Preoperative Theatre Planning and Preparation for Spinal Surgery, Related Positioning Safety

Tinnie Chiu
RN
STH

Function Of The Spine

- Transmit loading
- Allow movement
- Protect the spinal cord

Indications for Spinal Surgery

- Trauma
- Disc degeneration
- Spondylolisthesis
- Scoliosis
- Others- tumors, infection

Goal of Spinal Surgery

- Acute cases
  1) Early recognition of the injury
  2) Prompt resuscitation
  3) Stabilization of the injuries
  4) Prevention of additional neurological injuries
  5) Prevention of late-occurring complication
Goal of Spinal Surgery

- Chronic cases
- 1) Relief symptomatic problem
- 2) Correct deformity
- 3) Regain anatomical alignment
- 4) Stability of internal fixation
- 5) Early pain-free mobilization

Selection of Treatment Options

- Conservative
- Surgical intervention
  - a) Decompression – e.g. Laminectomy
  - b) Instrumentation – e.g. Pedicle screw
  - c) Anterior / posterior spinal fusion

Preoperative Planning and Preparation

- Environment
- Instruments
- Infection control
- Anesthesia
- Positioning

Environment

- Theatre setting
  - a) Equipments
Environment

- Theatre setting
  b) Spinal monitor

Spinal cord function can be monitored intra operatively using several type of evoked potential, it may be altered by hypotension, hypoxia or surgical misadventure. The anesthetic agents are chosen to avoid interaction with evoked potential monitoring.

Environment

- Theatre setting
  c) Positioning device

- Theatre setting
  d) X-Ray preventative precautions
Planes and Direction

- Anterior (ventral)
- Posterior (dorsal)
- Cranial
- Caudal
- Medial
- Lateral
- Coronal plane (frontal)
- Sagittal plane
- Axial plane (transverse)

Specific Pre-operative Investigations

1) X-ray
   - AP, lateral, flexion & extension view
   - For C1 & C2 – open mouth view is necessary
   - For C6 & C7 – swimmer’s / pull shoulder view is necessary

2) CT scan
   - When plain films are inconclusive or a significant abnormality was found

3) MRI
   - Suspicion of disc propulsion with canal compromise
   - Neurological deficit deteriorated
   - Assessment the degree or cord compression
Instruments

- Understanding the function of an instrument is as important as knowing it's specific name.
- Instruments corrosion may cause by the misuse of instrument, exposure to substances lead to corrosion, mechanical and thermal damage.

Instruments

- Basic spinal instruments

Instruments

- Retractors

Instruments

- Powered instruments
  i) Ensure power instruments are run perfectly before the start of surgery.
  ii) Ensure saw blades and drills fitted securely.
  iii) Allow air hoses to cool before use.
Infection control

- Infection may cause
  1) Discomfort suffered.
  2) Extended hospitalization for antibiotic therapy and care.
  3) Anxiety / stress due to possible readmission.
  4) Possible loss or reduce of income.

Infection control

All personnel before entering the OR

- Ensure hair is completely covered by headwear.
- Masks must be worn if sterile trays are open.
- No jewelry to be worn.
- Do not bring in personal bags or briefcases.
- Ensure OR dress / attire is clean.
- Ensure footwear is clean.
- Perform a general hand wash prior to entry.

Infection control

All ORP should hold their own up-to-date sterile technique policies and everyone must comply during the following procedure:

* Scrubbing up
* Glove donning
* Skin preparation
* Draping

Anesthesia

Fundamental principles

i) Providing a patent airway.
ii) Ensuring adequate oxygenation and ventilation of the lungs.
iii) Maintaining cardiovascular stability.
Considerations of Cervical Surgery

Risk of airway complications due to:
1) Retraction and distortion of the trachea during operation with the presence of an ET tube, airway edema may result.
2) Bleeding into soft tissues of the neck also cause obstruction of the airway.

Intubations For a Cervical Spine Injury Patient

- difficult airway management is required.
- Repeated Prior knowledge of patients with expected assessment and continuous monitoring.
- Adequate oxygenation.
- The head should NEVER be tilted for unstable cervical spine patient.
- Fiber optic intubations may required.

Positioning

Aims of the patient’s positioning:
- To provide a comfortable and safe position for the patient during surgery.
- To provide optimum exposure and access to the operative site.
- Sustain body alignments, circulatory, respiratory function and stabilization of body.
- To allow access of additional equipment. e.g. microscope, x-ray, C-arm / portable machine and spinal cord monitoring.
Planning

- Is the correct operating table in the OR?
- Is the operating table in good condition?
- Is the operating table positioned appropriately?
- Are all the necessary table attachments available and in good condition?
- Are there extra pillows and padding available?
- Are sufficient personnel available to undertake the transfer?

Nurses’ Responsibilities

- Determine appropriate mode of patient transport and transfer
- Check proper functioning of OR table and positioning aids
- Familiar with the functions, potential hazards of OR tables and accessories
- All equipments should be tested before
- Mechanical malfunction must be recognized and eliminated

General Hazard

- Traumatic injuries
- Position-related injuries
- Pressure-related injuries

Traumatic injuries Precaution

- Ensure patient are free to move and limbs are secured during transfer
- Never drag patient cause shear or tear of skin and underlying tissues may occur. Sufficient staffing is a must on spinal operation transfer.
- Ensure sufficient length of anesthetic, intravenous, and drainage tubing not to impede movement. Temporarily disconnect monitors or tubing when it is necessary.
Position-Related Injuries Precaution

- Keep natural movement of the torso, head or limbs, avoid hyperextension of extremes.
- Ensure limbs are not trapped underneath when change of position.
- Ensure soft tissue are well protected with padding.
- Restraint strap should be snug but should not exert pressure on bony prominence / superficially placed nerves area.

Pressure-Related Injuries Precaution

Pressure sores can occur if the surgery transmits in excess of 2 hours of static pressure. Padding and limb supports must be employed to:

- Bony prominences
- Superficially placed nerve structures

*Extra precautions must be given to the breasts and male genitals in prone position.

Contributing Factors to Potential Problem

- Long surgical procedures
- Excessive, sustained pressure to certain body areas
- Personal factors includes: age, height, body weight, skin condition
- Medical situation e.g. diabetic, obese, edema

Common surgical positions

1) Prone
2) Supine
3) Lateral
4) Knee-chest
Prone Position

Log Rolling
- Is a patient-handling maneuver.
- Minimize movement of the structure of the spine while turning the patient.
- Moved in a coordinated manner.
- A team of 6-8 members is required.

Prone Positioning (used for all procedures with a dorsal or posterior approach)
- Patient anaesthetized supine on transport stretcher then log rolled onto the OT table.
- Surgical team members no fewer than six persons; the anesthetist provider controls the patient's body moved by the team.
- Allow adequate chest expansion during ventilation.
- Pillow placed under tibia to relieve pressure on toe and feet.
- Arm and brought through their full range of motion (down and forward) placed on arm board with elbow flexed and palm down (sometimes arms are put alongside the body).
- Pillow under pelvis to relieve abdominal pressure if chest roll is used.

Positioning Team
- Anesthetist supports the head and neck.
- Team member 1 supports the shoulders and the spine as far as the rib cage.
- Team member 2 supports the ribcage to the pelvis.
- Team member 3 supports the pelvis and legs - this team member's hand should touch or overlap with member 2 to facilitate anesthetist of movement and to maximize support to the patient's spine.
- Team member 4 supports the feet and catheter tube and bag if in situ.
- Team member 5 will mirror 3; team member 6 will mirror 2; team member 7 will mirror 1 on receiving the patient.
Potential Hazards And Preventive Measures

1) Stressing the brachial plexus if patient’s head is allowed to fall away from the arm that is being pulled
   - Turn patient carefully and log roll the patient
   - Adequate manpower and support

2) Injuries during turning:
   - Loss of airway, vascular access, catheter, and monitor
   - Shoulder dislocation
   - Injury to the arm
   - Cooperation between turning attendants
   - Adequate manpower
   - Disconnect the monitors and peripheral lines and reattach after turning

3) Over-extension of the cervical spine while turning and resulting in neck pain
   - Adequate manpower
   - Good support

4) Radial nerve can be damage if arm is allowed to hang over the edge of OT table
   - Adequate manpower

5) Ulna nerve can be damaged if arm elbow rests against the edge of the mattress
   - Adequate padding

6) Toes abutting on the surface of the table
   - Soft pad under knee
   - Lower legs are raised on one or two pillows

7) Compression on the breasts and male genitals
   - Relieve pressure by adequate padding or free from compression by proper positioning

8) With pelvis higher than the chest will produce pain in lower neck and upper back with patient’s head turn to either side
   - The back and the neck should remain in the same plane and head in the neutral position

9) Pressure on the eyes will result in retinal ischemia even blindness
   - The face should only be allowed to rest on the forehead and must be properly padded
   - Correct size of headrest

10) Injury to lateral femoral cutaneous nerve resulting damage
    - Adequate support
Supine Position

Patient lies straight on back, face upward on the operating table.

Potential Hazards And Preventive Measures

1) Traction on the brachial plexus from incorrect position of arm and head
   - Arm should not be extended more than 90 degree
   - Abduction to 90 degree should only be permitted providing the hand is pronated and head is turned towards the abducted arm

2) Pressure on facial nerve from endotracheal tube connector
   - Adequate padding

3) Pressure on the radial nerve which is spiraling round the humerus
   - Avoid external pressure on it
   - Adequate padding

4) Pressure on the ulna nerve at elbow from the edge of the operating table mattress
   - Soft padding

5) Postoperative backache due to failure support for the normal lumbosacral curvature
   - Soft lumbar support

6) Pressure necrosis over the occiput, sacrum, and heel
   - Head is supported by soft pillow
   - Sheepskin rug under sacral area
   - Raised ankle support to keep the heel off the table

7) Deep vein thrombosis resulted from the pressure on the calf muscles of the lower legs
   - Apply external pneumatic compression
   - Wear anti-embolism stockings

8) Important structure compressed by crossed legs, e.g. Long saphenous vein
   - Uncross legs
Lateral Position

- Patient is anaesthetized and intubated in the supine position and then turned to the unaffected side.

Surgical team members no fewer than 4 persons to maintain body alignment and achieve stability

1. support head and neck by anesthetist
2. support and turn the patient’s chest by nursing members
3. support and turn pelvis by nursing members
4. support and turn the legs by nursing members

Lateral Position

- When turning shoulders and hips, move simultaneously to avoid torsion
- Patient’s trunk should be stabilized with positional devices that be prevent rolling either forward or backward
- Axillary’s roll placed under bottom arm to relieve brachial plexus pressure, radial and brachial pulse checked before and after axillary’s roll replacement
- Bottom shoulder brought slightly forward with arm extended on an arm board with palm up
- Top arm supported on a pillow or padded arm support with palm facing down
- The knee of the lower leg is flexed slightly to provide stabilization, the upper leg is flexed to provide counterbalance
- Put pillow between legs

Potential Hazards And Preventive Measures

1) Necrosis of underlying ear
   - Ensure ear does not become trapped
   - Supported on a soft pillow
   - Use head ring

2) The brachial plexus of upper arm can be stretched if the head is allowed to be too dependent
   - Extra padding or pillow under the head

3) Pressure on the adjacent deltoid muscle
   - Relieve pressure with axillary’s roll under the apex of the axilla
Potential Hazards And Preventive Measures

4) Pressure on the brachial plexus
   - Relieve pressure with axillary’s roll under the apex of the axilla

5) Arm support’s edge can compress the radial nerve in the spiral groove of the humerus
   - Prevent arm support pressing against the skin of the chest wall
   - Adequate padding

6) Pressure necrosis of the skin over lower iliac crest
   - Soft sheep skin rug
   - Soft mattress

7) Pressure on common peroneal nerve which winds round the neck of fibula
   - Both legs are supported by pillow between them
   - Care of bony prominence on the lower leg with adequate padding

Knee Chest Position

The knee-chest position allows surgical access to the lumbar posterior elements and segments. The advantage of this position is that it opens up the facet joints

1) The diaphragm compresses against the abdominal wall leading to poor expansion of the lungs.
   - Wedge-shaped padding allows the abdomen to fall into the gap created

2) The most vulnerable situation when being turned into this position
   - Sufficient personnel available to undertake the transfer

3) The eyes are at risk from corneal abrasions and conjunctive edema
   - The face should only be allowed to rest on the forehead and must be properly padded
   - Correct size of headrest
Potential Hazards And Preventive Measures

4) Ulna nerve can be damaged if arm elbow rests against the edge of the mattress
   - Arm boards with jelly pads placed to allow the arms to be extended alongside the head

5) Vascular compromise may develop in the forehead, nose, iliac crest and knee
   - Adequate padded and supported

We are a team

It is the responsibility of ORP to protect and preserve patient’s safety and dignity!

Thank You!