Traction Techniques

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Problem Identification and Needs Assessment

Identification of targeted learners
Targeted learners will include PGY 1 Orthopaedic Surgery residents with potential inclusion of PGY 2 residents and ER/OR staff.

Identification of need or problem for targeted learners
Skeletal traction is a fundamental treatment modality for fractures involving the cervical spine and long bones, specifically the femur. The implementation of traction often occurs in emergency department settings and is a necessary skill set for all Orthopaedic Surgery residents. This module provides basic education in femoral and tibial pin traction and the application of Gardner Wells tongs.

Current educational approach to address need or problem
The current educational approach to the implementation of skeletal traction is based on reading relevant literature followed by an apprentice learning experience in which the techniques are demonstrated by upper level residents or faculty as they treat patients. When the PGY 1 is judged able, she/he is observed performing the procedure with immediate feedback from the observer.

Ideal educational approach to address need or problem
Ideally, the learner(s) participate in a didactic experience to understand the relevant anatomy, indications and potential complications followed by a skills training session. That session consists of a review of the necessary materials (traction bow, twist drill, tongs, etc.) followed by hands-on training placing a pin (K-wire or Steinman pin) across a PVC pipe, then a PVC pipe covered with insulation. The learner would then apply the appropriate traction bow and secure it to a traction rope. For the application of Gardner Wells tongs, the learner would apply tongs to a portion of large diameter PVC pipe. In doing so, the learner will demonstrate appropriate technique and the ability to secure the device to traction rope.

Goals and Objectives

Specific educational goals
- The learner will understand the indications for skeletal traction and the relevant local anatomy.
- The learner will understand the pros and cons of K-wire versus Steinman pin traction.
- The learner will understand sterile technique in the insertion of traction pins or the application of Gardner Wells tongs.
- The learner will understand basic knot tying.
- The learner will understand the pitfalls and complications of traction for long bone and cervical spine injuries.

Specific cognitive, affective, psychomotor task objectives
- The learner will demonstrate the ability to use a twist drill.
- The learner will demonstrate the ability to accurately place a traction pin across a simulated bone/extremity.
- The learner will demonstrate the ability to tie Bowline and half hitch knots.
- The learner will demonstrate the ability to apply Gardner Wells tongs to a simulated skull, accurately placing the pins in a predetermined location.
- The learner will demonstrate the ability to correctly tighten Gardner Wells tongs.
Assumptions

It is assumed that the learner will have little or no knowledge regarding the local anatomy of the distal femur, the proximal tibia or the skull. The learner will also have little or no prior experience with a twist drill, no training in the accurate placement of pins using such a drill, and will not know how to tie appropriate knots.

Suggested readings


Description of laboratory module

The module will consist of required background reading, video demonstrations of correct techniques in pin insertion/tong application, a didactic session discussing anatomy, indications, complications, and a skills training session with models that simulate a bone without soft tissue, a simulated soft tissue covered bone and the skull, with and without simulated soft tissue coverage.

Description of techniques and procedures

At the initial skills station, the learner will demonstrate the ability to correctly insert a pin into a twist drill and to place the pin through a portion of PVC pipe, keeping the pin aligned in the coronal and sagittal planes with the pin exiting the far cortex at a pre-marked location.

In the second skills station, the learner will demonstrate the more difficult task of placing a pin across a limb simulated by a foam-covered portion of PVC pipe. The learner is required to simulate proper preparation of the skin, proper injection of local anesthetic and appropriate incision placement/size. The learner will demonstrate the ability to insert a pin, maintaining correct sagittal and coronal alignment, with the pin exiting at/near a pre-marked position.

At the third station, the learner will practice the application of Gardner Wells tongs to a section of large diameter PVC pipe. The external auditory canals and pinna will be simulated by drawings on the pipe and the learner will learn proper pin placement and insertion torque.

At the fourth station, the learner will practice application of Gardner Wells tongs on a section of large diameter PVC pipe covered with thin foam to simulate the skull with its overlying soft tissue. The external auditory meatus and pinna will be represented by drawings and the temporalis muscle will be represented by drawings made between the foam covering and PVC. Sterile skin preparation and local anesthetic infiltration will be simulated using a cotton sway and a blunt-tipped needle with a syringe attachment. The appropriate pin placement and torque will be reinforced.

At the final station, the learner will develop her/his skill in tying knots appropriate for the attachment of traction bows/tongs to weight hangers.

Common errors and prevention strategies

- Improper pin placement with deviation in the sagittal or coronal plane
- Improper placement/tightening of the traction bow
- Improper placement of the Gardner Wells pins (location, penetration of temporalis muscle, penetration of inner table)
- Improper torque setting of the Gardner Wells pins
- Use of improper knots

Demonstrate expert performance

Station specific videos – demonstrating relevant local anatomy, techniques and pitfalls/complications – are reviewed prior to the learner’s experience at each station.

Recommendations for motor skills practice

- Accurate placement of K-wires and Steinman pins using a twist drill
- Assembling and tightening traction bows
- Tying knots
- Repetitive, correct placement of Gardner Wells tongs
- Repetitive assessment of Gardner Wells pin torque
Supplies and station setup

- Twist drills
- Work tables with affixed vices
- K wires
- Steinman pins
- Traction bows
- Traction rope
- Empty syringes and dull needles
- Sections of 2 inch diameter PVC pipe
- Sections of 8 inch PVC pipe
- Foam insulation

Suggested duration for completion of module

Background reading and video review should be accomplished in 2 hours. Completion of the module with demonstration of proficiency should be accomplished in 4 hours.

Estimated budget

- Twist drills: $75 per unit
- K-wires: $13 per unit
- Steinman pins: $13 per unit
- Gardner Wells tongs: $1,400 per set
- PVC pipe and insulation: $150

Learner Evaluation and Feedback

Methods of performance assessment

Learners are assessed in their ability to place a traction pin through a simulated limb to a target on the contralateral side and in their ability to affix Gardner Wells tongs to a simulated skull. These activities will be timed prior to and after instruction.

Suggested proficiency benchmarks

The learner should demonstrate the ability to accurately place a K-wire/Steinman pin with a twist drill, followed by application of the appropriate traction bow and tying of an appropriate knot. Start to finish this task should take no more than 5 minutes. The learner should demonstrate the correct placement of Gardner Wells tongs with an appreciation for the correct pin torque. Following, the learner should demonstrate the ability to affix the tongs to traction rope using an appropriate knot. Time to completion should not exceed 7 minutes.

Methods for learner debriefing and feedback

Learners will provide curriculum feedback using a web-based, anonymous tool assessing module didactic content, expert video quality and usefulness of skills training.

Periodic Curriculum Review, Evaluation, Validation, and Refinement

Curriculum faculty will annually review learner comments and assess potential improvements in the didactic and manual skills portion of the module. Educational validation will occur when the learner is observed and graded in the clinical setting, noting the specific steps of aseptic technique, infiltration of anesthetic pin placement and time to completion.