RDS – CPAP or surfactant or both?

*EB NEO, Stockholm, June 2011*

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Developmental surfactant deficiency

The main cause of RDS

Surfactant treatment – when and how?
Ventilatory management - optimal strategy?

Avery & Mead, 1959
Susceptibility of surfactant deficient lung to ventilatory-induced lung injury

- Manual ventilation with a few large breaths in preterm lambs compromise the effects of subsequent surfactant treatment

Most babies will try to breath...

<table>
<thead>
<tr>
<th>Deliveries</th>
<th>No. (%) who cried</th>
<th>No. (%) who breathed</th>
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</thead>
<tbody>
<tr>
<td>Total (n=61)</td>
<td>42 (69)</td>
<td>49 (80)</td>
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<tr>
<td>&lt; 26 weeks (n=18)</td>
<td>10 (56)</td>
<td>12 (67)</td>
</tr>
<tr>
<td>≥ 26 weeks (n=43)</td>
<td>32 (74)</td>
<td>37 (86)</td>
</tr>
</tbody>
</table>

O’Donnell CPF, Kamlin COF, Davis PG, Morley CJ. Spontaneous respiratory effort of newly-born extremely preterm and/or extremely low birth weight infants (abstract). PAS 2006; 5560: 331
Surfactant in the delivery room - or later?

- Prophylactic = DR administration

- Rescue = selective administration after established RDS

  → Early rescue
  → Late rescue
  → or something in between?

Criteria in trials vary a lot!

How early is early enough?
Intubation or CPAP from birth?

- CPAP from birth could prevent complications from DR intubation and lung injury induced by early MV,

  BUT will also prevent prophylactic or very early surfactant administration.
RCTs of early CPAP

1. COIN = CPAP or intubation at birth
   Morley CJ et al, NEJM, 2008

- 307 infants CPAP/303 infants intubation, randomized at 5 min
- 25-28 weeks GA
- BPD and mortality similar
- Higher incidence of air leaks in the CPAP group (9 vs 3%, p<0.001)
  - High threshold for intubation and surfactant (FiO2>0.6) = late rescue
2. SUPPORT
Finer et al. NEJM, 2010

Early CPAP versus Surfactant in Extremely preterm Infants

1316 infants, 24 0/7 – 27 6/7 w
Antenatal steroid use 96%

Intubation in DR + surfactant within 1 hour
CPAP in the DR, intubation+surfactant followed by MV if FiO2>0.5

Primary outcomes (Death or BPD) no difference
Secondary: CPAP group less intubation, fewer days on ventilation, less postnatal steroids and more likely to be off vent on day 7
3. CURPAP

Prophylactic or early selective surfactant combined with nCPAP in very preterm infants

Sandri et al. Pediatrics, 2010

208 infants 25-28 wks randomized to
Intubation + surf within 30 min
CPAP + early rescue surf (FiO2 0.4)

Primary end-point MV in the first 5 days
31.4 vs 33.0% (CI 0.64-1.41)

No difference in rates of pneumohtorax, BPD och mortality

Early rescue surfactant as good as prophylactic
4. Columbia, RCT

Infants 27-32 weeks
CPAP from birth, randomized to surfactant followed by immediate extubation within 1 hour or CPAP alone with surfactant when FiO2 0.75
- Reduced need for MV and air leaks
- Trend towards reduced BPD

Rojas et al. Pediatrics, 2009

5. The Vermont Oxford Network

DR intubation with prophylactic surfactant and MV to early CPAP with surfactant when FiO2 0.6
- Outcome similar
- Half of early CPAP needed surfactant
- Intubation can be avoided with early CPAP but how to best identify those who will need surfactant?

PAS, 2010
If it was this easy to give surfactant...

ELGANs are surfactant deficient

Most of the recent RCT trials of ELGANs have used strategies of late rescue surfactant for infants on CPAP

Would earlier surfactant improve results?

Other strategies to combine non-invasive ventilation with surfactant?
INSURE

INtubation SURfactant Extubation

Bohlin et al, J Perinat, 2007
Can we predict who will need surfactant?

Lamellar Body Count

Gastric aspirate collected in DR
Lamellar body size = platelets
Blood counter – result within 30 min

Cut-off value <2000/µL vs <42 000 µL
Sensitivity and specificity 73-92%

Daniel et al. Neonatology, 2010
Conclusion

Early CPAP in very preterm infants is as safe as routine intubation in the delivery room.

However, a strategy for surfactant administration should be part of a non-invasive ventilation approach for those infants at risk of developing significant RDS.