Guidelines for Prone Positioning of Ventilated patients

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Intensive Care Unit

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The following recommendations are a consensus view of medical and nursing staff on ICU and not necessarily based on clinical evidence.

Contents

Introduction

Prone position ventilation in ARDS/ALI has been discussed for some 20 years. There are theoretical models and animal studies that show improvement in V/Q, PaO2, FRC and compliance (refs.). Primarily, changes are within ventilation mechanics, with little change in blood flow.

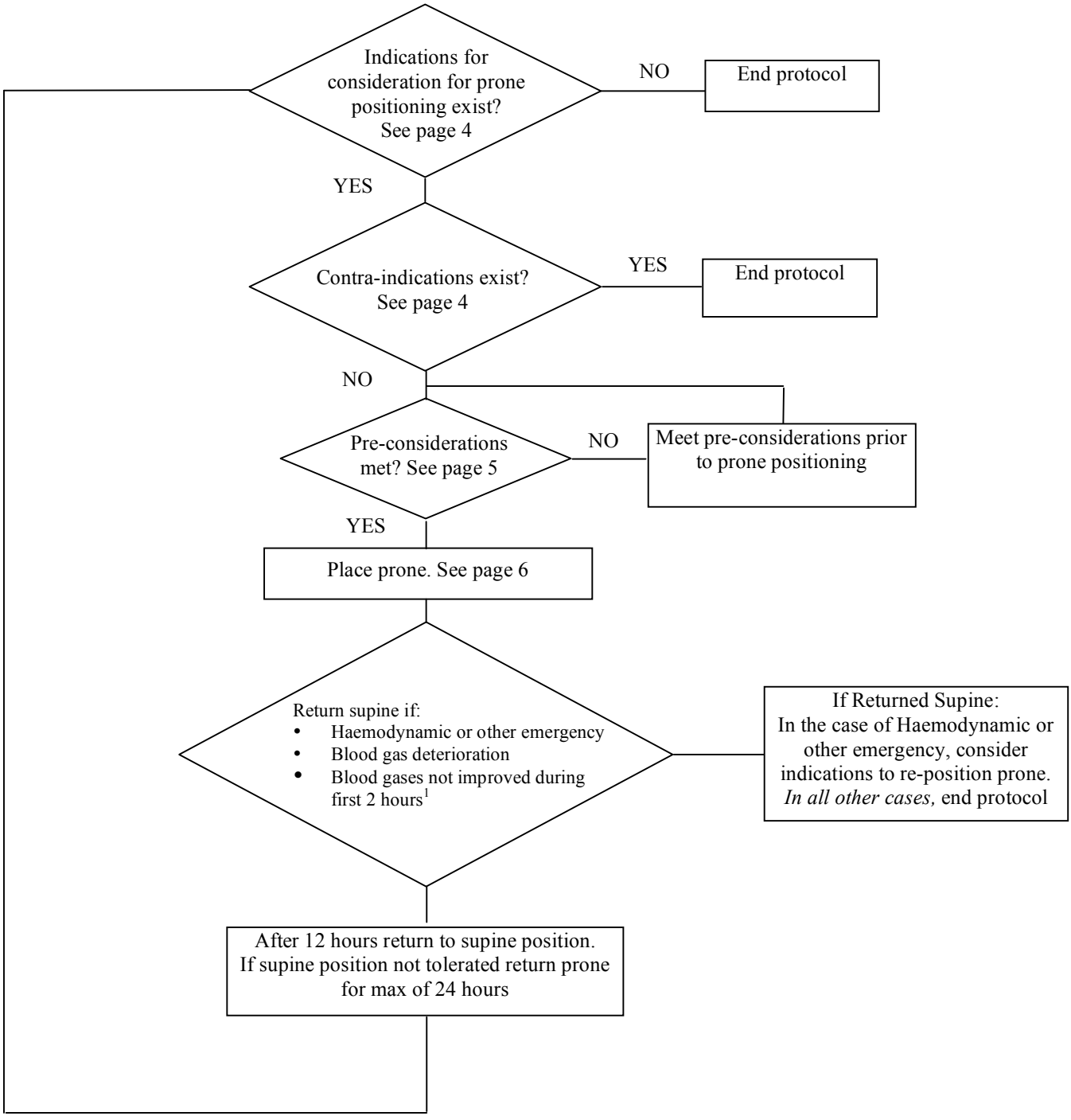
Literature searches by the author and others [1] have revealed no randomised-controlled trials of the use of prone position ventilation in adult humans with ALI/ARDS. There is however an increasing number of papers reporting the effects of prone ventilation [2 – 7].

There is evidence that ICUs are shifting towards the early use of prone positioning. There is urgent need for controlled trials for prone position ventilation in human adults with ARDS/ALI to examine:

- immediate effects such as changes in lung mechanics, hypoxeamia, and haemodynamic and other sequel
- Intermediate effects such as the incidence of multi-organ failure
- Intensive care and hospital mortality and morbidity

We have had some limited considerable success with prone positioning, especially when used early. These guidelines should assist in the selection of patients and the process of prone positioning.

Flow Chart for proccess of prone position ventilation



Indications

Confirmed diagnosis of:

Acute Lung Injury (ALl)

Adult Respiratory Distress Syndrome (ARDS)

PaO_2 (kPa) : FiO_2 ratio ≤ 25 i.e. PaO_2 ≤15 with FiO_2 ≥ .6 %

Bilateral infiltrates on the CXR

PCWP < 18mmHg

Optimal ventilation including Pressure Controlled Ventilation (PCV) with inverse I: E ratio 1: 1 or greater

Extrinsic PEEP ≥ 7.5

Early use after insult/onset of symptoms may have an influential/critical bearing on outcome from prone position therapy.

Contraindications:

Absolute

- ✖ Laprostomy
- ✖ Un-drained pneumothorax
- ✖ Spinal instability
- ✖ Pregnancy[1]
- ✖ Acute active bleeding

Use with Caution with

- ! patients with Asthma, COPD/emphysema
- ! Head Injury and/or clinical/measured evidence of raised ICP
- ! Care should be taken in event of severe Haemodynamic instability
- ! Abdominal surgery

Haemofiltration is not a contraindication to prone positioning; it can make it more difficult and more hands may be needed.

[1] May be done, but only after discussion and agreement from consultant anaesthetist and Obstetrician.

Pre considerations

- Complete medical/nursing assessment. Complete essential interventions (line replacement /Investigations)
- Manual Handling assessment
- Wounds assessed/redressed
- Lines. Padding over Subclavian/Femoral lines
- Eyes. Ensure closure of eyelids. Consider taping shut. Lacrilube may be indicated, but if there is evidence of normal tear film and the eye lids are closed there should be no need for this
- Oral care.
- Airway security. Re-intubation equipment at hand
- Pro-arrhythmic potential. Correct electrolytes prior to turning prone (K+, Mg2+). Ensure PA Catheters are securely fixed.
- Mattress. Pressure area risk assessment. Pegasus airwave is minimum standard. Spenco style mattress will make moving difficult and is unlikely to provide sufficient pressure relief.
- Information to and preparation of patient and family
- Suction. Closed suction system is mandatory for ETT/Tracheostomy
- Stop NG Feeding and empty stomach
- Ensure enough 'give' on infusion giving sets. Best position for infusions is at the top of the bed. It is probably best to allow the lines to cross over during prone positioning and not to uncross them. This should reduce the risk of accidental line removal if the patient has to be placed supine in an emergency.
- Sedation. Sheffield Sedation score (Sss) should be at least 4 although most patients will require level 5. Patients with Sss ≤ 4 should be have additional sedation prior to being turned prone to ensure compliance and reduce fear/anxiety while being positioned prone.

Strategy

- Prone position patient initially for 12 hours except
  - ✖ Haemodynamic or other emergency
  - ✖ Blood gas deterioration
  - ✖ Blood gases not improved during first 2 hours[2]
- Turn patient to supine after 12 hours initially, if this position is not tolerated then extend prone position duration to 24 hours maximum
- Continue to nurse in alternate side lying positions
- Consider kinetic therapy when not prone
- Assuming gases improved during prone ventilation consider repositioning prone if gases deteriorate i.e. PaO_2 (kPa):FiO_2 ratio ≤ 25 i.e. PaO_2 <15 with FiO_2 (kPa) 0.6 %

[2] an increase of <1.3kPa for the same FiO2

- If prone positioning does not improve gases after 2 hours, repeated manoeuvres unlikely to be effective, although can be considered

Guide to turning a patient prone

Adapted from clinical guidelines, ICU, Manchester Royal Infirmary

Process relies on teamwork.

Aim is to have patient in a 'front crawl' position

- Head turned towards one side.
- Arm out in front on side that patients' face is facing.
- Other arm down by the side

Co-ordination of the turn is by lead nurse

Anaesthetist is responsible for safety and control of head and airway

Identify appropriate direction to turn – consider lines/filter etc.

Nurses 1 and 2:

- slide patient towards edge of bed using the sheet

Nurse 3 and 4 (opposite side of the bed):

- insert new sheet for patient to roll onto
- if pillows are necessary (see Tracheostomy/ *Management of patient in prone position* below) then place at this point, beneath sheet

Place patient's arm beneath hip on the side to roll towards and lift patient's opposite leg to assist turning

Turn patient slowly onto abdomen

Ensure safe position of head & ET tube

On normal bed place thin pillow beneath head and the shoulder that the patient is facing

On flexicair bed a pillow may be necessary to support the shoulder and arm that the patient is facing to allow access to face & ET tube

If the patient has a **Tracheostomy** a pillow may be necessary under both shoulders to allow access to this. A 'gap' cushion in the flexicair bed may be of value

Re-connect leads and lines, re-commence feeding

Put bed into reverse trendellenburg (i.e. feet down 10–15 degrees)

Document actions clearly on chart and medical notes.

Management of patient in prone position

Monitor Haemodynamic status. If compromised by abdomen, then try raising leg that the patient is facing, or use pelvic/shoulder pillows to reduce compression

Re-position head and arms maximum 4 hourly, raise arm that the patient is facing and place other arm by their side

Support patient and relatives with explanation of this treatment

Be prepared to turn back rapidly in event of sudden deterioration in oxygenation or cardiovascular state. [3]

No Chest physiotherapy, but physiotherapy should see and assess for limb positioning

Expect an increased expired tidal volume on pressure control (reduce inspiratory pressure) or reduced airway pressure on Volume controlled ventilation. Also note, these changes are likely to reverse in full or part after placing supine.

Blood gases

Blood gases are required (combination of good practice and providing evidence when guidelines are evaluated):

- Immediately prior to turning prone
- 30 minutes, 2, 4 and 8 hours post prone positioning unless already turned supine
- Just prior to turning supine, unless in emergency.
- 30 minutes, 2, 6 and 8 and 16 hours post supine positioning. Thereafter as clinically indicated

References

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[3] Consider staffing ratios for following shifts