher J, Després J-P, Dishman R, Franklin B, Garber C 1998. The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. *Medicine and Science in Sport and Exercise* 30; 6
- Prentice WE, 2004 *Rehabilitation techniques for sports medicine and athletic training*, 4th ed. McGraw-Hill, New York, p 526-578.
- Sevet S 2006 *First Aid at Work*. Third Edition. Highfield. Co. UK. Ltd. Doncaster, pp 59, 60, 74-78, 92-94, 111-114