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Delivery Room Management: CPAP vs Intubation

Kelly Harvey

Aims

- Discuss approaches to the management of preterm infants immediately following delivery.
- Explore the physiological impact of neonatal intubation.
- Discuss the evidence base around approaches to delivery room management.
- Discuss strategies for change.

Newborn Life Support

- NLS guidance.
 - 2016 manual does talk about different strategies for preterm infants respiratory management immediately post delivery.
- Focus in preterm management should be supporting the transition from in-utero to ex-utero life rather than active resuscitation.
 - Most preterm infants have not suffered a hypoxic insult and do not require aggressive resuscitation.

Current Approach

- What is your typical approach to NLS?
- How does this alter with gestation?
- Common practice is to base your approach to resuscitation on gestational age.
 - “Need” for delivery room intubation and exogenous surfactant administration.
- Does your unit have a clear in date guideline around this initial management?

Current Practice

- **Local Policy/Guideline**
 - Network/Shared guidelines
- **National Guidance**
 - NLS
- **International Guidance**
 - European consensus guideline on the management of RDS (Sweet 2013).
 - Attempts to provide guidance on delivery room management of extremely preterm infants.

European Consensus Guideline

- Sweet et al (2013) – updated 2016
- Recommendations:
 - Infants <30/40 – CPAP from delivery
 - Infants <26/40 – Elective intubation, surfactant and then extubation where appropriate (INSURE).
- 2016 update:
 - Reiterates clear evidence for CPAP at delivery and the need for all neonatal teams to be evidence based in their approach to delivery room management.
 - Highlights other routes of surfactant administration and non-invasive respiratory support.
 - Discusses other factors (antenatal care, management of sepsis) as important in the initial management of preterm infants.

Intubation

- Current practice across many neonatal units in the UK for infants $<29/40$ is elective intubation at delivery and prophylactic administration of surfactant.
- Evidence demonstrates the intubation of preterm infants causes physiological adverse effects.
 - This risk is increased when the intubation takes place on delivery suite.

Adverse effects of Intubation

- Pain and trauma.
- Haemodynamic instability.
- Airway injury
- Infection
 - Mahmoud et al (2011) reported that 80% of intubated infants have bacterial colonisation of the airway within days of mechanical ventilation.
- An adverse event occurred in 40% of preterm intubations with the probability of an adverse event doubling with every additional intubation attempt.
 - Junior doctors were noted to have lower success rate leading to increased attempts.
- Finer and Rich (2010) video recorded all neonatal intubation attempts.
 - Intubation success rates were 56% within 30 seconds of the laryngoscope entering the mouth.
 - Failure significantly increased on the first attempt in infants less than 28 weeks gestation and those weighing less than 1,000 grams required an average of three attempts, each attempt being associated with physiological instability.
- Neurological development is also linked to poor respiratory management at delivery and mechanical ventilation.

Ventilator induced lung injury

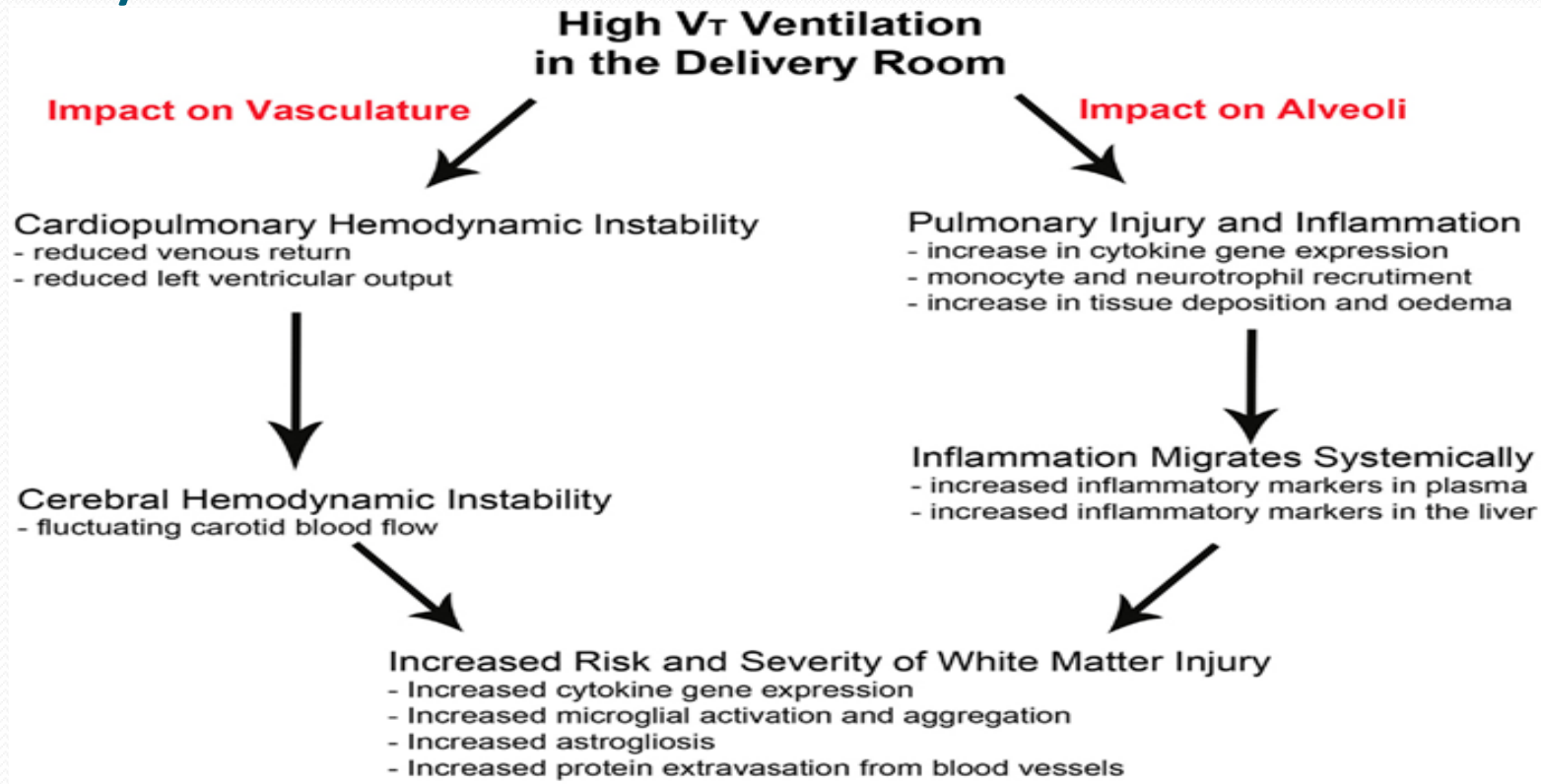
- Ventilation has been the preferred respiratory management for 40yrs.
 - Significant reduction in extreme preterm mortality since its introduction.
- Morbidity remains unchanged – BPD rates static in the extreme preterm population.
 - Positive pressure ventilation has a significant impact on lung development.
 - High tidal volumes in first 30minutes of ventilation triggers the cascade leading to VILI.
 - Impact on long term development of the lung
 - Arrested lung development alters future development

Ventilator Induced Lung Injury

- Prematurity and the developing lungs increase the susceptibility of preterm infants to VILI
- VILI occurring pre full development of lungs is likely to affect future lung development resulting in long lasting damage and respiratory morbidity.

Ventilator Induced Lung Injury	
Volutrauma	Overstretching of the lungs by high tidal volumes
Atelectotrauma	Repeated alveolar recruitment and collapse with uneven expansion of the lungs.
Barotrauma	Use of excessive inspiratory pressure
Biotrauma	Oxygen toxicity and inflammatory agents.

Adverse effects of Respiratory management at delivery on the brain.



CPAP as primary respiratory support.

- Gentler mode of respiratory support.
 - In keeping with supportive stabilisation rather than aggressive resuscitation.
- Method of CPAP in the delivery room
 - PEEP via mask
- Logistics
 - Equipment

What is the Evidence?

- The UK vs the rest of the world.
 - The UK has not so far been involved in any RCT's associated with delivery room management utilising CPAP.
- Much of Europe, the USA and Australia utilise CPAP in the delivery room as standard.
- Recent systematic reviews of the evidence indicate the onus is now to provide good evidence for NOT using CPAP as the initial respiratory support in infants $>26/40$.

Study Name & Author	Details	Key findings
<p>COIN Morley et al 2008 International study (Australia, USA and Europe – NOT UK))</p>	<p>RCT - 610 infants 25-28+6/40 Randomised at birth to CPAP or intubation and ventilation. 7 year study 1999-2006 Clinician decided at 5 minutes if respiratory support was required and an envelope was opened.</p>	<p>No significant difference in mortality or BPD. <u>Approx 50% infants managed on CPAP without MV or surfactant.</u> CPAP group - significantly less required oxygen at 28 days. CPAP group – higher incidence of pneumothorax 9% vs. 3%.</p>
<p>SUPPORT Finer et al 2010 - USA</p>	<p>Multicentre RCT - 1316 infants 24-27+6/40 weeks' gestation. Randomly assigned to intubation and early surfactant (within 1hr) CPAP versus surfactant and intubation. Did not include <24/40 as previous evidence identified 100% require intubation and surfactant.</p>	<p>No difference in rates of death and BPD. 85% infants in CPAP group required intubation and surfactant. No difference in pneumothorax rate. CPAP group – lower rate of intubation, reduced rate of post natal steroids, shorter duration of MV.</p>
<p>Delivery room management trial Dunne et al 2011 - Canada</p>	<p>Multi centre RCT Delivery Room Management Trial. Comparison of 3 approaches to initial respiratory management of premature infants at delivery. 1. Prophylactic Surfactant and MV, 2. INSURE technique followed by bubble CPAP, 3. Early CPAP and selective surfactant. 648 infants over 27 centres. 26-29+6/40 6 year study 2003 and 2009.</p>	<p>No statistical difference between 3 groups in rates of death and BPD. In the nCPAP group, 48% managed without intubation and MV, 54% without surfactant treatment. Intervention 1 and intervention 3 had the same outcomes on all measures.</p>

So what next?

- UK review of European guideline
 - advise stopping the use of prophylactic surfactant.
 - stabilisation in air not 100% oxygen
 - training of junior doctors in the skill of initiating CPAP on delivery suite
- Sakonidou and Dhaliwal (2015)



UK practice – the reality

- Mann et al 2012:
 - Review of delivery room practices across the UK in 2009.
 - 28% NICU's and 17% of LNU's use delivery room CPAP.
 - 85% NICU's and 70% LNU's electively intubate preterm infants.
 - 90% NICU's and 85% LNU's administer prophylactic surfactant in the delivery room.
 - Only 13% of all units follow NLS guideline regarding resuscitation commencing in air.

Delivery room management

- Introducing a standardised approach to delivery room management.
 - There are some out there!
- Appropriate staff engagement and training
- Equipment availability and training.
- Clear guidelines
- Process for debrief and feedback
- Audit

Practice Change

- When the evidence for change is overwhelming clinicians must take action.
- Safe change of practice relies upon driven leaders.
 - Engaging the team
 - Providing clear guidance.
 - Sharing the evidence, helping the team to understand the need for change
 - Education of the team not only on the need for change but the clinical skills required for the new practice.

Barriers

- Unfamiliarity
- The “need” to give surfactant
- “Small babies need intubation”
- Lack of training
- Lack of equipment



Caution

- Whilst the safety and efficacy of utilising CPAP as your initial tool in preterm delivery management is clear caution is required in your management of these babies.
- Dargaville et al 2016 – review of CPAP failures in all NICU's in Australia and NZ between
 - -25-28/40 – 48% CPAP failure <72 hrs
 - 29-32/40 – 21% CPAP failure <72hrs
 - Associated with poorer outcomes (mortality, BPD, LoS)
 - Indication caused by surfactant deficiency
 - Alternative routes for surfactant
 - Recognition of the “failing baby” is vital
 - Staff education

The Future

- The UK is already behind Europe, the US and Australia in utilising CPAP at delivery.
 - CPAP at delivery is now the norm in these countries and they are now researching additional alterations to delivery room management to further improve outcomes.
- **Sustained inflation:**
 - Prolonged inflation breaths (15-20 seconds) at lower PIP i.e. 15cm H₂O rather than 5 inflation breaths of 2-3 seconds
 - Alveolar recruitment.
- **Different mechanisms for delivering surfactant:**
 - INSURE
 - LISA – NG tube through vocal cords
 - Rolled out in UK
 - Nebulised
- **High flow:**
 - Less invasive than CPAP
 - Mechanism of “washing out the airway dead-space
 - Utilised in neonatal practice but not as initial support – yet??

Summary

- Overwhelming evidence that the use of CPAP as initial respiratory support is safe and effective.
- Intubation and ventilation are high risk treatments with possible long term adverse effects.
- Changing practice is difficult and must be done with the support of education and leadership to ensure safety at all times.
- Evidence based practice informs best practice.

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Any Questions???

