Orthopaedic Traction

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Traction

Allows constant controlled force for initial stabilization of long bone fractures and aids in reduction during operative procedure

Option for skeletal vs. skin traction is case dependent
General Considerations

Safe and dependable way of treating fractures for more than 100 years
Bone reduced and held by soft tissue
Less risk infection at fracture site
No devascularization
Allows more joint mobility than plaster
Disadvantages

Costly in terms of hospital stay
Hazards of prolonged bed rest
  ▪ Thromboembolism
  ▪ Decubiti
  ▪ Pneumonia
Requires meticulous nursing care
Can develop contractures
History

Skin traction used extensively in Civil War for fractured femurs
Known as the “American Method”
Skeletal traction by a pin through bone introduced by Steinmann and Kirschner
Beds And Frames

Standard bed has 4-post traction frame
Ideal bed for traction with multiple injuries is adjustable height with Bradford frame
Mattress moves separate from frame
Beds and Frames

Bradford frame enables bedpan and linen changes without moving pt
Alternatively bed can be flexible to allow bending at hip or knee
Knots

Ideal knots can be tied with one hand while holding weight
Easy to tie and untie
Overhand loop knot will not slip
Knots

A slip knot tightens under tension
Up and over, down and over, up and through
Skin Traction

Limited force can be applied - generally not to exceed 5 lbs
More commonly used in pediatric patients
Can cause soft tissue problems especially in elderly or rheumatoid patients
Not as powerful when used during operative procedure for both length or rotational control
Skin Traction - “Bucks”

An option to provide temporary comfort in hip fractures
Maximal weight - 10 pounds
Watch closely for skin problems, especially in elderly or rheumatoid patients
Skeletal Traction

More powerful than skin traction
May pull up to 20% of body weight for the lower extremity
Requires local anesthesia for pin insertion if patient is awake
Preferred method of temporizing long bone, pelvic, and acetabular fractures until operative treatment can be performed
Traction Pin Types

Choice of thin wire vs. Steinman pin

Thin wire is more difficult to insert with hand drill and requires a tension traction bow
Traction Pin Types

Steinmann pin may be either smooth or threaded
- Smooth is stronger but can slide if angled
- Threaded pin is weaker, bends easier with higher weight, but will not slide and will advance easily during insertion

In general a 5 or 6 mm diameter pin is chosen for adults
Traction Pin Placement

Sterile field with limb exposed
Local anesthesia ± sedation

Insert pin from known area of neurovascular structure
- Distal femur: Medial → Lateral
- Proximal Tibial: Lateral → Medial
- Calcaneus: Medial → Lateral

Place sterile dressing around pin site
Place protective caps over sharp pin ends
Head Halter traction

Simple type cervical traction
Management of neck pain
Weight should not exceed 5 lbs initially
Can only be used a few hours at a time
Outpatient head halter traction

Used to train neck pain and radicular symptoms from cervical disc disease
Device hooks over door
Face door to add flexion
Use about 30 min per day
Weight 10-20 lbs
Cervical skeletal traction

Used to treat the unstable spine
Pull along axis of spine
Preserves alignment and volume of canal
Gardner-Wells and Crutchfield tongs commonly used
Gardner Tongs

Easy to apply
Place directly cephalad to external auditory meatus
In line with mastoid process
Just clear top of ears
Screws applied with 30 lbs pressure
Gardner Tongs

Pin site care important

Weight ranges from 5 lbs for c-spine to about 20 lbs for lumbar spine

Excessive manipulation with placement must be avoided

Poor placement can cause flex/ext forces

Can get occipital decubitus
Crutchfield Tongs

Must incise skin and drill cortex to place

Rotate metal traction loop so touches skull in midsagittal plane

Place directly above ext auditory meatus

Risks similar to Gardner tongs
Halo Ring Traction

Direction of traction force can be controlled
No movement between skull and fixation pins
Allows the pt out of bed while traction maintained
Used for c-spine or t-spine fx
Halo Ring Traction

Ring with threaded holes
Allow 1-1.5 cm clearance around head
Place below equator
Spacer discs used to position ring
- Central anterior and 2 most posterior
Halo Ring Traction

Two anterior pins
- Placed in frontal bone groove
- Sup and lat to supraorbital ridge

Two posterior pins
- Placed posterior and superior to external ear

Tighten pins to 5-6 inch-pounds with screwdriver
Halo Traction

Traction pull more anterior for extension
More posterior for flexion
Use same weight as with tong traction
Left: “Safe zone” for halo pins. Place anterior pins about 1 cm above orbital rim, over lateral two thirds of the orbit, and below skull equator (widest circumference).

Right: “Safe zone” avoids temporalis muscle and fossa laterally, and supraorbital and supratrochlear nerves and frontal sinus medially.

Posterior pin placement is much less critical because the lack of neuromuscular structures and uniform thickness of the posterior skull.

Halo Vest

Major use of halo traction is combine with body jacket
Allows pt out of bed
Can use plaster jacket or plastic, sheepskin lined jacket
Halo Vest

Pin site infection a risk
Can remove pins and place in different hole
Pin penetration can produce CSF leak
Scars over eyebrows
Can get sores beneath vest
Upper Extremity Traction

Can treat most fractures
Requires bed rest
Usually reserved for comatose or multiply injured patient or settings where surgery can not be done
Forearm Skin Traction

Adhesive strip with Ace wrap
Useful for elevation in any injury
Can treat difficult clavicle fractures with excellent cosmetic result
Risk is skin loss
Double Skin Traction

Used for greater tuberosity or prox humeral shaft fx
Arm abducted 30 degrees
Elbow flexed 90 degrees
7-10 lbs on forearm
5-7 lbs on arm
Risk of ischemia at antecubital fossa
Dunlop’s Traction

Used for supracondylar and transcondylar fractures in children
Used when closed reduction difficult or traumatic
Forearm skin traction with weight on upper arm
Elbow flexed 45 degrees
Olecranon Pin Traction

Difficult supracondylar/distal humerus fractures
Greater traction forces allowed
Can make angular and rotational corrections
Place pin 1.25 inches distal to tip
Avoid ulnar nerve
Lateral Olecranon Traction

Used for humeral fractures
Arm held in moderate abduction
Forearm in skin traction
Excessive weight will distract fracture
Metacarpal Pin Traction

Used for obtaining difficult reduction forearm/distal radius fx

Once reduction obtained, pins can be incorporated in cast

Pin placed radial to ulnar through base 2\textsuperscript{nd}/3\textsuperscript{rd} MC

Stiffness intrinsics common
Finger traps

Used for distal forearm reductions
Changing fingers imparts radial/ulnar angulation
Can get skin loss/necrosis
Recommend no more than 20 minutes
Upper Femoral Traction

Several traction options for acetabular fractures
Lateral traction for fractures with medial or anterior force
Stretched capsule and ligamentum may reduce acetabular fragments
LOWER EXTREMITY TRACTION

Can be used to treat most lower extremity fractures of the long bones
Requires bed rest
Used when surgery cannot be done for one reason or another
Uses skin and skeletal traction
Buck’s Traction

Often used preoperatively for femoral fractures
Can use tape or pre-made boot
No more than 10 lbs
Not used to obtain or hold reduction
Split Russell’s Traction

Buck’s with sling
May be used in more distal femur fx in children
Can be modified to hip and knee exerciser
Bryant’s Traction

Useful for treatment femoral shaft fx in infant or small child
Combines gallows traction and Buck’s traction
Raise mattress for countertraction
Rarely, if ever used currently
90-90 Traction

Useful for subtroch and proximal 3rd femur fx
 Especially in young children
 Matches flexion of proximal fragment
 Can cause flexion contracture in adult
Femoral Traction Pin

Must avoid suprapatellar pouch, NV structures, and growth plate in children
Place just proximal to adductor tubercle along midcoronal plane
At level proximal pole patella in extended position
Distal Femoral Traction

Place pin from **medial to lateral** at the adductor tubercle - slightly proximal to epicondyle

Distal Femoral Traction

Alignment of traction along axis of femur
Used for superior force acetabular fx and femoral shaft fx
Used when strong force needed or knee pathology present
Proximal Tibial Traction

Used for distal 2/3\textsuperscript{rd} femoral shaft fx

Femoral pin allows rotational moments

Easy to avoid joint and growth plate

1 inch distal and posterior to tibial tubercle
Balanced Suspension with Pearson Attachment

Enables elevation of limb to correct angular malalignment

Counterweighted support system

Four suspension points allow angular and rotational control
Pearson Attachment

Middle 3\textsuperscript{rd} fx had mild flexion prox fragment
- 30 degrees elevation with traction in line with femur

Distal 3\textsuperscript{rd} fx has distal fragment flexed post
- Knee should be flexed more sharply
- Fulcrum at level fracture
  Traction at downward angle
  Reduces pull gastroc
Distal Tibial Traction

Useful in certain tibial plateau fx
Pin inserted 1.25 inches proximal to tip medial malleolus
Avoid saphenous vein
Place through fibula to avoid peroneal nerve
Maintain partial hip and knee flexion
Calcaneal Traction

Temporary traction for tibial shaft fx or calcaneal fx
Insert about 1.5 inches inferior and posterior to medial malleolus
Do not skewer subtalar joint or NV bundle
Maintain slight elevation leg
Thank You