Randomized Trial of Varying Levels of Oxygen (21%, 40% and 100%) at Resuscitation in Premature Infants < 32 wks GA

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Background

NRP recommends adjusting FiO2 at birth based on preductal saturations (SpO2) in the first 10 min of life. It is possible that resuscitation of preterm infants with 100% O2 initiates significant oxidant stress early in lung development predisposing them to BPD. *Objective*: Limiting O2 at resuscitation in infants < 32 wks would decrease oxidant stress as assessed by reduced to oxidized glutathione ratio (GSH / GSSG).

Design/Methods

Infants < 32 wks GA were randomized to 21%, 40% or 100% O2 & resuscitated per 2004 NRP guidelines. Soon after birth preductal SpO2 were recorded (Masimo SET, Masimo, CA). O2 groups & SpO2 were unmasked at 10 min, FiO2 adjusted to maintain SpO2 85-95%. The intervention was complete when infant in ICU. Blood was collected at 24h, 8d and 28d for measurement of oxidative stress markers such as GSH/GSSH, nitrotyrosine (NT) and 8-hydroxydeoxyguanosine (8-OHdG). At 30% enrollment the study was stopped after publication of the 2010 NRP guidelines.

Results

Admission data are as follows:

Characteristics & Clinical Outcomes In Study Infants

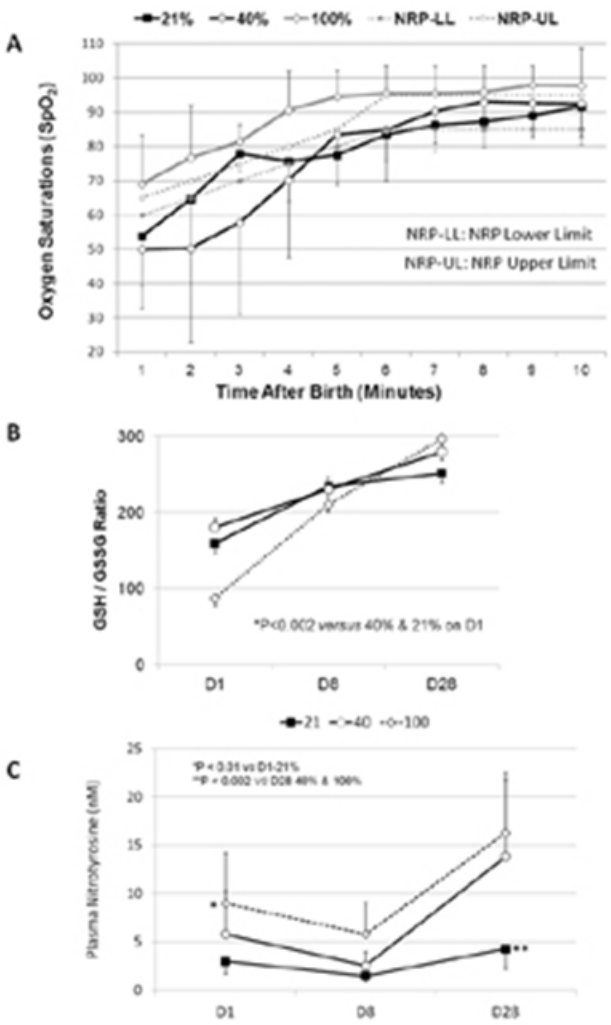
Oxygen Group	21% (n=6)	40% (n=8)	100% (n=5)
GA (wks)	29.3 ± 2.3	28.1 ± 2.6	27.6 ± 2.4
BW (gms)	1182 ± 340	1206 ± 439	1139 ± 374
Males (%)	2 (33%)	5 (62%)	3 (60%)
Cord pH	7.28 ± 0.04	7.32 ± 0.05	7.33 ± 0.06
Apgar - 5 min	9	9	8
IVH (I-IV)	0	0	2 (40%)
BPD+NEC+Death	3 (50%)	5 (63%)	5 (100%)

Values expressed as mean ± SD

100% group had SpO2 above NRP-UL in the first 10 mins (Fig A). GSH/GSSG was significantly lower (Fig B) & NT significantly higher (Fig C) at 24h in 100% group compared to other groups. GSH/GSSG, NT & 8-OHdG were significantly higher on D28 compared to D1, indicating significant oxidant stress & DNA damage over time.

Conclusions

Resuscitation of premature infants with 21% O2 will maintain SpO2 within 2010 NRP guidelines. GSH/GSSG & NT are impacted by O2 at birth & over time, which may lead to DNA damage. 21%-40% O2 seems appropriate at resuscitation in premature newborns (funded by Wildermuth Grant).


A
21%
40%
100%
NRP-LL
NRP-UL
Oxygen Saturations (SpO_2)
NRP-LL: NRP Lower Limit
NRP-UL: NRP Upper Limit
Time After Birth (Minutes)
B
GSH / GSSG Ratio
*P<0.002 versus 40% & 21% on D1
D1
D8
D28
21
40
100
C
Plasma Nitrotyrosine (nM)
*P < 0.01 vs D1-21%
**P = 0.002 vs D28 40% & 100%
D1
D8
D28