Case - Study I

Objectives

1. Importance of Antenatal steroids and Neonatal Outcomes
2. Risk / Protective factors for HMD
3. Discuss prophylactic and early CPAP
4. Initial settings and change in settings during CPAP ; FRC clinical / radiological assessment
5. Monitoring of the baby on CPAP
6. Weaning from CPAP

Baby P was born at 31 weeks of gestation to a Gravida 4 mother with 2 previous still births. She was born by emergency LSCS in view of antepartum hemorrhage (placenta previa) in the mother; she weighed 1.31kg at birth. The antenatal period was supervised and placenta previa was diagnosed 2 weeks prior to delivery. Mother received antenatal steroids and the last dose was administered 12 hours before the delivery. The baby required initial steps followed by bag and mask for 30 seconds.

Q. What are your concerns at this stage?

1. Role of antenatal steroids
2. What is the risk of HMD in this infant?
3. Role of prophylactic surfactant and delivery room CPAP.

The baby was shifted to the NICU in view of prematurity. After 30 minutes, she developed respiratory distress with retractions, grunting and decreased air entry. Silverman score was 6. SpO2 was 88% on room air. Capillary refill time and temperature were normal. The baby was started on oxygen by hood. An ABG was done which read: pH7.23/PaCO2 53.9/PaO2 57/HCO3 12.2 and SBE -10.

Q. Comment on the management of the baby so far.
What would you have done at this stage?

1. Stress the importance of Early CPAP - discourage the use of starting oxygen by hood as a first step!
2. CPAP vs. ventilation - stress them that even though CO2 is on a higher side, still CPAP would suffice; discuss how optimal CPAP could help in removal of Co2

3. Discuss the initial settings of CPAP
4. Role of surfactant and INSURE approach
5. Discuss the causes of acidosis in the baby

The resident doctor started the child on Bubble CPAP with PEEP of 5cms, FiO2 of 50% and a flow of 5liters/min. After a few minutes, the PEEP was increased to 6cms and FiO2 to 60% in view of persisting retractions. CXR done at this time showed 7 spaces with reticulogranularity and air bronchogram.

Q. What action will you take?

1. How to make changes of FiO2 and PEEP after starting on CPAP (spO2, PaO2, Retractions and CXR)
2. If on bubble CPAP/Flow driver how to make changes in Flow
3. Introduce to INSURE ; method in next case
4. Monitoring of a baby on CPAP support: clinical (Silverman score), saturation, ABG, etc.

At 30minutes the distress improved, silverman score decreased to 4, grunt disappeared, air entry improved. ABG was pH7.23 / PaCO253.5 / PaO2 99 / BE -7.0 / HCO3

Q. What action will you take?

1. CPAP vs. ventilation now!
2. What are the monitoring tools while the baby is on CPAP: Clinical, Circuit, Interface, Humidification, Airway

The baby improved gradually - the retractions lessened and the respiratory rate became normal.

At 8 hours of life, the baby was on Bubble CPAP with PEEP of 6cm H_2O, FiO2 60% and Flow of 5liter/min. Examination showed mild retractions, good air entry. Circulation was poor, CFT was 3 secs, MAP was 35mm of Hg and pulse volume was normal. ABG done now showed 7.20/PaCO2 45/PaO2 88/BE -10/HCO3 14.0.

Q. What action will you take?

1. What could be the reasons for poor circulation now
2. Role of saline bolus
3. Role of bicarbonate in metabolic acidosis

Chest expansion was fair. No evidence of hyperinflation. No murmur. No IVH on Neurosonogram.

A bolus of Normal saline was given (10ml/kg) over 15 minutes. The circulation improved and the distress gradually improved. FiO2 was decreased in steps of 5% and when FiO2 was 50%, PEEP was decreased to 5cm H_2O . over the next 12 hours FiO2 was brought down to 25% and PEEP to 4cms of water.

At 36 hours of life, the baby was stable with good respiratory efforts, no retractions and circulation was normal. PEEP was 4cm H_2O, FiO2 was 25% and flow was 2 liters. The baby was shifted to oxygen by hood.

Q. What should be nursing instructions now?

1. Prone positioning/ frequent change in position
2. Watch for apnea or worsening distress
3. Start feeds after 2 to 4 hours if there is no worsening of distress

CASE-STUDY II

Objectives

1. Antenatal counseling for a Preterm delivery
2. Preparations at birth before delivery of a VLBW baby ; concept of "Golden hour"
3. RD in a newborn-
   a. Clinical and CXR differentiation, shake test to diagnose RDS
   b. Assessment of severity (Downes and Silverman scoring, AaDO2 etc)
4. Steps of surfactant administration
5. Complications; Respiratory acidosis, Metabolic acidosis, causes and treatment

Baby V 33 weeks, 1.46kg, born to Gravida 4 mother with no living issue was born by elective LSCS (for previous caesarian section) with antenatal steroids at 28 weeks of gestation. No asphyxia at birth. Apgar at 1 min and 5 min were 7 and 8 respectively.

Q. What are your concerns at this stage?

1. Antenatal counseling
2. What should be the arrangements before birth in this baby?

The baby was shifted to the NICU. After 5 minutes, the baby was noted to have respiratory distress with retractions, grunting, flaring of alae nasi and decreased air entry. Silverman score was 6. SpO2 was 84% on room air. Circulation was impaired with low volume pulses and MAP was 35 mm of Hg.On Hood oxygen, ABG was 7.224/PaCO2 41.5/PaO2 51/HCO3 17.2 and SBE -10.

Q. What action will you take?

1. What are the causes of Respiratory distress in this newborn
2. Differential diagnosis and bedside diagnostic tools
3. How to asses severity of respiratory distress in a neonate (Scoring, FiO2 requirement, associated features)
4. How to manage the respiratory problem in this infant?

The medical officer started the child on Bubble CPAP with PEEP of 5cm H_2O, FiO2 of 50% and a Flow of 4liters/min. CXR was done and it showed 7 spaces with reticulo granularity and air Bronchogram. Baby was given bolus of 10 ml/kg of normal saline and improved..

At 2 hours the RD was persisting with FiO2 requirement of 60% and PEEP of

6 cm H_2O, Silverman score of 5, a dose of surfactant was given by INSURE technique and reconnected to Bubble CPAP. After surfactant. ABG showed pH 7.21/ pCO2 52.7/ pO2 132/ HCO3 21.3/ BE -7.

Q. What action will you take?

1. What are the causes of respiratory acidosis in this infant
2. What are steps of INSURE
3. What monitoring is required after giving surfactant

By 14 hours of life the baby was better with Silverman score of 2. Examination showed tachypnoea, mild retractions, and good air entry. FiO2 was decreased in steps of 5% and when FiO2 was 50% PEEP was decreased to 5cm H_2O and flow could be brought down to 3 liters/min. ABG pH 7.31, pCO2 31.4, pO2 53, HCO3 15.8, BE -10.

Q. What action will you take?

1. What could be the reasons for poor circulation now
2. Role of saline bolus
3. Role of bicarbonate in metabolic acidosis

Over the next 48 hours FiO2 was brought down to 30% and PEEP to 4cms of water. ABG was pH 7.32, pCO2 41.4, pO2 49, HCO3 21.3, BE -5.

At 65 hours of life, the baby was stable with good respiratory efforts, no retractions and circulation as normal. PEEP was 4cm H_2O, FiO2 was 25% and flow was 2liters. The baby was shifted to nasal oxygen.

CASE-STUDY III

Objectives

1. Risk factors for sepsis, sepsis screen,
2. Transport of a sick neonate, pretransport stabilization (STOPS) and communication. CPAP during Transport
3. Complications on CPAP : Hyperoxia, Hypercarbia, Pneumothorax,
4. Predictors of CPAP Succues/failure. Criteria for Failure. Checklist before intubation

Baby R 30 weeks, 1.49kg, female baby was born to Gravida 2 mother with 1 abortion, by emergency LSCS for Preterm premature rupture of membranes. Mother's antenatal period was supervised; she was diagnosed to have PPROM 10 days back. She received one course of antenatal steroids, the last dose about 8 days ago. Baby cried at birth and was assigned Apgars of 6 and 8 at 1 and 5 minutes respectively.

Q. What are your concerns at this stage?

1. Role of sepsis screen - indications, components, interpretation
2. Steps to be taken if this baby has to be transferred from another hospital - stabilization, option of providing CPAP during transport (if baby develops respiratory distress), monitoring during transport. STABLE, etc.

At 1 hour of age, the baby developed respiratory distress: her respiratory rate was 65/min; on examination, she had grunting, upper chest see- saw movement, lower chest mild retraction, sternal retractions, marked flaring of alae nasi and decreased air entry bilaterally. SpO2 was 80% on room air. Circulation was normal. Was euthermic (temp 36.5 C). ABG was 7.12/PaCO2 58.4/PaO2 45/HCO3 12.2 and SBE -10.

Q. What are the diagnostic possibilities? What action will you take?

1. Silverman Score of the baby
2. Monitoring a baby with respiratory distress
3. Role of CPAP vs. ventilation in suspected pneumonia
4. How to rule out RDS at the bed-side: role of shake test and its interpretation
5. Stress the importance of intense monitoring in this baby as she is more likely to have pneumonia than the previous 2 babies and hence more likely to fail with CPAP.
6. Role of prophylactic antibiotics in PPROM - in the antenatal as well as in the postnatal period

The baby was started on Bubble CPAP with PEEP of 5cm H_2O FiO2 of 50% and a Flow of 4liters/min .CXR was done and it showed 6 spaces on right side and 7 spaces on left side with reticulogranularity and air Bronchogram. ABG after 30 minutes of starting CPAP showed pH 7.25, pCo2 48.8, pO2 104.1, HCO3 21.2, BE -6.

Q. What action will you take?

1. To continue CPAP;
2. ABG showing hyperoxia - discuss how to wean off the settings in CPAP - role of pulse-oximeter, target saturations, and reducing the FiO2 and not the pressure (at least initially) if the baby is hyper-saturating

3. Discuss about monitoring an infant while on CPAP - silverman score in a baby with CPAP cannula - how to modify the score in such instances

At 5 hours the distress improved, silverman score decreased to 4, grunt disappeared, air entry improved and FiO2 decreased to 25%. At 16 hours of life baby had poor perfusion with capillary filing time of more than 3 sec, pulses were low volume, mottling was present and MAP was 30 mm Hg. Normal saline bolus 10 ml/ kg was given. Was maintaining border line saturations and continued to have mild to moderate retractions. PEEP was increased to 6 cms and FiO2 to 100% gradually in increments of 5%. But baby's saturation was 75%.

Q. What action will you take?

1. Reasons for poor circulation now
2. CPAP failure and the reasons for it
3. Contraindications for CPAP
4. How to predict CPAP failure

Baby was started on ventilatory support (SIMV) with PIP of 14, PEEP of 4 cm, Rate of 40/min, Ti -0.40 sec, FiO2 - 60%. ABG after an hour- pH 7.25/ pCO2-37.2/ pO2- 49/BE of -11. Baby was started on inotropic support and the antibiotics were started. There was no IVH, no signs of PDA. 2D ECHO showed PPHN.

At 36 hours of life baby was better with mild retractions with good air entry, perfusion improved. ABG pH- 7.33/ pCo2 -42/ pO2 -60/BE of -4. Baby was extubated and put on nasopharyngeal CPAP for 2 days. Oxygen inhalation was stopped on day 7.Tube feeds were started on day 4 and gradually increased to full feeds by day8.

1. Initial ventilator settings in pneumonia and shock
2. Discuss the causes for PPHN in preterm babies
3. Diagnosis, treatment and supportive strategies in management of PPHN