



The Prone position

1) D

The only real absolute contraindication for the prone position is unstable spinal fractures that could get worse by the prone position. Elevated intra cranial and intra ocular pressures can also be contraindications though not studies specifically. There are multiple risks and theoretical worries that hinders the use of the prone position like hemodynamic instability but most of studies that show improved mortality included patients in shock on intravenous pressors. Morbid obesity is not a contraindication. This patient is in moderate ARDS with $PaO_2:FiO_2$ 112.

2) B

There are many mechanisms for the postulated improvements of oxygenation and mortality including:

Lung inflation and ventilation are more even in the prone than in the supine position, whereas perfusion is similar in both conditions, the ventilation-perfusion ratios are more homogeneously distributed in the prone position with homogeneous distribution of stress and strain. Dorsal alveolar recruitment prevails over ventral derecruitment, leading to increased lung compliance. These improve ventilation to perfusion matching and perhaps the reduction of dead space ventilation. Evening the distribution of transpulmonary forces may reduce the incidence of Ventilator Induced Lung Injury (VILI).

In addition, other mechanical factors that contribute to the benefits of the prone position include enhanced airway drainage, reduction of atelectasis induced by the weight of the heart and abdominal organs on the dorsal alveoli, possible reduction in pneumonia, as well as improvement in the right heart function and pulmonary circulation.

The lung compliance improves however the chest wall compliance is actually reduced.

3) C

In the past it was thought that the pulmonary circulation and perfusion improves with gravity but that was disproven and perfusion is unchanged from the supine to the prone position, however the ventilation improve in the prone position (see above).

4) C

Though the prone position showed to improve oxygenation, ventilation, mortality, no much evidence to suggest it reduces the ventilator length of stay or ICU stay.

5) C

There are definite risks of applying the prone position, however with a well applied protocol and expert clinicians, those risks are usually not much different than in the supine position. Aspiration did not show to be higher in the prone position and holding enteral nutrition in those patients are not justified.

6) C

The longer is the better. Guidelines by SCCM, ATS, ESCIM recommend more than 12 hours, however the PROSEVA trial that showed significant improvement in mortality used 16 hours/day. Sometimes prolonged proning > 24 hours are needed if the oxygenation deteriorate when placed back in the supine position

7) B

As in question 5

8) B

Shock and hemodynamic instability are not contraindications for the prone position. Most of the studies of proning had 60-70% of the patients on intravenous vasopressors.

9) B

CO₂ elimination and ventilations are slightly ignored when the decision is made to apply the prone position. However, the improved Ventilation/Perfusion mismatch, dead space usually leads to improvements in PaCO₂. Some studies have shown that the improvement in PaCO₂ is correlated to improved survival.

10) C

Though extensively used and increasingly studied, the results of the awake proning are still unclear. Most studies have shown improved oxygenation, however the effect on preventing mechanical ventilation or improved mortality is still conflicting and unclear