PASSIVE MOVEMENT

These movements are produced by an external force during muscular inactivity or when range of motion is reduced for any cause.

Classification of Passive Movement

1- Relaxed Passive Movements, including accessory movements.

2- Forced Passive movement.

3- Continuous Passive movement.

I- RELAXED PASSIVE MOVEMENT

Definition:

These are movements performed accurately, rhythmical and smoothly by the physiotherapist through available range of motion (according to anatomy of joints). The movements are performed in the same range and direction as active movements. The joint is moved through the free range and within the limits of pain.

PRINCIPLES OF RELAXED PASSIVE MOVEMENT

1-Relaxation:

The selection of a suitable starting position ensures comfort and support, for both patient and physiotherapist through the movement.

2-Fixation:

Good fixation for the proximal and distal joint by the physiotherapist to ensure that the movement is localized to the movable joint.

3-Support:

Full and comfortable support is given to the part to be moved, so that the patient has confidence and will remain relaxed.

4-Traction:

The fixation of the bone proximal to the joint providing an opposing force to a sustained pull on the distal bone. Traction is thought to facilitate the movement by reducing inter-articular friction.

5-Range of movement:

The range of movement is done in painless range to avoid spasm in the surrounding muscles.

6-Speed and Duration:

As it is essential that relaxation is maintained throughout the movement, the speed must be slow and rhythmical, with suitable repititions of the movement.

EFFECTS AND USES OF RELAXED PASSIVE MOVEMENTS

1. Maintain range of motion and prevent formation of adhesions.
2. Maintain the physiological properties of the muscle (extensibility, elasticity, etc.) and prevent shortening and contracture.
3. Help in preserving and maintain the memory of the movement pattern by stimulating the kinaesthetic receptors.
4. The mechanical pressure resulted from the stretching of the thin walled vessels which passing across the moved joint will assist the venous and lymphatic return (improving circulation).
5. Can be used in training of relaxation as the rhythmic continuous passive movements can have a soothing effect and induce further relaxation and sleep.
6. Improving sense of position and sense of movement.

INDICATIONS OF RELAXED PASSIVE MOVEMENT

1. In cases of paralysis, patient who is confined in bed for a long time or complete rest on bed.
2. When there is an inflammatory reaction and active movement is painful.
3. When the patient in coma.
4. In relaxation as a factor helping to reduce spasm in group of muscles.

CONTRA-INDICATIONS OF RELAXED PASSIVE MOVEMENT

1- Unhealed fracture, recent fracture, at the site of fracture.

2- At site of effusion or swelling.

3- Immediately following surgical procedure to tendon, ligaments, joint capsule.

4- Immediately after recent tear to ligament, tendon.

5- When a bony block limits joint motion e.g. myosities ossificans.

6- Recent injuries

7- Sever muscle weakness.

8- Acute inflammation or infection as arthritis, osteomylities.

II- Forced passive movement

Definition

An exercise performed on a subject by a partner who exerts an external force not only to produce a passive movement, but also to increase the range of movement of a joint. The partner presses the joint into its end-position (i.e. end of range), while the subject's muscles that normally carry out the movements are completely relaxed. There is a danger of overextension beyond the range of movement and damage to the joint if the exercise is not carried out carefully.

EFFECTS AND USES OF FORCED PASSIVE MOVEMENTS

As in relaxed passive movement, but specially increasing the limited range of motion.

III- Continuous passive motion (CPM)

A continuous passive motion device maintains movement of a joint after limb sparing surgery. This device is usually called a CPM. Continuous movement limits stiffness and pain. It is very important to keep joints moving following surgery so that motion will not become limited. The CPM will move the involved leg through its full range of motion. It is only used in bed, but can be used while relaxing, eating, or sleeping.

Robert Salter, a Canadian physician, originally proposed the use of CPM to assist in the healing of synovial joints. On the basis of his clinical observations, Salter hypothesized that the application of CPM would be beneficial in three ways:

- ▶ • Enhancing the nutrition and metabolic activity of articular cartilage
- ▶ • Stimulating tissue remodeling and regrowth of articular cartilage
- ▶ • Accelerating the healing of articular cartilage, tendons, and ligaments

BENEFITS OF CPM:

1- Decreasing the complication of immobilization.
2- Decreasing the post-operative complication and pain.
3- Improving the recovery rate and ROM.
4- Improving the circulation through pumping action.
5- Prevent adhesions and contracture.
6- Prevent joint effusion and wound oedema.

PROCEDURE OF CPM

It is important that you understand the use of CPM. The therapist may adjust the device to fit you before surgery. You will begin to use the CPM right after surgery. Your therapist will give you instructions and monitor how you use the device. The CPM is set to allow 45 degrees of motion right after surgery. Generally, motion will be increased about 15 degrees a day. You will need to use the CPM for about 6 weeks after surgery.

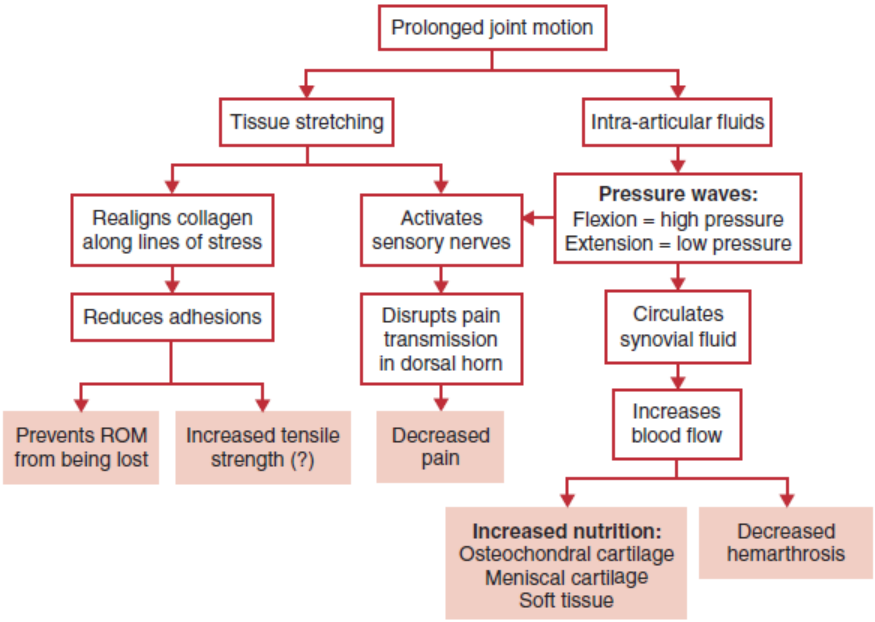

Figure . **Effects of Continuous Passive Motion.**

* Practical Evidence

Studies generally agree that CPM has limited utility following knee arthroplasty.[43,44,45,46] Only slight increases in knee flexion (2 degrees) and knee extension (3 degrees) are realized when CPM is applied immediately after surgery. The length of hospital stay is not affected, but the need for follow-up manipulation is reduced. The differing protocol, pathologies, and patient base used in these studies make reaching a firm conclusion regarding the efficacy of CPM on ROM impractical, although most studies demonstrate equivalency in the total ROM over the long term.

* Practical Evidence

Studies show no significant difference in pain (as reported using a visual analog scale) and pain medication between patients receiving CPM and those not receiving CPM,[31,61] those receiving manual passive ROM treatments,[32] and those patients controlling their own medication dosage.[62]

* Practical Evidence

Although CPM is often used following ACL reconstruction and rotator cuff repair, a synthesis of published research does not support these practices versus active exercise alone, especially when costs are considered.[46,65–67]

At a Glance: Continuous Passive Motion

Description

A motorized device that moves one or more joints at a controlled speed through a preset range of motion. Continuous passive motion is used to restore early range of motion, delaying atrophy and improving joint nutrition.

Indications

- After surgical repair of stable intra-articular or extra-articular joint fractures
- After joint surgery, including surgery on the ACL[74]
- Following open reduction–internal fixation fracture management
- After joint arthroplasty
- After surgery or chronic pathology to the knee extensor mechanisms
- Joint contractures
- Following meniscectomy
- After knee manipulations
- After joint débridement for **arthrofibrosis**
- Tendon lacerations
- After osteochondral repair
- For enhancing the reabsorption of a hemarthrosis
- Thrombophlebitis
- Following surgical correction of chondromalacia patellae

Primary Effects

- Improved nutrition of articular structures
- Increased metabolic activity of articular structures
- Increased remodeling of collagen along the lines of stress
- Increased tensile strength of healing tendons, ligaments, and other soft tissue
- Improved early range of motion
- Potential edema reduction
- Pain reduction via secondary mechanisms (e.g., increased ROM)

Contraindications

- Cases in which the device causes an unwanted translation of opposing bones, overstressing the healing tissues
- Unstable fractures
- Spastic paralyses
- Uncontrolled infection

Treatment Duration

Continuous passive motion may be applied in long-term bouts where the patient is continuously attached to the unit, or the device may be applied in 1-hour treatment bouts three times a day. After surgery, use is for 6 to 8 hours a day, although the duration preferred by patients is 4 to 8 hours.[37] Patients may also be instructed in the use of CPM for in-home treatments, or a home-care visit may be required.

Precautions

- The use of continuous passive motion in conjunction with anticoagulation therapy may produce an intracompartmental hematoma[81] or deep vein thrombosis.[30]
- Skin irritation from the straps or carriage cover may develop. Overtightening of the straps and/or dressing can lead to necrosis of the incision sites or other local tissue.[10]