Maximizing nutrition to minimize extrauterine growth retardation in Low Birth weight neonates and assessing Retinopathy of Prematurity in this population
Ankita Shukla M.D., Bethany Jung, Nutritionist, Shakuntala Chandra, M.D.
Division of Neonatology, Department of Pediatrics, The Children’s Hospital at Saint Peter’s University Hospital, New Brunswick, NJ

Contact author: Shakuntala Chandra: email: Schandra@saintpetersuh.com ph: 7327458523

Background:
Extrauterine growth restriction is defined as ≤10th percentile of intrauterine growth expectation based on estimated postmenstrual age in premature (23-34 weeks’ estimated gestational age) neonates at the time they are discharged from the hospital. Extrauterine growth retardation or post natal growth failure is attributed to low energy intake, Infection, respiratory distress, pharmacological effects and postnatal growth lag.

Goals of early and adequate nutrition is to achieve a normal body composition while minimizing undesirable effects of unbalanced nutrition, to facilitate recovery or catch-up growth and to improve neurodevelopment outcome. Low energy intake can be improved by early provision of nutrients, early parenteral and enteral nutrition with improved overall weight gain and earlier achievement of full enteral feedings.

Relationship to Retinopathy of Prematurity (ROP): Growth retardation is associated with low IgF levels which could be correlated to development of ROP Low Insulin-Like Growth Factor I (IGF-I) levels in premature infants between gestational ages of 23 and 40 weeks is a predictor of ROP. Although, we did not measure IgF levels we analyzed to see if growth percentiles affected development of ROP in both groups.

Aim:
- To reduce extra uterine growth retardation by 25 % in low birth weight infants by 2015 by measuring discharge percentiles and days to regain birth weight
- To assess the incidence of retinopathy of prematurity in growth retarded preterm infants

Methods:
Intervention: our new guidelines
1. we began starter total parenteral nutrition (TPN) within hours 2 after birth
2. we optimized nutrition by beginning 3.5 gms of proteins and 2 gms of lipids in infants < 1000 gm infants and 3 gms of lipids in infants > 1000 gms and < 1500gms
3. Liquid fortifier addition to facilitate mixing instead of powder
4. Fortification and optimizing calories to reach 26 cal/oz

We compared 2 groups of infants after all these interventions were implemented

<table>
<thead>
<tr>
<th></th>
<th>Group 1 (n=35)</th>
<th>Group 2 ( n=35)</th>
<th>P value</th>
</tr>
</thead>
</table>

Group 1
All infants < 32 weeks of gestation admitted to our NICU at Saint Peters University Hospital before implementation of the guidelines from July 2013- Sept 2013

Group 2
All infants < 32 weeks of gestation admitted to our NICU at Saint Peters University Hospital after the implementation of the guidelines from Oct 2013 – Feb 2014

Groups were comparable
Gestational age in weeks  | 28.69±2.2 | 29.35±2.3 | 0.25  
Birth weight in grams   | 1050±311  | 1124±290  | 0.31  

T test for comparing means in continuous variables, Non parametric test chi-square was used for categorical variables

**We Measured**

Percentage of infants who were growth retarded infants after implementation of the new guidelines

In addition we measured:
- Discharge weight percentile (DCWP)
- Discharge HC percentile (DCHCP)
- Discharge length percentile (DLP)
- Difference between birth and discharge head circumference percentile (B-DHC)
- Difference between birth and discharge length percentile (B-DLP)
- Day to regain birth weight
- Day of life for achievement of full feeds
- Length of hospitalization

**Secondary outcome measurement:**

Retinopathy of Prematurity: ROP

**Results:**

1) we began starter total parenteral nutrition (TPN) within hours 2 after birth
2) we optimized nutrition by beginning 3.5 gms of proteins and 2 gms of lipids in infants <1000 gm infants and 3 gms of lipids in infants > 1000 gms and < 1500gms
3) Liquid fortifier addition to facilitate mixing instead of powder
4) Fortification and optimizing calories to reach 26 cal/oz

We compared 2 groups of infants after all these interventions were implemented
There was no difference in serum sodium levels in both groups (Hyponatremia is an independent risk factor for growth failure and poor neurodevelopmental outcome( Pediatrics 2009 Moritz et al) )

There was no difference in BUN levels between both groups (Although protein amount was increased indicating anabolic phase in the 2nd group favoring growth)

**Conclusions:**

Adopting the new nutritional practice guidelines helped us to reduce extra uterine growth retardation by 15 % we will continue our efforts to reduce it by 25%

**Showed a significant reduction in extra uterine growth retardation from 57% to 42 % (15% reduction**

And an improving trend in
- Discharge weight percentile
- Discharge HC percentile
- Discharge length percentile
- Difference between birth and discharge head circumference percentile
- Difference between birth and discharge length percentile
- Reduced time to full feeds
- Reduced length of NICU stay
- Earlier attainment of birth weight
- Showed Reduction of severe ROP by 12 % and total ROP by 7%

**Future:** To continue with the practice and attempt to reduce growth retardation by 25%