Al-Mustaqbal University

Collage of Engineering

Prosthetics and Orthotics Engineering

Third Stage

ORTHOTICS II

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Upper-limb Orthoses

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Introduction

▶ An orthosis is a device that is applied to the body in order to protect and stabilize body parts, to prevent or correct scarring and deformities, or to aid in performance of certain functions.

▶ Upper limb orthoses are applied to the shoulder, elbow, arm, wrist, or hand. These devices may be called orthoses, orthotic devices, or splints.

▶ Upper limb of Human beings requires controlled coordination of different muscles and joints with intact sensation. mobility and function are more important than stability.

▶ Various Orthotics is being advised keeping this in mind. They help to align, or resist or assist or simulate particular function. Thus they may be of static, dynamic or functional types.

Type of orthosis

- **Static orthoses** immobilize a part, maintain correct alignment, protect an injured part or stabilize a part. It is rigid support may use in fracture, inflammatory conditions and nerve injuries.

- **Dynamic devices** allow controlled motion of some joints, neutralizing progressive deforming forces and substituting for weakened muscles. On the other hand

- **functional orthoses** are used to substitute for irreversible loss of function

- Orthoses for upper limbs should be comfortable, cosmetically acceptable, fulfill a real need, light weight, be relatively inexpensive and be easy to use.

- The most important determining factor in patient's acceptance of an upper limb orthosis, is whether the orthosis permits the patient to perform activities which would not be possible without it and which patient wishes to perform.

- Orthotics devices may be temporary (**used** in management of fractures and dislocation, peripheral neuropraxia, tendon repairs and management of contractures)

- semi-permanent (used after tendon transfers as assistive devices, acute and sub-acute phases

Purpose

- stabilizing fractures or unstable joints
- immobilizing joints to promote healing
- preventing or correcting joint contractures
- correcting subluxation of joints or improper alignment of tendons
- preventing formation of burn scar tissue
- maintaining correct joint alignment
- assisting movement of joints
- reducing muscle tone in spastic muscles

Functions

- Increase range of motion (ROM)
- Immobilize an extremity to help promote tissue healing
- Apply traction either to correct or prevent contractures
- Assist in providing enhanced function
- Serve as an attachment for assistive devices
- Help correct deformities
- Block unwanted movement of a joint

Classification

- Clavicular and shoulder orthoses: Balanced forearm orthosis.
  - high-level tetraplegia or Brachial plexus lesion
  - Supports the weight of the forearm and arm against gravity

Tetraplegia
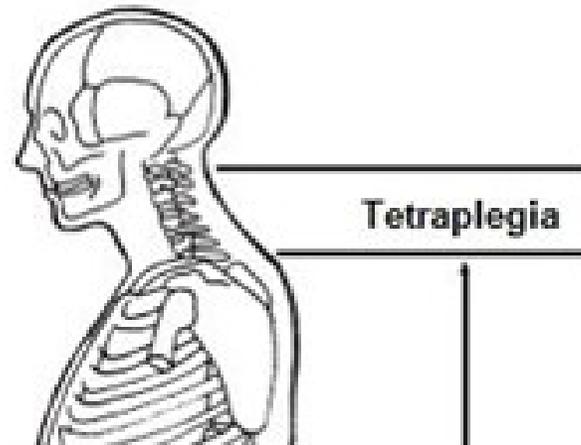
- Elbow orthoses

  - Posterior elbow splints - for elbow immobilization in elbow surgery or inflammation

  - Serial cast - for prevention or correction of contractures by promoting soft tissue stretch and passive ROM

  - Air splint- maintain or increase elbow extension or it form of circumferential inflatable sleeve.

  - Dynamic elbow flexion orthosis - maintains the elbow in 90° of flexion in cases of elbow contractures, burns, and fracture

- forearm-wrist-hand

  - Immobilization for hand flexor and extensor tendinitis

  - Tendon, nerve or fracture repair

  - maintenance of passive ROM in patients with UMN lesions, burns & contractures

- Hand orthosis
- Static
  - proximal interphalangeal (PIP) orthosis - Boutonniere & swan-neck deformities (rheumatoid arthritis)
  - distal interphalangeal (DIP) orthosis - immobilize the DIP joints in extensor tendon and collateral ligament repairs
- Dynamic: MP (Metacarpophalangeal) joint dynamic orthosis.