PROGRESSIVE ROP: ACCEPT OR TAKE ACTION

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ROP DEVELOPMENT

General idea is that
Incidence and severity of ROP is increased by
Extra oxygen
Erythrocyte transfusions

ROP DEVELOPMENT

Retinal changes are always seen at the same moments in time

ROP DEVELOPMENT

First signs of ROP 32 wkn PMA
Laser treatment 34-38 wkn PMA
Retinal Detachment 40 wkn PMA
**ROP DEVELOPMENT**

**PHASE 1 ROP AND O₂**

*From Birth to 32 wks PMA*

- Increased SpO₂
- Hyperoxia
- Down regulation of the retinal angiogenesis

**PHASE 2 ROP AND O₂**

*From 33 wks PMA*

- Decreased SpO₂
- Hypoxia
- Increase in VEGF levels and low levels of IGF-1
- Vasoproliferation
ROP and $O_2$

### Phase 1

- **Vaso-obliterative**
  - First 3 days after birth $O_2$ most effect on the development of ROP
  - Doubles the chance on Type 1/Threshold ROP in zone 1, 70% more chance getting plus signs

**Hauspurg, Blood gases and ROP: The ELGAN study, Neonatology, 1104-1199:2011**

Recent 3 studies
SUPPORT, COT en BOOST II
Looks at the effect of high (90-95%) and low (85-89%) levels of SpO$_2$ in Phase 1 (birth-32wks PMA)


Schmidt, Canadian Oxygen Trial (COT) Group, JAMA 2111-20:309:2013


Neonatologist

Ophthalmologist
Meta-analysis showed that the quality of evidence is low for the estimate of effect of low mortality before discharge with the higher SpO₂ target.

The lower SpO₂ target group had a tendency toward reduced severe ROP.

Target SpO₂ between 88-95%

The SpO₂ is dictated by the Neonatal literature at the present moment.
ROP AND $O_2$

Phase 2

Retinal hypoxia leading to vasoprolifation.

With adequate oxygenation abnormal vessel growth regresses.

ROP $O_2$

Phase 2

STOP-ROP study

Objective:
Can higher levels of SpO$_2$ decrease the progression of ROP and reduce the number of treated eyes.

STOP-ROP, a randomized controlled trial: 1 primary outcome, Pediatrics 2016-0181652000
ROP O₂

STOP-ROP study

A trend but a significant decrease in the number of treated eyes in Type 1 ROP except in eyes without plus signs.

STOP-ROP, a randomized controlled trial: 1 primary outcomes, Pediatrics 2000;105:200-209

ROP O₂

SpO₂ 96-99%
>32 wkn PMA

ROP O₂

SpO₂ 96-99%
>32 wkn PMA
ROP O₂

Progressive ROP and elevation of SpO₂ (>95%)

Prevention of treatment in progressive ROP without plus signs

ROP O₂

Progressive ROP and elevation of SpO₂ (>95%)

Prevention of treatment in progressive ROP without plus signs

Delay of treatment in progressive ROP with plus signs

ROP O₂

Progressive ROP and elevation of SpO₂ (>95%)

Delay of treatment in progressive ROP with plus signs

Transfer for treatment needed
Sick infants
Delay ➔ older children ➔ anesthesia easier

PHASE 2 ROP AND O₂

From 33 wks PMA

Increased SpO₂
Less tissue hypoxia
Decrease in VEGF levels and low levels of IGF-1
Less Vasoproliferation
ROP $O_2$

*Phase 2*

The $SpO_2$ is dictated by the Ophthalmologist who can observe the progression of ROP.

**ROP and Hb**

**Progressive ROP with low Hb**

<table>
<thead>
<tr>
<th>Puck</th>
<th>Gest Age</th>
<th>BW</th>
<th>ROP 1 in zone 2 for a long period, however in a two weeks window at 41+5 severe ROP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25+1 wks</td>
<td>769 gr</td>
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</table>
Progressive ROP with low Hb

Puck

Oxygenation was not changed
After discharge at the NICU 36 wks
PMA
High care center accepted for weeks a
Hb of 5.2-5.4mmol/l and was only
treated with ferrofumaraat

ROP AND HB

Englert et al study on Anemia transfusions and ROP

Englert et al, Effect of anemia on ROP in extreem low birth weight infants, Journal of Perinatology, 2001;21;121-6
ROP AND HB


ROP AND HB


ROP AND HB

Erdol et al. study on distribution of HbA and HbF in term and premature infants and the effect on ROP

ROP AND HB

**ROP AND HB**

Erdol et al., Investigation of the effect of hemoglobin F and A levels on the development of ROP, *Journal of AAPOS*, 2017;21;136-40

**Non of these studies made a differentiation in the moment that the anemia is present or the erythrocyte transfusion is given (wks PMA)**

**PHASE 1 ROP AND HB**

*From Birth to 32 wks PMA*

- Transfusion adult blood
- Increased HbA
- Hyperoxia
- Down regulation of the retinal angiogenesis
PHASE 2 ROP AND HB

From 33 wks PMA

- Anemia
- Less tissue oxygenation
- Increase in VEGF
- Vasoproliferation

PROGRESSIVE ROP

- Something changed in oxygenation?
- Low Hb levels?
- Systemic problems?

PROGRESSIVE ROP IN THE MMC

Action ➜ Adjust SpO₂ >95%

Effect ➜ Regression of ROP vessel growth in avascular zone (within 10 days)
**PROGRESSIVE ROP IN THE MMC**

**Action** ➔ Adjust $\text{SpO}_2 > 95$

**Effect** ➔ regression of ROP

vessel growth in avascular zone

(_within 10 days)

**Action** ➔ Check Hb

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**LASER TREATED ROP**

After laser treatment until first check

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**LASER TREATED ROP**

After laser treatment until first check

VEGF down regulation takes time after laser

So until first check after laser:

- $\text{SpO}_2 > 95$
- $\text{Hb} > 7 \text{ mmol/l}$
Thank you for your attention