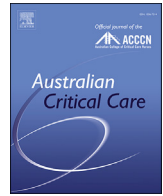




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Case study

Manual proning of a morbidly obese COVID-19 patient: A case report

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Continuously rising numbers of obese critical care patients pose many challenges to the healthcare workers, especially during the COVID-19 pandemic. Among them, proning may be one of the most labour-intensive tasks. Prone positioning is performed manually in hospitals where mechanical lifting aids are unavailable; however, the exact method of manual proning is not explicitly described in the literature.

Here, we present a case of a morbidly obese patient with COVID-19 pneumonitis in the intensive care unit with a step-by-step guide of the manual proning technique. Our approach is simple and feasible, as only readily available tools, such as bed sheets and friction-reducing sheets, are used.

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1. Introduction

As the world focuses on the ongoing battle with the COVID-19, the pandemic of obesity remains relevant with the continuously rising numbers worldwide.¹ This is also reflected by an increasing fraction of obese intensive care unit (ICU) patients, which was reported to be around 20% in 2019.² However, with the clash of the two pandemics, we are faced with even more challenging situation: according to the most recent UK Intensive Care National Audit and Research Centre Report on COVID-19 in critical care, the prevalence of obesity in the ICU reached 49.6%.³

Among many diagnostic, therapeutic, and logistic challenges in caring of obese patients, proning may be one of the most labour-intensive tasks. Despite that, it has been demonstrated to be a feasible and safe intervention for this population and also likely even more beneficial than for nonobese individuals.⁴ Although it is advised to use lifts or proning beds for proning of obese patients,⁵ not all hospitals are equipped with these aids. Under such circumstances, a manual proning is used; however, the exact method is only briefly described in the literature.^{4,6}

Here, we present a case of a morbidly obese patient with COVID-19 pneumonitis in the ICU with a step-by-step guide of the manual proning technique. Our approach is simple and feasible, as only readily available tools, such as bed sheets and friction-reducing sheets, are used.

A written informed consent was obtained from a legally authorised representative of the patient before the publication.

2. Case report

A 50-year-old man was admitted to a hospital with COVID-19 pneumonitis in December 2020. He had a past medical history of asthma, obstructive sleep apnoea, and morbid obesity (height, 193 cm; weight, 190 kg; body mass index, 51). He received continuous positive airway pressure (CPAP) ventilation on a respiratory ward for 5 days; however, owing to a sudden deterioration, he was admitted to the ICU and intubated.

During intubation, the patient sustained a cardiac arrest. After one cycle of chest compressions, return of spontaneous circulation was achieved; however, the patient remained unstable and developed multiple-organ failure (acute respiratory distress syndrome, shock, and acute kidney injury), requiring high level of organ support (FiO₂ of 1.0, noradrenaline infusion of 0.9 mcg/kg/min, and renal replacement therapy). Chest X-ray demonstrated worsening bilateral infiltrations. Bedside cardiac ultrasound revealed a right ventricular strain, and given a high risk of pulmonary embolism (risk factors: morbid obesity, immobility, and COVID-19) and haemodynamic instability, thrombolysis was administered. Several hours later, the SpO₂ of the patient remained 75–85% with FiO₂ of 1.0 (PF ratio 60 mmHg); therefore, it was decided to place the patient into a prone position.

The usual proning method in our hospital was a “burrito” technique, which has been demonstrated elsewhere.⁷ It was performed by a proning team assembled during the COVID-19 pandemic. The team consisted of one anaesthetist or critical care doctor and a combination of redeployed anaesthetic nurses and other theatre staff. The “burrito” technique applied for nonobese patients included lifting a patient after proning to adjust the thoracopelvic support (pillows) and positioning a patient straight.

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The application of this technique for proning of our morbidly obese patient was deemed too dangerous for the staff owing to the weight of the patient and the personnel body mechanics when reaching over a wide bariatric bed. Therefore, a new manual proning technique was proposed with the following goals:

- I. to completely avoid lifting.
- II. to straighten out the body of the patient and avoid a semi-prone position with the panniculus lying sideways to make head turns possible both ways.
- III. to use pillows as thoracopelvic support. Whilst we did not expect to achieve a full abdominal suspension, our hope was

that the elevation of the chest and pelvis would relieve some of the abdominal pressure and improve the lung ventilation.

The schematic sequence of the used proning technique can be seen in Fig. 1. After a 16-h proning session, a significant improvement in the gas exchange was observed: SpO₂ 91% and PaO₂ 67 mmHg on FiO₂ of 0.6. Over the following days, the patient was successfully prone two more times with the same methodology. The time needed to achieve prone position for this patient shortened from approximately 1 h to 30 min with subsequent proning sessions. The proning team did not report any injuries.

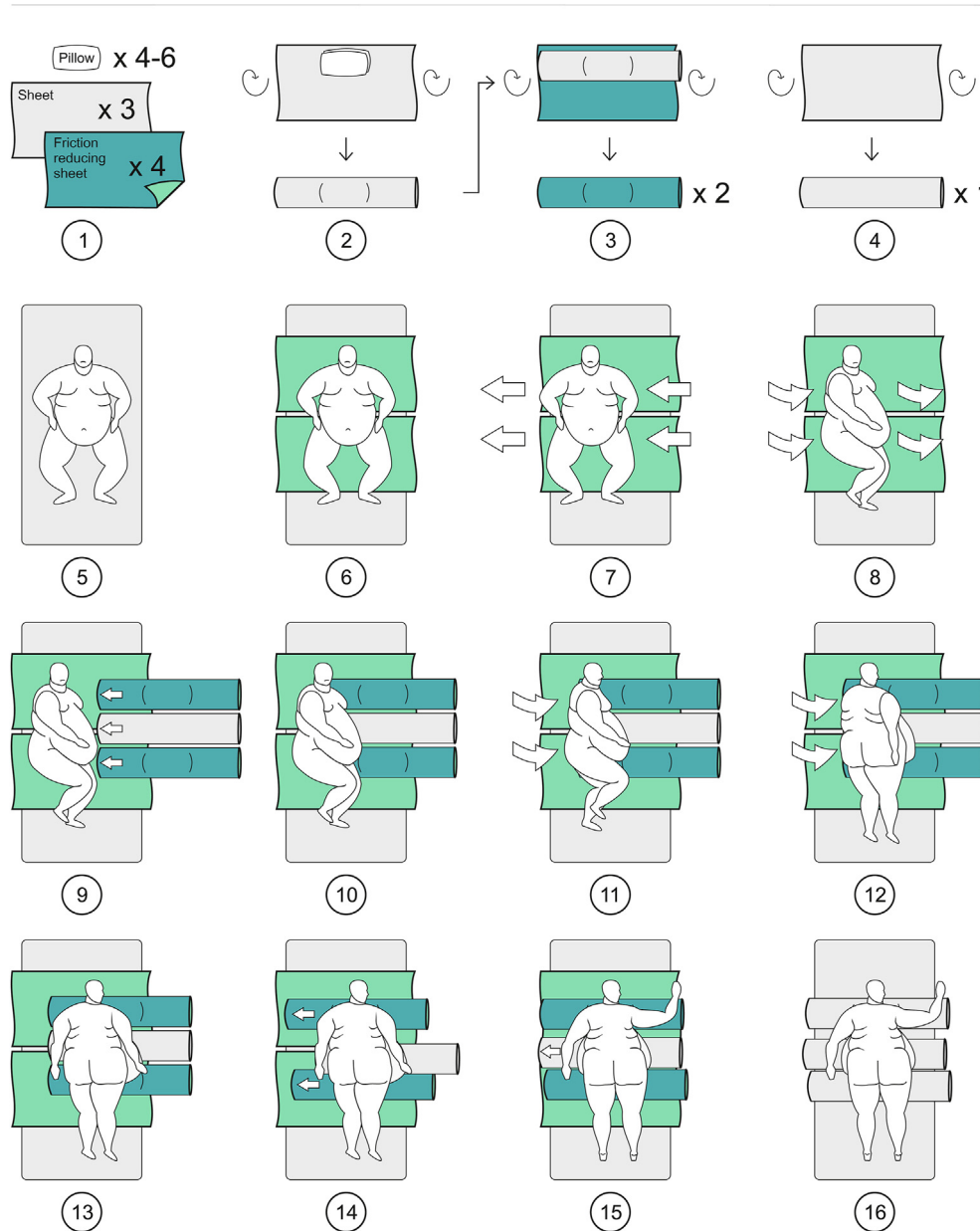


Fig. 1. Sequence of a proning technique for a morbidly obese patient. *Preparation:* The necessary equipment: three sheets, four friction-reducing sheets, four to six pillows (1). A sheet is wrapped around some pillows to form a pillow-packed sheet tube (2), which is then wrapped into a friction-reducing sheet (3). Two pillow-packed friction-reducing sheet tubes and one plain sheet tube are necessary (4). *Proning:* A new sheet (5) and two friction-reducing sheets (6) are placed underneath the patient. The patient is then pushed/pulled towards a side of the bed (7) and rolled onto his/her side (8). After this step, two pillow-packed friction-reducing sheet tubes are tucked underneath the patient's chest and pelvis, and one plain sheet tube placed underneath the panniculus (9–10). The patient is then rolled further (11–13) until reaching semiprone position. *Adjustments:* Pillow-packed friction-reducing sheet tubes will slide without much resistance between the patient and the bottom friction-reducing sheets, allowing positioning of the pillow packs in the desired areas (14). The plain sheet tube when pulled will slide against the bed; however, owing to friction, it will drag the panniculus, allowing it to be displaced underneath the patient (15). Finally, all the friction-reducing sheets are removed while the plain sheet tubes and the pillow packs are left under the patient (16).

Despite the initial improvement of the patient's condition, 1 week later, respiratory failure worsened again and, sadly, after 9 days of ICU stay, the patient passed away.

3. Discussion

To our knowledge, this is the first published detailed description of manual proning of a morbidly obese patient.

Despite a widespread use of the prone position for patients with acute respiratory distress syndrome during the COVID-19 pandemic, the practical aspects of the technique did not receive a wide scientific interest. The most common methods have recently been summarised by Wiggerman et al.;⁵ however, specific instructions regarding obese patients remain scarce.

There is a significant risk of musculoskeletal injury to the staff during repositioning of patients,⁸ which is likely even higher during proning.⁹ Thus, using a ceiling lift or a proning bed should always be the first choice for obese patients.⁵ In hospitals where lifting aids are not available, it is relied on the staff to do this strenuous labour. Some centres deem the manual proning of an obese patient too dangerous,¹⁰ while others report it as safe and feasible.^{4,6} De Jong et al.⁴ described a similar manual proning approach in morbidly obese patients. However, important practical aspects were not mentioned in the publication. It is unclear whether the patient was straightened or kept semiprone with the panniculus lying sideways and how the thoracopelvic supports were positioned underneath the patient.

Skin integrity damage in prone position is one of the most common complications; therefore, 2-hourly head turns are recommended to prevent facial injuries.¹¹ For this to be feasible, the patient needs to be positioned straight with a neutral spine. However, in morbidly obese patients, obtaining such a position may be difficult owing to patient's panniculus, and thus, only a semi-prone position can be typically achieved, as can be seen in the publication by De Jong et al.⁴ Attempting to do a head turn towards the other side may be dangerous owing to an extreme degree of rotation of the neck.

Another consideration is the intra-abdominal pressure, which is often increased in individuals with high body mass index.¹² This is associated with impaired respiratory mechanics, which can be further exacerbated by prone position.¹³ As such, abdominal suspension with thoracopelvic support should be used to prevent compression of the lung bases by the visceral abdominal mass.¹² However, positioning of the pillows is usually achieved by lifting the patient, which, in the case of a morbidly obese individual, poses an unacceptable risk to the staff's health.

Our case report and the illustrated proning technique aim to address these practical questions of prone position of obese patients. We have successfully used simple tools to place a morbidly obese patient in a straight prone position as well as adjust thoracopelvic supports while completely avoiding lifting.

This technique may be used as an alternative to mechanical lifting aids in low-resource settings.

CRedit authorship contribution statement

The author wrote the manuscript and prepared the illustrations.

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Conflict of interest

None.

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