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Case Report

Transport of a Prone Position Acute Respiratory Distress Syndrome Patient

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A B S T R A C T

We report the case of a non-physician based critical care transport team (registered nurse and paramedic) that successfully initiated prone positioning of a severe acute respiratory distress patient prior to transport to an extracorporeal membrane oxygenation capable teaching hospital.
With the increasing use of advanced treatments such as extracorporeal membrane oxygenation, prone positioning, and continuous renal replacement therapy for severe acute respiratory distress syndrome (ARDS), the necessity to transport these patients to specialized hospitals will correspondingly increase. Emergency Health Services Life Flight, the primary critical care transport program in Eastern Canada, developed a prone position protocol to meet this clinical need. Since the implementation of the protocol, we have successfully initiated prone positioning of 2 patients with ARDS before transport to an extracorporeal membrane oxygenation– and continuous renal replacement therapy–capable teaching hospital. This represents the first report of a nonphysician (registered nurse and paramedic) critical care team initiating prone positioning before transport. Consent for publication was only obtained in the second case, which we present here.

Case Report

A 51-year-old man (1.75 cm, 71 kg, and body mass index = 23 kg/m^2) with a history of paraplegia, alcohol abuse, opiate abuse, smoking, and hypothyroidism was taken to the local emergency department by his concerned family. On arrival, the patient was drowsy (Glasgow Coma Scale = 14/15), afebrile (37° C or 98° F), hypotensive (blood pressure = 72/41 mm Hg), tachycardic (105/minute), and in respiratory distress (oxygen saturation = 84% on room air). The emergency physician diagnosed the patient with community-acquired pneumonia, and he was stabilized with intravenous fluids, antibiotics, and noninvasive ventilation. Despite this, the patient required intubation on day 3 for worsening respiratory failure. Unfortunately, on day 13, 10 days after intubation, the patient developed a pulmonary hemorrhage, and the attending physician decided to transfer the patient to the teaching hospital for further management.

Because of poor weather conditions, the critical care transport team responded by ground ambulance to retrieve this patient. When the team arrived, they found the patient hemodynamically stable (blood pressure = 130/60 mm Hg), deeply sedated, and paralyzed (fentanyl, propofol, and cisatracurium infusions). A 7.0 endotracheal tube (ETT) was in good position, and the patient was on pressure control ventilation (PCV) (inspiratory pressure = 32 cm H_2O, tidal volume = 325-350 mL, 5 mL/kg ideal body weight [IBW], respiratory rate = 32 breaths/min, inspiratory time = .9 seconds, fraction of inspired oxygen [FiO_2] = .80, positive end-expiratory pressure [PEEP] = 12 cm H_2O). The most recent arterial blood gas (ABG) analysis showed acceptable oxygenation (PaO_2 = 90.1 mm Hg), hypercapnia ($PaCO_2$ = 90.8 mm Hg), and acidosis (pH = 7.11) (Table 1).

Initially, the team planned to transport the patient in the supine position; however, once the patient was connected to the transport ventilator (Oxylog 3000; Dräger, Lübeck, Germany) on the same PCV settings, the patient became difficult to ventilate with the tidal volume falling to 150 to 190 mL (2.2-2.7 mL/kg IBW). Immediately, the critical care team reconnected the patient to the hospital ventilator and suctioned the airway for copious amounts of bloody secretions with minimal clinical improvement.

The decision to prone the patient was made after consultation with the medical control and the attending and receiving physicians. Following the supine to prone

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checklist (see the Discussion section and Fig. 1), the team rolled the patient onto his side and then into the prone position on the transport stretcher. On PCV (inspiratory pressure = 32 cm H_2O, respiratory rate = 32 breaths/min, inspiratory time = .9 seconds, FiO_2 = .80, PEEP = 12 cm H_2O), the tidal volumes slowly increased to 350 mL (5 mL/kg IBW), and 30 minutes later, ABG analysis was performed (PaO_2 = 79.9 mm Hg and $PaCO_2$ = 78.4 mm Hg).

The team departed by ground ambulance, and the patient remained hemodynamically stable during the 80-minute transport time to the receiving critical care unit. Upon arrival, the team transferred the prone patient to their hospital bed following the prone to prone checklist (see the Discussion section and Fig. 2) without incident. Two ABG tests showed improved oxygenation (PaO_2 = 136 mm Hg and 96 mm Hg) and ventilation ($PaCO_2$ = 59 mm Hg and 52 mm Hg) (Table 1).

Discussion

ARDS is a syndrome of acute and persistent lung inflammation with increased vascular permeability leading to diffuse alveolar damage and decreased lung compliance.[1] Direct ARDS manifests from direct injury to the lungs (pneumonia, aspiration, and so on), and indirect ARDS manifests from secondary lung injury (sepsis, burns, and so on). Clinically, ARDS presents with acute onset (within 1 week), bilateral opacities (not fully explained by effusions or lobar/lung collapse), and pulmonary edema not fully explained by cardiac failure or fluid overload with poor oxygenation (Table 2).[1] ARDS can be stratified according to the PaO_2 and FiO_2 ratio. Mild ARDS is defined as a PaO_2:FiO_2 between 200 and 300 mm Hg, moderate ARDS a ratio between 100 and 199 mm Hg, and severe ARDS a ratio < 100 mg Hg.[1]

Table 1
Arterial Blood Gases

	FiO_2	pH	$PaCO_2$	PaO_2	PaO_2/FiO_2 Ratio
#1 Before prone position	.8	7.11	90.8	90.1	112.5
#2 After pone position (30 minutes)	.8	7.17	78.4	79.9	98.75
#3 After transfer of care (1st) (13 minutes)	.8	7.29	59	136	170
#4 After transfer of care (2nd) (50 minutes)	.8	7.35	52	96	122.5

FiO2 = fraction of inspired oxygen.

Supine to Prone Checklist

- **Pre Procedure**
  - ❑ Life Flight Nova Scotia RN assumes team lead on procedure
  - ❑ Mandatory communication with LF MCP +/- sending and accepting physicians for approval (Pt must have Art Line prior to transport)
  - ❑ Patient has adequate sedation and paralysis prior to moving
  - ❑ Connect patient to the LF Ventilator (Min: 10min then obtain ABG) Ensure to clamp tube and that AnchorFast is in place(apply if needed)
  - ❑ Minimize all non-essential infusions and ensure all lines are secure and midline to the patient
  - ❑ Tape patient`s eyes closed
  - ❑ Remove all poles and monitor from LF stretcher/ move gel pad towards the head and layout LifeBlanket and flannel
  - ❑ Secure LF stretcher to hospital bed with straps
  - ❑ Ensure adequate padding for chest, hips, legs
  - ❑ Airway management plan discussed and equipment ready and available
- **Procedure**
  - ❑ Minimum of 5 staff to safely move patient
  - ❑ LF CCP at head of bed controlling movement and securing ETT
  - ❑ Any participant can call a "**STOP**" during the procedure if concerned
  - ❑ LF RN + hospital staff next to our stretcher
  - ❑ 2 hospital staff next to hospital bed
  - ❑ Patient movement coordinated from CCP (head of bed)
  - ❑ Move patient in slow controlled stages
  - ❑ Ensure pt's arm closest to our stretcher is tucked under buttock
  - ❑ Position supine patient near the edge of the hospital bed
  - ❑ Slowly roll patient onto their side (towards the Life Flight stretcher)
  - ❑ Slowly roll patient on to the chest and pelvis padding on the LF Stretcher
- **Post Procedure (Min of 20min prior to transport)**
  - ❑ Reassess patient after movement(Vitals/ vent settings/2nd ABG)
  - ❑ Switch monitoring cables to LF monitor and apply Defib pads
  - ❑ Reconnect infusions that are required for transport
  - ❑ Check patient placement(padding is still adequate)
  - ❑ Eyes closed/ ears not folded/ head not hyperextended/no pressure on eyes & nose. Reassess during transport
  - ❑ Secure the patient

Figure 1. Supine to prone checklist. CCP, Life Flight critical care paramedic; MCP, Life Flight medical control physician.