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Early versus late extubation after surfactant replacement therapy for respiratory distress syndrome

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KEYWORDS

Surfactant;
Extubation;
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Abstract *Patients and methods:* Ninety patients treated by surfactant replacement therapy were included in the study. Patients were divided into 2 groups; group A consists of patients who were extubated early within 24 h after surfactant administration and group B consists of patients who were extubated after 24 h from surfactant administration.

Results: 59 patients were extubated early (within 24 h after surfactant administration) while 31 patients were extubated late (after 24 h from surfactant administration). Patients in group B (late extubation group) had a longer duration of CPAP (41.53 + 9.74 h in group B versus 17.30 + 4.03 h in group A), a longer duration of total oxygen administration (73.41 + 11.24 h in group B versus 45.33 + 5.22 h in group A) and a longer duration of hospital stay (171.88 + 75.74 h in group B versus 106.82 + 52.79 h in group A) than patients in group A (early extubation group). 41 (69.50%) Patients who were extubated early received surfactants at or before the age of 6 h while 22 (70.97%) patients who were extubated late received surfactants after the age of 6 h. Regarding complications, 6 patients had transient bradycardia (6.7%), 4 patients had pneumothorax (4.4%) and 4 patients had pulmonary hemorrhage (4.4%).

Conclusion: Early administration of surfactants is associated with early extubation. Patients who were extubated early (most of them had an early administration of surfactants) had a lower chance for re-intubation, less duration of total oxygen administration and less hospital stay.

Introduction

Artificial respiratory support and surfactant replacement are cornerstones of the management of infant respiratory distress syndrome (RDS). Respiratory support strategies include nasal continuous positive airway pressure (NCPAP) and mechanical ventilation (MV), which are effective in reducing mortality and

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Nomenclature

CPAP	continuous positive airway pressure	NCPAP	nasal continuous positive airway pressure
CS	cesarean section	NICU	neonatal intensive care unit
FIO_2	fraction of inspired oxygen	NVD	normal vaginal delivery
INSURE	intubation-surfactant-extubation	RDS	respiratory distress syndrome
MV	mechanical ventilation		

morbidity due to RDS.[1,2] Early discontinuation of mechanical ventilation presents difficulties, and up to 25–52% of preterm neonates experience extubation failure (EF).[3–5]

A method of respiratory assistance, commonly referred to as INSURE (intubation-surfactant-extubation), reduced the need for MV, the duration of respiratory support and oxygen supplementation, further surfactant administrations, and the length of stay in the neonatal intensive care unit (NICU).[6] Although beneficial in clinical practice, the INSURE method cannot be universally applied to all preterm neonates with RDS and is unsuccessful in a particular section of this population.[6] The INSURE failure rate reported in the literature ranges from 9% to 50% according to the different populations included and the different criteria used for the definition of failure.[7–9]

The purpose of this study was to compare outcomes between two strategies of surfactant administration in infants with RDS; early surfactant administration (within 6 h after birth) followed by prompt extubation, compared with later use of surfactants followed by continued mechanical ventilation.

Patients and methods

The study was done in a tertiary care hospital in the Arab Gulf area after approval of the institutional review board (IRB) as a prospective – cohort – study. All newborn infants (full or preterm) who were admitted to the NICU with respiratory distress syndrome, born between January 2012 and December 2013 and treated by surfactant replacement therapy were included in the study. 90 patients fulfilled our criteria. Their data were collected including, sex, gestational age, mode of delivery, maternal chronic illness, antenatal steroids for mothers, Apgar scoring at 1 and 5 min, age of surfactant administration, mode of ventilation, failure of extubation, maximum FIO_2, duration of oxygen supply and duration of hospital stay. Patients were divided retrospectively into two groups. The first group consists of patients who were extubated early within 24 h after surfactant administration and the second group consists of patients who were extubated after 24 h from surfactant administration.

Exclusion criteria included all infants with major congenital anomalies (infants delivered with known syndrome or with chromosomal abnormalities) or patients with incomplete medical records. Our policy was to give any infant who was diagnosed to have RDS early surfactant within 6 h after delivery; however some infants received late surfactant administration because they were born outside our center and referred to us later for further management.

Early surfactant administration was provided to symptomatic infants within the first few hours after birth, shortly after the onset of respiratory symptoms, often before the need for endotracheal intubation to treat respiratory failure. Later surfactant therapy was defined as surfactant administration at or near the time of respiratory failure when the newborn requires intubation and mechanical ventilation to maintain oxygenation.

Statistical analysis

Data were entered into the SPSS software program (SPSS 19 Inc., Chicago, IL, USA). Incidence rate and 95% confidence interval will be reported. For significant comparison relative risk and logistic regression will be used to compare late preterm and full term infants. For ordinal variables, the Wilcox on rank sum test will be used for comparison of medians.

Results

The study was done over 2 years, 90 infants' met the defined criteria from January 2012 till December 2013. 59 patients were extubated early (within 24 h after surfactant administration) while 31 patients were extubated late (after 24 h from surfactant administration). 63 patients (70%) were males while 27 patients (30%) were females. 38 patients (42.2%) were born by normal vaginal delivery while 52 patients (57.8%) were born by cesarean section. The mothers of 39 patients (43.33%) had chronic illness. Only 15 mothers (16.67%) received antenatal steroids to enhance fetal lung maturity. 86 patients (95.55%) received one dose of surfactant only one time, while 4 patients (4.45%) received two doses. 13 patients were re-intubated (6%), two of them from group A and eleven from group B with significant statistical difference between the 2 groups. 86 patients were put on CPAP (95.55%), while only 4 patients (4.45%) were extubated to room oxygen in the incubator. After 72 h from extubation 19 patients were on SIMV (21.11%), 24 patients on CPAP (26.67%), 12 patients were on incubator oxygen (13.33%) and 35 patients on room air (38.89%). After 120 h from extubation 2 patients were on SIMV (2.22%), 8 patients on CPAP (8.89%), 12 patients on incubator oxygen (13.33%) and 68 patients on room air (75.56%). Regarding the complications, 6 patients had transient bradycardia (6.7%), 4 patients had pneumothorax (4.4%) and 4 patients had pulmonary hemorrhage (4.4%). All patients in group A were successfully discharged home and 2 patients from group B expired later due to sepsis (2.2%), (Table 1).

Patients in group B (late extubation group) had a longer duration of CPAP (41.53 + 9.74 h in group B versus 17.30 + 4.03 h in group A), a longer duration of total oxygen administration (73.41 + 11.24 h in group B versus 45.33 + 5.22 h in group A) and a longer duration of hospital