Plaster and Orthopaedic Appliances

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PWH
Function of Plaster

- Immobilize of fracture or injured tissue to avoid further damage
- Maintain in proper body alignment
- Provide support & rest for the injured part
- Protect repaired tissue to promote healing (e.g. tendon repair, SSG)
- Act as orthotic (e.g. u-slab / cylinder of stump)
- To promote healing & early weight bearing
- Maintain position (e.g. Hip spica)
Plaster Material

(1) Plaster of Paris: CaSO$_4$.2H$_2$O
   - e.g. Gypsona
   - usually use as temporary measure

(2) Synthetic Resin: C$_6$H$_5$.NCO
   - Fiberglass casting material
     - e.g. Scotchcast, Dynacast
   - usually use in cases planned with longer period of immobilization
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Plaster of Paris</th>
<th>Synthetic Resin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>heavy</td>
<td>light</td>
</tr>
<tr>
<td>Strength</td>
<td>weaker</td>
<td>stronger</td>
</tr>
<tr>
<td>Permeability</td>
<td>poor</td>
<td>good</td>
</tr>
<tr>
<td>Moulding capacity</td>
<td>easy</td>
<td>difficult</td>
</tr>
<tr>
<td>Radiolucency</td>
<td>fair</td>
<td>good</td>
</tr>
<tr>
<td>Drying Time</td>
<td>longer</td>
<td>shorter</td>
</tr>
<tr>
<td>Price</td>
<td>lower</td>
<td>higher</td>
</tr>
</tbody>
</table>
Before Plaster Application

- Assessment
  1) History taking
     - allergy
     - mechanism of injury
  2) Physical Assessment
     - vascular status
     - skin integrity
     - neurological status & ROM of the affected limb
     - alignment & position
- Care of the skin lesion e.g. laceration
- Give analgesics
- Clear explanation
- Padding to the bony prominence area
- No rings on finger & remove all nail-polish
plaster + water $\rightarrow$ Gypsum + HEAT

Exothermic reaction
Potential Complications After Casting

- Allergic Reaction – cast materials
- Tissue Impingement
- Compartment Effect – Volkmann’s ischaemic contracture
- Pressure sore formation
- Muscle Wasting – lack of exercise
- Joint Stiffness – prolonged casting
**Allergic Reaction**

- check for allergic history before application
- excessive irritation → remove the cast, cleanse the skin thoroughly and re-apply other materials.
Causes
- insufficient padding
- tight cast
- excessive swelling
Compartment Syndrome

- Within a confined space (an osteofascial compartment) oedema leads to an increase of pressure; this reduces the capillary flow, which leads to more oedema
- A vicious circle develops, resulting in ischaemia of the tissues within the compartment
- s/s: 5 ‘P’s
  - Paraesthesia
  - Pain
  - Pallor
  - Pulseless
  - Paralysis
Circulatory & Nerve Impairment

Treatment

- Elevation
- Encourage movement of the extremities

Bivalve the cast
Impaired Skin Integrity

- Dress wound properly
- Ensure the edges of the cast are well padded
- Handle the cast with the palms of the hands instead of the fingers to prevent indentations in the soft plaster
- Aware of plaster sore
Plaster Sore

- Causes
  - uneven bandaging technique
  - Insufficient padding over bony areas
  - Cast is too tight or too loose
  - Foreign body inside the cast
- S/S
  - itching
  - burning sensation
  - fever
  - sleep disturbance
  - foul smell
  - discharge
Wire impinging on Cast lead to rotation of wire
- Adequate cushion to protect skin
- Cover second layer of gauze to prevent knocking against cast
- Ensure wire is parallel to wall of cast as possible
Pressure Sores
Cast indentation constriction
Risk of Loss of Alignment

- Maintain the reduction and keep the affected part in a desired position during cast application
- Promote drying of the unconsolidated cast
- Use pillow to support the cast
Risk of Loss of Alignment

- Support the cast with palms
- Check for cracks/softening/loosening
Prepare for Mobilization

- Weight bearing is not allowed until cast is dry/instructed by surgeon
Muscle Wasting & Joint Stiffness

• Muscle strengthening exercises
• Exercise joints above and below the affected limb
Window on Cast
Body Image

- Allow to choose the preferable colour, esp. in adolescence
- Discuss expectation of activity and appearance of cast
Patient Education

- Dos & Don’ts
- Dietary advice
- Care after removal of cast
Application of Cast

- Padding
- Activation of cast material
  - immerse in luke warm water at a 30 degree angle to the vertical
  - gentle squeeze until no more bubbles appear
  - squeeze out excessive water
- Applications
  - circular
  - slab
Technique for applying a cast

- A stockinette – extending to the joint above and longer than the limb (fold back at the end to make a smooth edge)
- Take up the slack of every layer to be covered by the coming fold
- Smooth out every layer to remove air
- Apply with continuous folds to cover at least half the previous fold
- Use the thenar areas of the hands for molding
- The cast must be fit the external anatomy of the limb, mold to create a three-point fixation
How to apply a short arm dynacast

- Cast application (click to see video)
- Bivalve cast (click to see video)
Traction

Definition:
Traction is the use of pull to exert force directly or indirectly to bones to overcome deformity or to help restore alignment following trauma.

Aims:
- to reduce and stabilize a fracture or dislocation
- to relieve pain and reduce muscle spasm
- to immobilize a joint or part of the body
• Skin Traction
  – Apply traction directly onto skin

• Skeletal Traction
  – through skeleton via transosseous pin
Buck’s Unilateral Leg Traction

- Temporally stabilization of hip fracture to relieve pain and muscle spasm
Halter Traction

- Indication: cervical spondylosis
Pelvic Traction

Indication: prolapsed lumbar intervertebral disc
Bryant’s (Gallow’s) Traction

Indication: fracture of the femur in children
< 3 years old, B.W < 30 lbs
Skeletal Traction

- Indication
  - fracture shaft of femur
  - fracture acetabulum
90° – 90° skeletal traction for Paed case
Halo traction

- Indication
  - fracture or dislocation of cervical vertebrae
Orthopaedic Appliances
Arm Elevator
90°–90° Elevation

Shoulder immobilizer
Hi-lo chair
Spinal Orthosis

Function
- To relieve pain
- To support weakened or paralyzed muscles and unstable joints
- To immobilize the vertebral column in the best functional position while healing occurs
- To prevent the occurrence of deformity or correct deformity
Foam collar

Thomas collar

Moulded polythene cervical orthosis (Philadelphia neck collar)
Halo-Body Jacket

soft lumbar corset

Knight brace

Halo-Body Jacket

Underarm brace
Thank You