Musculoskeletal Physiotherapy

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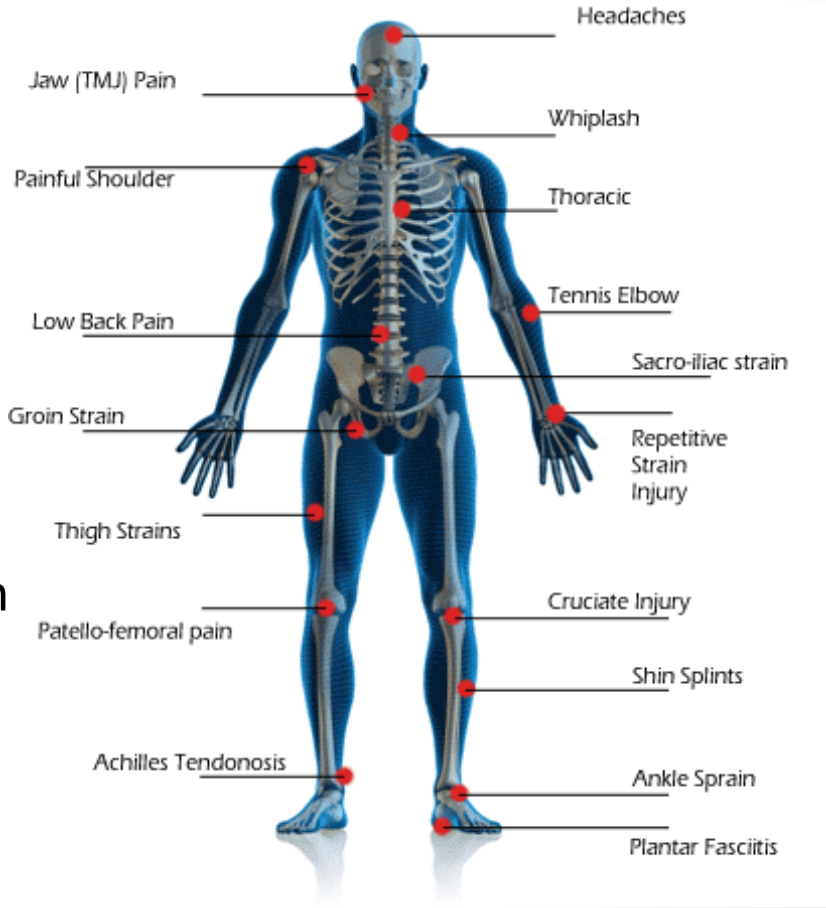
What is Musculoskeletal Physiotherapy?

Musculoskeletal Physiotherapy is a core and specialised area of Physiotherapy which treats injuries and conditions that affect the muscles, joints, and soft tissues.

<u>Injuries can include</u>:

- Ligament sprains
- Muscle strains
- Arthritis
- Cartilage tears
- Pre and post surgery rehabilitation
- Fracture rehabilitation
- Back pain



- These injuries can require both a musculoskeletal physiotherapy assessment and treatment session to optimise healing and speed the recovery process.

- Upon assessment the physiotherapist will work with the patient to set goals and develop an appropriate rehabilitation plan.

- Some of the treatments which the Musculoskeletal Physiotherapist may use include:

* Exercise Therapy
* Manual Therapy
* Massage
* Self-management strategies

- The most appropriate treatments are selected after clinical judgement and experience of the Physiotherapist on the findings from the initial assessment.

- Treatments for musculoskeletal injuries aim to:

* Optimise healing
* Speed the recovery process
* Increase strength
* Restore normal movement
* Decrease pain
* Decrease swelling and inflammation
* Increase independence

- These will all be considered by the Musculoskeletal Physiotherapist when they are developing the treatment plan.

Inflammatory Stage

- The inflammatory response is the body's natural response that occurs immediately following tissue damage. It's main functions are to defend the body against harmful substances, dispose of dead or dying tissue and to promote the renewal of normal tissue.

- The inflammatory reaction is most commonly characterized by 5 distinct signs:

1. Pain (due to chemicals released by damaged cells).
2. Swelling or oedema (due to an influx of fluid into the damaged region).
3. Redness (due to vasodilation- the widening of blood vessels and bleeding in the joint or structure).
4. Heat (due to an increase in blood flow to the area).
5. Loss of function (due to increased swelling and pain).

- The inflammatory reaction is the combination of a number of reactions within the body and is immediate to 2-5 days.

Tissue Injury:

- Tissue damage may occur from trauma such as a fall, RTA, collision etc, however, tissue injury can also be due to overuse – also known as microtrauma.

Release of Chemicals:

- When tissue cells become injured they release chemicals that initiate the inflammatory response. Chemicals such as histamine work together to cause increased vasodilation, leading to increased blood flow to the injured tissue. These chemicals also act as messengers that attract some of the body's natural defence cells- a mechanism known as chemotaxis.
- Although very beneficial to the body's defence methods some of the chemicals can also increase the sensitivity of the pain fibres in the area, making the area more painful.

Leukocyte Migration:

- Chemotaxis leads to the migration of leukocytes (white blood cells) to the damaged tissue.
- The first white blood cells to the injured site are neutrophils which neutralize the harmful bacteria,
- Secondly the macrophages engulf the bacteria and dead cells and ingest them so that the area is clear for new cells to grow.
- This process occurs within **72 hours of the injury** and can remain in the area for weeks after the injury.

Proliferative Stage

Collagenation:

- Wound healing occurs towards the end of the inflammatory process, however the two processes do overlap hugely. After a number of days fibroblasts (which produce collagen) form a new collagen matrix which acts as a framework for new tissue cells.

Angiogenesis:

- Once the area is sufficiently cleared the damaged area can form new capillaries to bring blood to the wound site (angiogenesis or revascularization).
- When the blood flow has been re-introduced to the area there are particular tissue cells which re grow.

Proliferation:

- The proliferation phase **can last up to 4 weeks**.
- When the injury sustained is severe the affected area may be composed of a mixture between specific tissue cells (such as muscle cells) and other tissue known as granulation tissue.
- If this granulation tissue is not removed it will remain and form scar tissue, which can lead to a decreased functional ability of the tissue.

Remodelling Stage

- The stage of remodelling occurs when the new cells mould into their surroundings to produce functioning tissue.
- This process of remodelling can **last from 3 weeks to 2 years.**
- The new cells and protein fibres become arranged in a way that is best suited to the stresses imposed on the tissue, although the scar tissue will only be 80% as strong as the original tissue.
- It is important that when the tissue is healing it is stretched into the correct direction to optimize the strength of the new tissue.

Muscle Injury

Muscle Pain:

- (Pulled Muscle; Muscle Strain; Muscle Injury; Muscle Tear)

- Muscle pain - injury to the muscle resulting in muscle pain, weakness and reduced muscle performance.

- Muscle pain can be caused by any strain, injury or tear. The most common areas to become injured are the high speed and load muscles such as the hamstrings, quadriceps, calf, back and biceps.

- Muscle tears can range from a mild strain (grade one), moderate strain (grade two) to a severe strain or complete rupture (grade three).

Muscle Injury cont.

The signs and symptoms of a muscle strain/ tear include:

- Muscle tightness
- Bruising
- Weakness
- Inability to fully stretch the injured muscle

Treatments for a Muscle Strain/Tear:

- RICE
- Ice and a compression bandage
- Elevate the region if it is swollen
- If it's painful to walk - ?use crutches
- Reduce training to a pain free level

Next Steps:

- Assessment of the muscle function, core stability and biomechanics to avoid injury recurrence
- Soft tissue massage to break down any scar tissue and promote healing
- Muscle rehabilitation program that incorporates components of strength, endurance, flexibility and speed that is specific to the chosen sport
- Neural tissue dynamics assessment to ensure that no nerve tissue has become entrapped in the scar tissue
- Use of heat and ice for swelling and pain relief after treatment sessions

Ligament Injury

- A ligament is a short band of tough, flexible tissue, made up of many individual fibres, which connect the bones of the body together. They can be found connecting most of the bones in the body.

- Ligament injury in athletes are common and can occur at any joint. However, tripping over or stepping on uneven surfaces can cause ligament injuries. The knee and ankle are particularly vulnerable to ligament injuries.

- Ligaments are strained when the joint is stressed beyond its normal range. Common causes of a ligament injury include: twisting, or landing awkwardly. It is most common when the ligaments around a particular joint are at full-stretch can cause it to tear away from the bone. Or even tear apart.

Grades of Ligament Injury are:

Grade I : Mild ligament tear
Grade 2 : Moderate ligament tear
Grade 3 : Severe (Ruptured) ligament tear

Ligament Injury cont.

Signs and symptoms of a Ligament Injury:

- Sudden onset of pain and severe swelling
- Joint instability
- Impaired function eg can't walk or run

- Most ligament injuries can be rehabilitated for a safe return to sport **between 4 to 12 weeks**. The time period varies greatly depending upon the location and severity of injury. The best guide if unsure is to ask the doctor.

Common Ligament Injuries include:

- ACL Tear
- Acromioclavicular Joint Injury
- Back Muscle Pain
- Ankle Sprain (lateral ligament more common then medial ligament)
- Knee Ligament Injury
- Muscle Pain: Strains or Tears
- Neck Headache
- Repetitive strain injuries
- Plantar Fasciitis
- Shoulder Dislocation

Ligament Injury cont.

Treatments:

- RICE
- Soft Tissue Massage
- Aids – crutches, stick, frame
- Aircast boot
- Taping/ support brace
- Closed Kinetic Chain Exercises
- Gait Re-Education
- Proprioception & Balance Exercises (e.g. heel-toe walking, SLS, SLS on pillow, SLS with eyes shut)
- Neurodynamics / Neuro Mobilisation
- Strengthening Exercises
- Stretching Exercises

Fractures

- Fractures can occur in people of any age, but two groups of people tend to sustain most fractures - the elderly and children.
- In children a broken forearm is the most common fracture, with boys sustaining fractures more than girls.
- Teenagers tend to be the most active age group, which increases their risk of injury, and their bones are more prone to breaking following the period of rapid growth during adolescence.
- In the elderly age group a combination of Osteoporosis and increased incidence of falls means that the number of broken bones increases with age.
- In the older age group women suffer more fractures than men - this is because hormonal changes during the menopause increase the incidence of Osteoporosis.
- The most common fractures are the hip and wrist.

Fracture Healing

- The bones of the skeleton are essential for protection of organs, maintenance of posture, and movement.

- Bone is very strong, but also relatively lightweight. It is made up of microscopic channels that are surrounded by a very strong layer called the Cortex, which in turn is surrounded by a tough outer surface known as the Periosteum. Apart from making bones lightweight, the channels allow blood flow throughout the bone tissue which supports constant metabolic activity within the bone.

- This metabolic activity means that bone is constantly re-modelling itself in response to the stress it is subjected to during exercise and work activities. The process of 'bone modelling' occurs all the time and this ability to constantly regenerate means that bone can heal fully following a fracture.

- Because of the complications that can occur during the fracture healing process it is extremely important to follow the expert advice of the Orthopaedic Consultant. Any interruption during the stages of bone healing can lead to a fracture 'Non Union' or 'Delayed Union', where the fragments come together extremely late or, worse still, don't come together at all.

Fracture Healing (3-5 Days Following Fracture)

- The Inflammation Stage begins the moment the bone is broken and lasts for around five days. When a fracture occurs there is massive disruption to the blood channels and consequently a large amount of bleeding from the fracture fragments.
- This causes immediate swelling and bruising in the area of the broken bone known as a haematoma. The damaged bone tissue at the edges of the fracture fragments die.
- Osteoclasts remove the dead bone cells.
- The main aim of the treatment is for the trauma doctor to ensure the fracture fragments are returned back into place, which helps to stem the blood flow from the broken bones and in turn reduce the pain.
- Within hours of the fracture, the blood from the fracture fragments forms a mesh of clotted blood, which is the first link between the two fragments. The mesh contains special cells called Fibroblasts, which begin to lay down tissue called Granulation tissue between 4 and 10 days after the fracture occurs.
- The Granulation tissue forms a 'scaffold' between the two fragments, from which the formation of a Soft Callus can begin.

Fracture Healing (4 Days – 3 Weeks)

- The chemical and metabolic reactions that produce the Soft Callus begin a few days after the bone is broken.

- Fibroblast cells that are present in the Granulation tissue begin to form Cartilage and Fibrocartilage (spongy material that fills the gap between the two fracture fragments), although it remains quite weak to external stresses for around **six weeks**.

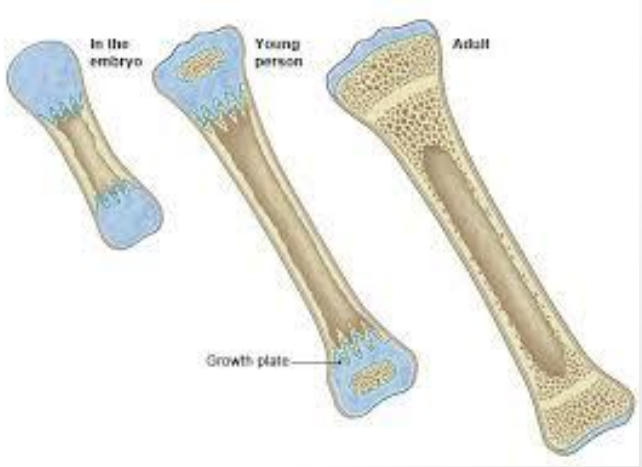
- It is therefore important that there is not too much movement of the fracture fragments.

Fracture Healing (2 Weeks – 6/12 Weeks)

- From two to three weeks the fragile cartilage material of the Soft Callus is transformed completely into Woven bone.
- This process normally continues for between six and twelve weeks, depending on the location and type of fracture (**generally six weeks for the upper limb and twelve weeks for the lower limb**).
- Hard Callus formation is a complex process that is guided by the release of mineral compounds such as Calcium and Phosphate into the Cartilage tissue, which subsequently transforms into a bridge of Hard Callus over the fracture site.
- Once the Hard Callus has formed at the former fracture site, then fracture Union is said to have occurred.
- Fracture Union can be seen on x-ray at around six weeks in upper limb fractures and twelve weeks in lower limb fractures.
- One of the factors that encourages Hard Callus formation in lower limb fractures is gentle weight bearing exercise.

Fracture Healing

- Bone Remodelling can continue for several years.
- During normal bone healing the body will lay down more Hard Callus than is needed to unite the fracture fragments.
- As a result the fracture, site looks enlarged when viewed on x-ray.
- Ultimately, once the fracture healing process is complete, the bone should be at least as strong as it was originally.



Treatments - RICE

- **R** (Rest)
- **I** (Ice)
- **C** (Compression)
- **E** (Elevation)

PRICE

REST

- A short period of immobilisation is beneficial, but should be limited to the first few days after injury.
- This allows the scar tissue to connect the injured muscle to withstand contraction-induced forces without re-rupturing.
- By restricting the length of immobilisation to a period of less than a week, the adverse effects of immobility can be minimised.

ICE

- Evidence shows early use of cryotherapy is associated with a significantly smaller haematoma, less inflammation, and the potential to accelerate early regeneration.
- In the acute inflammatory phase, cryotherapy is thought to decrease oedema via vasoconstriction.
- During the later, sub-acute phase short periods of ice application have been used to produce a similar analgesic effect, thus facilitating earlier therapeutic exercise and allowing a quicker return to activity.
- Evidence also shows that ice has a pain relieving factor.

PRICE

COMPRESSION

- Compression can reduce the intramuscular blood flow to the injured area.
- According to evidence, it is recommended that the combination of ice and compression to be applied in shifts of 20 minutes, repeated at intervals of 30 to 60 minutes, can result in a decrease in the intramuscular temperature and a 50% reduction in the intramuscular blood flow.

ELEVATION

- Elevation is based on the basic principles of physiology and traumatology; the elevation of an injured extremity above the level of the heart results in a decrease in hydrostatic pressure and, consequently, reduces the amount of interstitial fluid.

Treatments

Soft Tissue Massage :

- Soft tissue massage is not just a massage but can range from a superficial light massage to deeper approaches such as friction.

Mechanical:

- Mobilisation of soft tissues (muscles, tendons, ligaments)
- Stretching and mobilisation of scar tissue
- Aiding lymphatic drainage (the system of tubes or vessels in your body that helps drain fluid back to the blood and helps fight infection).

Physiological:

- Circulatory - increased blow flow, stimulation of the healing process
- Neurological - can be either relaxing or stimulating.

Treatments

Psychological:

- Pain and stress relief
- Preparation for physical activity.

Taping:

- Special tape is used, taping around muscles and joints for support. In cases after injury, you can use taping to restrict the movement of a joint to protect it from further injury.

Physiotherapy Checklist Pre Mobility After Surgery

- Read post-op care plan from Doctor
- Weight bearing status as per surgical plan (if the patient has had surgery and the WB status is not documented, contact Dr to ask)
- Ensure patient has had pain relief
- Check wound – redness, swelling, oozing, bruise, open wound
- Check for DVT (pain, swelling, tenderness in one of the legs (usually your calf), a heavy ache in the affected area, warm skin in the area of the clot, redness of your skin)
- Check ROM

Pre Checklist cont.

- Check sensation
- Check strength – can the patient SLR whilst in bed
- Check SH (how much assistance does the patient need and what do they mobilise with or are the independent)
- SOEOB – check BP and HR, dizzyness
- STS with aid if needed
- Check attachments (e.g. drip, vac pump, catheter)
- Mobilise
- Document

******Should the patient be on bed rest******

Oxford Scale

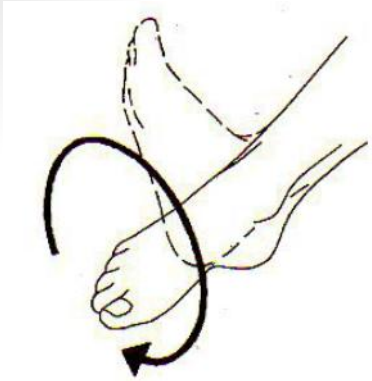
- 0 - No voluntary contraction
- 1 - Muscle Flicker: No movement
- 2 - Muscle Contraction: movement if gravity eliminated
- 3 - Muscle Contraction: movement against gravity
- 4 - Muscle Contraction: movement against some resistance
- 5 - Normal Muscle Strength

Post Surgery

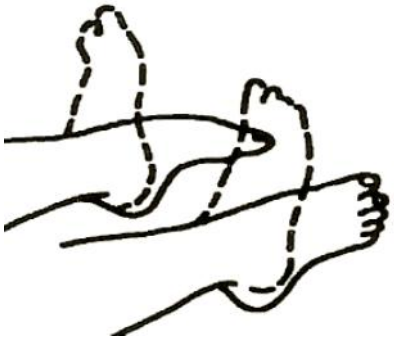
- **ACBT** - prevent the build up of phlegm and maintain clear chest clear following surgery.
- Coughing - support by holding a rolled up towel
- Pain relief to gain the most benefit from physio
- Sit in an upright position either in the bed or in a chair if it is not contraindicated (e.g. spinal surgery)
- Early mobilisation - getting out of bed as soon as possible – ideally on the day after your surgery. This will help to maintain healthy lungs and circulation and prevent muscle weakness and joint stiffness developing.
- Mobilising (be aware of drips and drains) it does not mean that you cannot walk because of attachments.

Bed & Chair Exercises

- To maintain and improve muscle strength
- Increase efficiency of the lungs and circulation
- Maintain general health and wellbeing
- Doing a few simple exercises can aid with strength and help to speed up the patients recovery
- If the patient feels any dizziness, chest pain or any changes with pain whilst doing these exercises STOP AT ONCE and re-check obs.

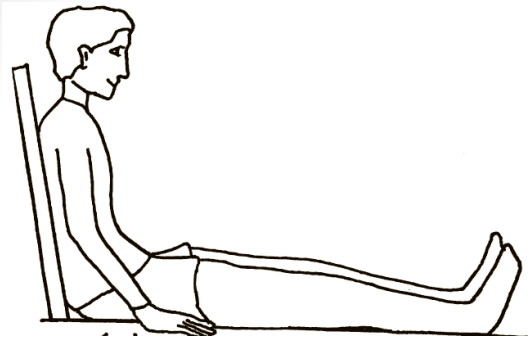


Ankle Rotations
Repeat 10 times on each ankle.

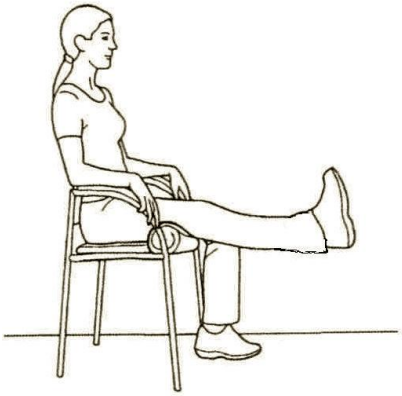


Ankle PF & DF
Paddle your feet up and down, repeat this 10 times each ankle.

IRQ
Place a pillow or a rolled up towel under one knee. Pull the foot and toes up, tighten the thigh muscle and straighten knee, hold for 5 seconds.

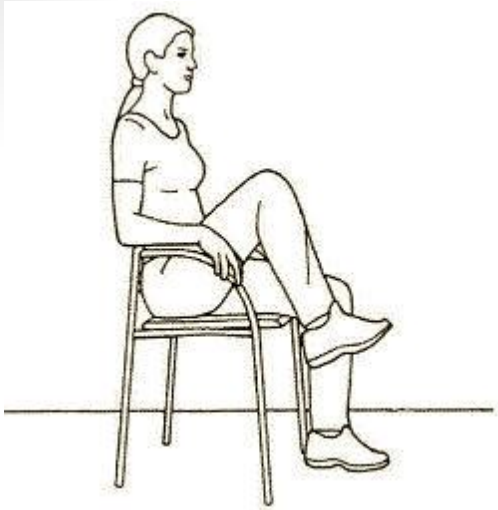


Glut Squeezes
Squeeze bottom cheeks together.
Hold for 5 seconds.



SLR
Pull toes upwards, tighten thigh muscles and straighten knee.
Hold for 5 seconds then slowly lower.

Sit to Stand
Cross arms



Lift one knee up off the chair, as high as possible, keeping the knee bent. Hold for 5 seconds then slowly lower.

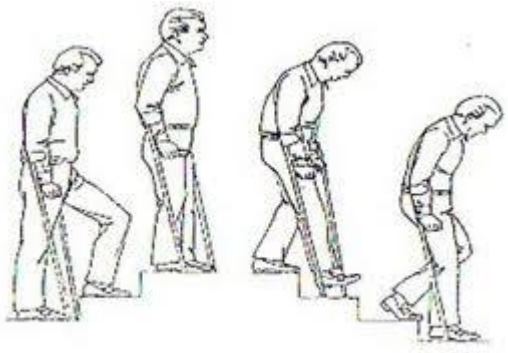
Push the back of the knee into the bed and bring your toes and hold for 5 seconds

Exercises

- Dressing gown to increase DF
- Kneeling to increase PF
- Wall slides
- Squats
- Steps

Extra Information

- When using crutches have to teach - 2 point, 3 point and 4 point gate
- Stick – use the stick on the weaker side
- Stairs – “Good leg to heaven, bad leg to hell”
- When walking up stairs, aid to come up last with ‘weaker’ leg, when walking down stairs aid to come first with ‘weaker’ leg.



THANK YOU!