

Effects of Position on Oxygen Saturation in Acute Respiratory Distress in Neonates

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ABSTRACT

Objective To determine the effects of prone versus supine positions of the patient on oxygen (O_2) saturation in neonates with acute respiratory distress.

Study design Observational Cross sectional study.

Place & Duration of study Department of Paediatrics Chandka Medical College Hospital Larkana, from December 2011 to June 2012.

Methodology One hundred neonates were included in this study by non-probability sampling. All the patients with respiratory distress (RD) were kept in supine position for three hours after all necessary resuscitative measures and oxygen saturation was recorded with pulse oximeter. After that they were kept in prone position for six hours. With pulse oximeter oxygen saturation and respiratory rate were measured every two hours interval for six hours.

Results Age ranged from 1 hour - 25 days. There were 77 (77%) term, 19 (19%) preterm and 4 (4%) post term babies with male to female ratio of 1.3:1. There were a total of 200 supine-prone cycles. After 6 hour in prone position the PaO_2 of all patients increased by about 7%. In supine position it was 86.4 ± 5.7 and in prone 93.5 ± 4.1 with p value of < 0.001 which is statistically highly significant.

Conclusion Prone position improves oxygenation in majority of patients as compared to supine position.

Key words Respiratory distress syndrome, Neonates, Prone position, Oxygen saturation.

INTRODUCTION:

Respiratory distress is a common emergency and is responsible for 30-40% of admissions in the neonatal period.¹ Initially named as adult respiratory distress syndrome but now termed the acute respiratory distress syndrome since it does occur in children.² The incidence of RDS is inversely proportional to gestational age with high mortality. Respiratory distress is one of the commonest disorders usually occurring within the first 48-72 hours of life. It occurs in 0.96 to 12% of live births and is responsible for about 20% of neonatal mortality.³⁻⁵

The management of respiratory distress syndrome has advanced because of improvements in mechanical ventilators, availability of surfactant and overall advancements in neonatal intensive care. Prone positioning was advocated 30 years ago to improve oxygenation in patients with hypoxemic acute respiratory failure (ARF) receiving mechanical ventilation.⁶ Most of the related studies published from developed countries for consequences of prone position on oxygen saturation were on mechanical ventilation.

This study conducted in our neonatal unit aimed at measuring oxygen requirement in patients with RD. The objective was to determine effect of prone versus supine position on O_2 saturation in neonates with acute respiratory distress. Our hypothesis was that prone position improves oxygen saturation in infants with RD as compared to supine position.

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METHODOLOGY:

This cross sectional observational study was conducted in the Paediatric department of Chandka Medical College Hospital Larkana from December 2011 to June 2012. One hundred neonates were included in this study by non-probability convenience sampling. After taking informed consent, neonates who fulfilled inclusion criteria were enrolled for the study. After taking all resuscitation measures and clearing airway patients were kept in supine position for 2 hours and oxygen saturation and respiratory rate were measured. Patients were then kept in prone position for 6 hours and respiratory rate and oxygen saturation were measured every 2 hours by pulse oximeter. Twenty patients were not able to sustain position or complications like transient oxygen desaturation, hypotension, airway obstruction, vomiting etc occurred.

Data were analyzed by SPSS software version 11.0. Frequencies were determined for categorical data like gender. For continuous variables like age, mean and standard deviation were determined. Discrete variables were expressed as percentages.

RESULTS:

A total of 100 patients (mean age 4.1±5.3 days, age range 1-25 days) were enrolled in the study with gestational age of 35.7±2.5. The common modes of presentation of neonates were respiratory distress (n=74), grunting (n=48) and cyanosis (n=33). Babies presented with one or more than one problem like respiratory distress with birth trauma (n=7) or meconium aspiration syndrome (n=10). APGAR score was not known in 30 % of patients because of home delivery or being referred from other hospitals. Patients who were born at Shaikh Zaid women hospital CMC Larkana, received resuscitation and of them 78% patient responded. They were provided with oxygen using Ambu bag. Endotracheal intubation was done in 12% and 46 % of the patients required medications.

There were total of 200 supine prone cycles. After 6 hours of the prone positioning, the PaO₂ of all patients had increased by about 7% with oxygen saturation in supine position 86.4±5.7 and in prone position 93.5±4.1 with p value of < 0.001. They maintained their O₂ saturation in supine posture

after 6 hours of prone position except in those cases who died due to acute respiratory failure (table-I) Out of 100 patients, 20 (20%) died. Deaths in these neonates were due to acute respiratory failure because of severe birth asphyxia and sepsis.

DISCUSSION:

Respiratory distress is a common cause of hospital admission in the neonatal period and is responsible for 20% of neonatal mortality. Placement of patients with RD in prone position has been shown to improve oxygenation. The proposed mechanism by which prone position improves oxygenation is multi-factorial and includes better diaphragmatic movement, recruitment of formerly collapsed dependent lung regions, redistribution of pulmonary blood flow to better ventilated regions, enhanced drainage of airway secretions and increased negative pleural pressure.⁷ Similarly, repositioning these patients back to supine position has often been associated with a noticeable deterioration in gas exchange. We found that oxygen saturation improved with prone positioning within 2 hours.

Study by Monica S et al showed that prone position (PP) improved oxygenation in patients with RD receiving mechanical ventilation. Keeping these patients in PP for 12 hours was associated with a more pronounced and stable improvement in the oxygenation rather than that occurring for shorter periods.⁸ Lori D et al showed that when a prone positioning protocol is used no increase risk of inadvertent endotracheal tube dislodgement, interruptions in mechanical ventilation, and pressure ulcers occurred.⁹

Results of Down E Elder et al study showed that the supine sleep position appears to be appropriate for preterm infants, with and without chronic lung disease, who are ready for discharge from the neonatal nursery.¹⁰ We have also shown that sleep state and immaturity at discharge appeared to have more influence on cardiorespiratory instability than ongoing respiratory disease and oxygen dependency. We found no effect of sleep position on oxygen saturation and apnea in this group of preterm infants.

Table I: Demographic characteristics (n = 100)

Age (in days)	Mean + SD, (Range)	4.1±5.3, (1 -25)
Gestational age	Mean + SD	35.7 + 2.5
Weight of baby	Mean + SD	2338 + 677

A multicentre trial on use of prone ventilation for prolonged periods of time was found to be feasible and safe.¹¹ We do not recommend the routine use of prone positioning for patients with hypoxemic respiratory failure. Despite the neutral effect on mortality, clinicians may still consider prone positioning for life-threatening hypoxemia, along with other supportive therapies.

CONCLUSIONS:

Prone positioning improved oxygenation in the majority of the patients with RD. The improvement in oxygenation was maintained after returning the patient to the supine position.

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