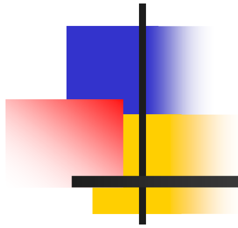
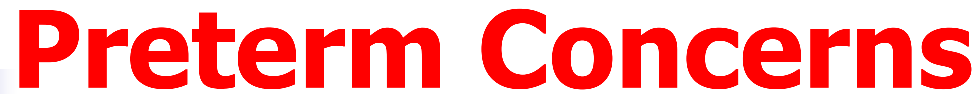
Challanges in Care of VLBW Babies



Rhishikesh Thakre

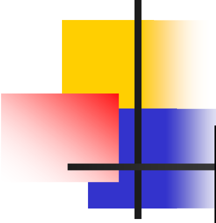
DM (Neo), MD, DNB, DCH, FCPS.

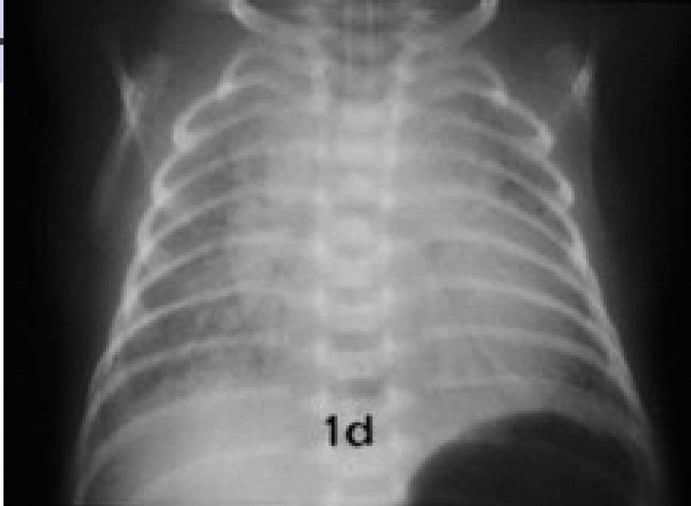


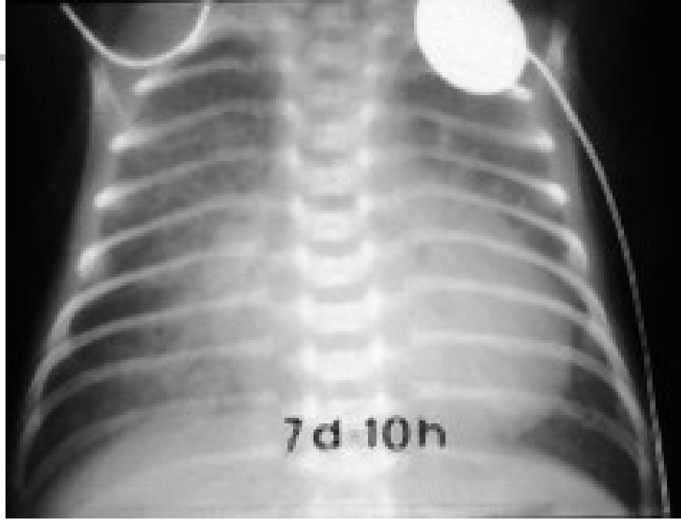
Preterm Concerns

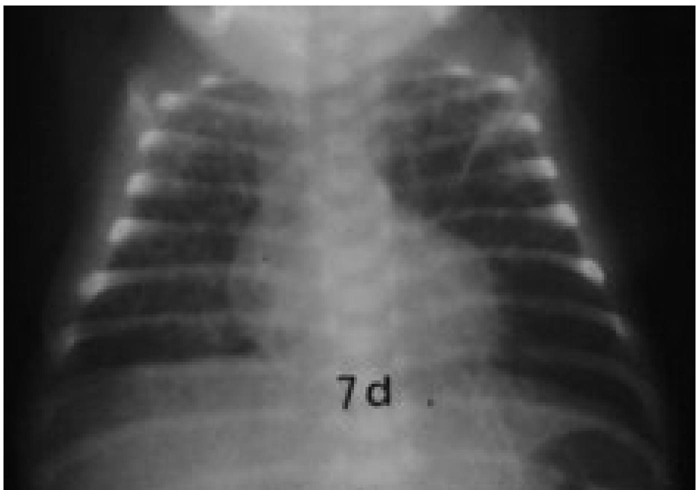
- **EARLY**
- HMD
- IVH
- PDA
- NEC
- Jaundice
- Sepsis
- Apnea
- Nutrition

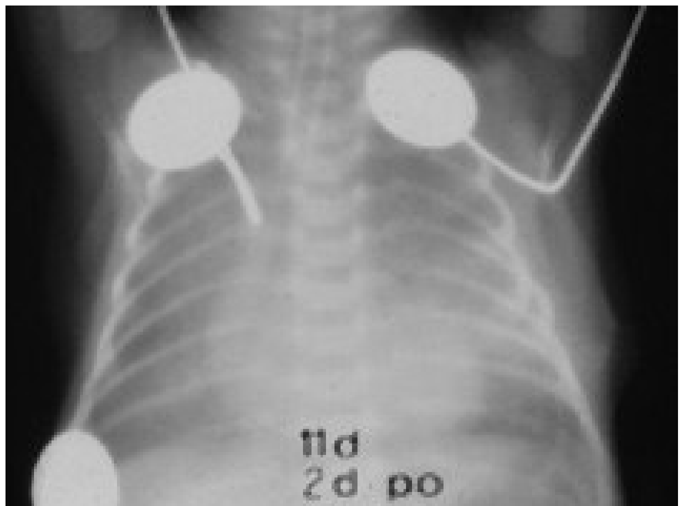
- **LATE**
- **Chronic lung disease**
- **Osteopenia**
- **Anemia of prematurity**
- **ROP**



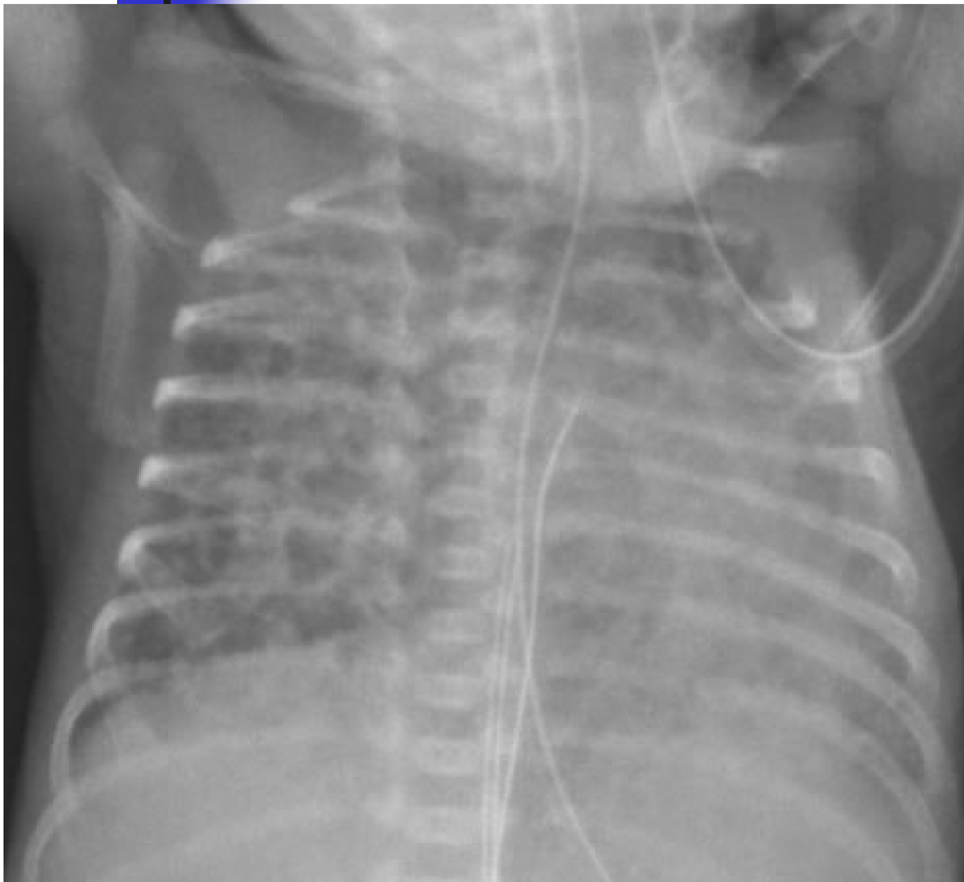

1d

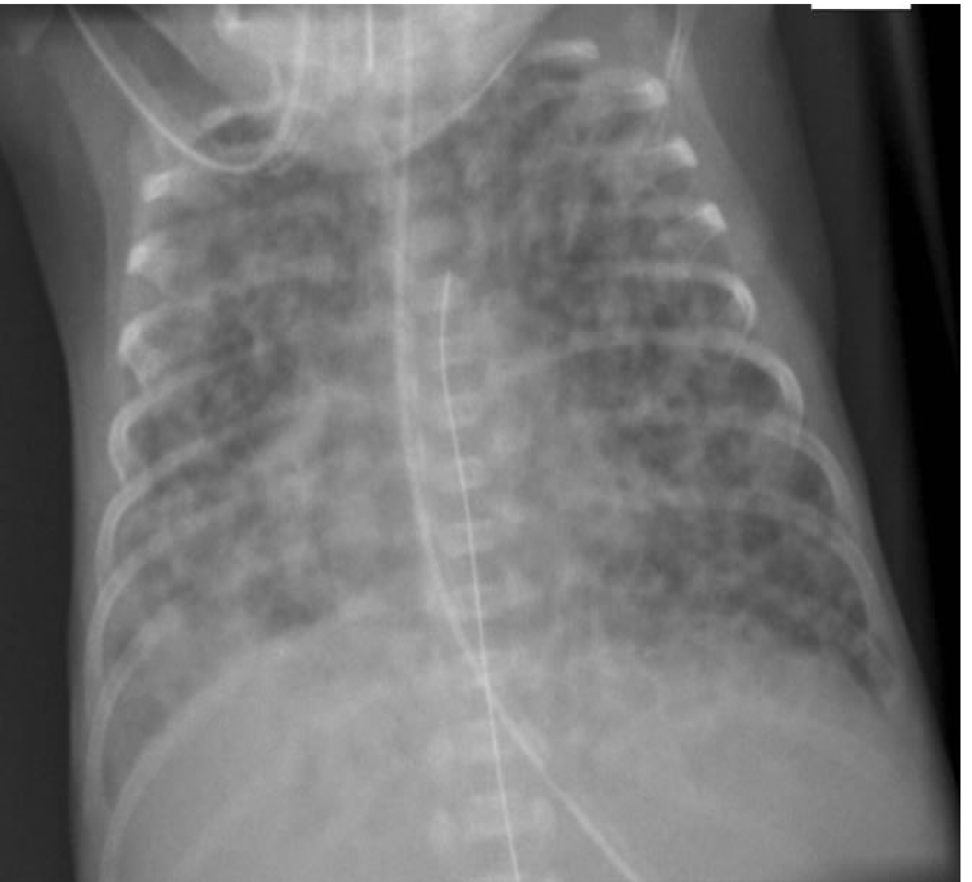

7d 10h

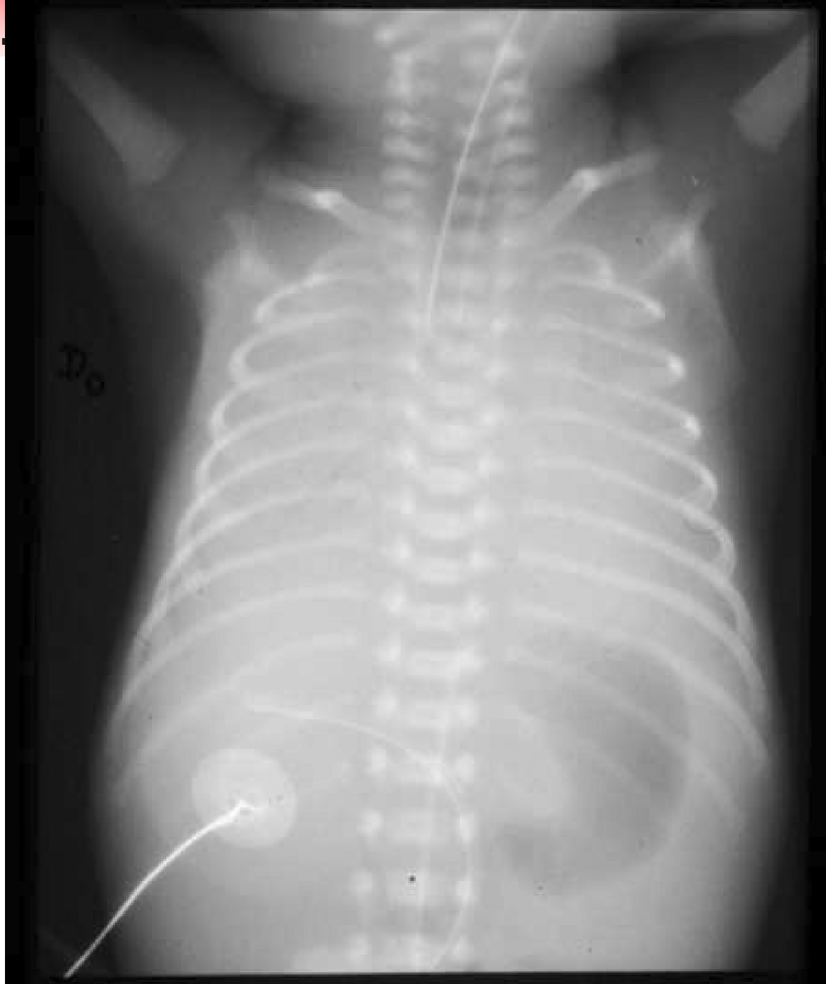

7d

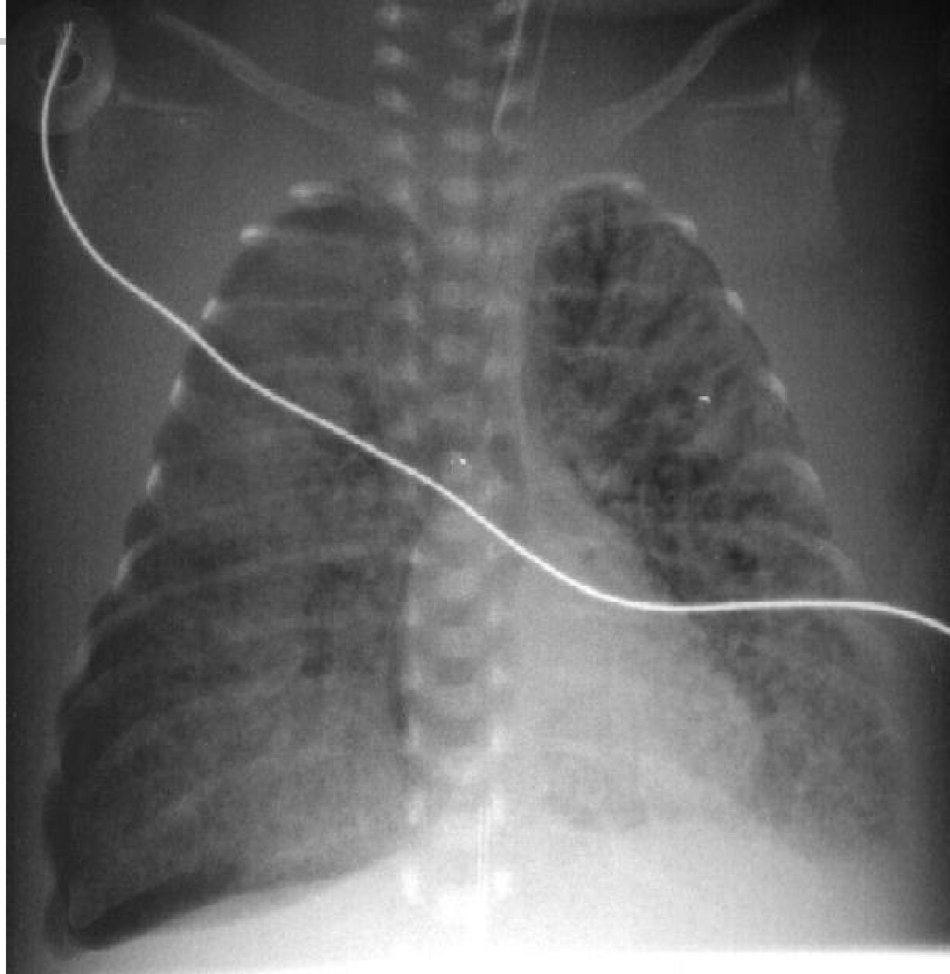

11d
2d po

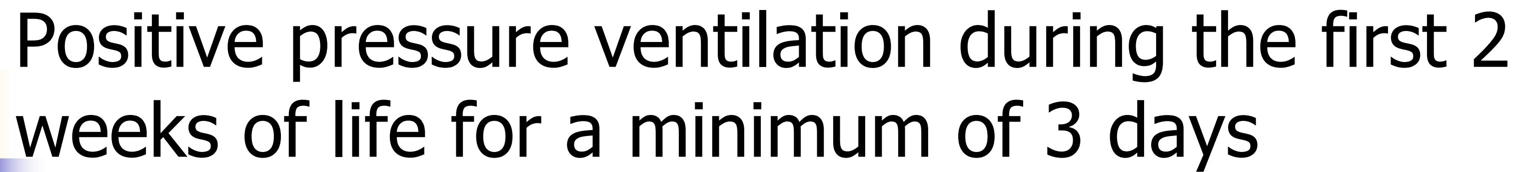
Day 12 Day 22



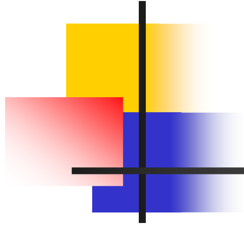








- Positive pressure ventilation during the first 2 weeks of life for a minimum of 3 days
- Clinical signs of abnormal respiratory function
- Requirements for supplemental oxygen for longer than 28 days of age to maintain PaO2 above 50 mm Hg
- Chest radiograph with diffuse abnormal findings characteristic of BPD



" Infants who continue to have significant pulmonary dysfunction at 36 weeks corrected age "

Predisposed infant

Immaturity

Severity of RDS

Severe lung disease

PDA/ fluid overload / PIE

Contributory factors

Infection

Inflammation

Anti oxidants

High resp. support

Oxygen toxicity

Barotrauma

Volutrauma

C L D

Surfactant & CLD

- Prophylactic surfactant for “at risk” for RDS

- Early vs. delayed selective surfactant therapy first 2 hours of life for RD

- Surfactant in established RDS

Cochrane Database Syst Rev,2005

Ventilation issues

- CPAP :

  Prophylactic Vs Rescue

- Conventional ventilation

  Gentle vent. / Permissive hypercapnia

- High frequency ventilation

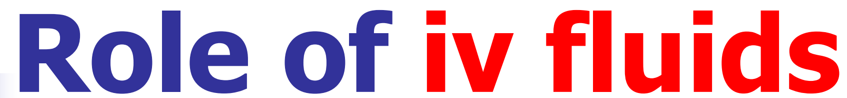
  Elective Vs Rescue

Ventilation strategies

MV at low / high lung volumes	VILI
Gentle ventilation	Reduced vent. support but did not alter the risk of death or BPD
Volume-targeted vent. Proportional assist vent.	Short-term physiologic benefits. Need larger studies
Patient-triggered vent.	Shorter duration of ventilation. No decrease in BPD
Nitric oxide	Improves oxygenation.
High-frequency vent.	Small reduction in BPD

Ventilation strategy

- Smallest possible tidal volume
- Sufficient insp / exp. Times
- Moderate PEEP
- Early / prophylactic use of surfactant
- Early extubation
- Theophylline : < 30 d
- Rescue with high frequency if air leak



Role of iv fluids

- Liberal vs restricted fluids during 1st week of life

" Careful restriction of water intake so that physiological needs are met without allowing significant dehydration"

Resp. support : Oxygen

- Saturation goal should be 93-95 %
- Monitored over several feed periods or for several hours during sleep
- Periodically (eg twice/week) turn off the oxygen and carefully monitor the saturations

Role of systemic steroids

- Routine use in prevention not recommended
- Baby > 2 weeks of age who is unable to be weaned from MV

- Role limited to clinical trials
- Increased risk of short / long term comp.
- No decrease in overall mortality
- Weigh risk benefit ratio

" Short term gains & long term pains "

Role of diuretics

- No evidence of efficacy in stable non ventilated babies

- Un-expected weight gain
- Ventilator dependant babies
- Short term Vs long term
- PO/ IV vs Inhaled

- Chlorthiazide + spirinolactone > frusemide

Management Issues : **Nutrition**

- Intake of 120-180mls/kg/day
- 130 - 150 calories/kg/day
- Fortified breast milk / formula
- Vit A

<u>Monitor growth</u>

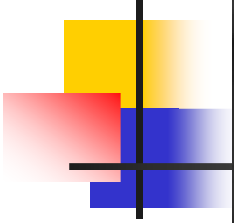
No Role in CLD

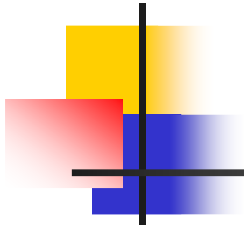
- Inhaled steroids
- Early (< 96h)
- Intermediate (< 2w)
- Cromolyn sodium
- Routine diuretics
- Erythromycin
- N Acetyl cysteine
- Vit E
- Superoxide dismutase
- Alpha 1 protease inhibitor
- Selenium

Cochrane Database Syst Rev,2005

Preventive Strategies

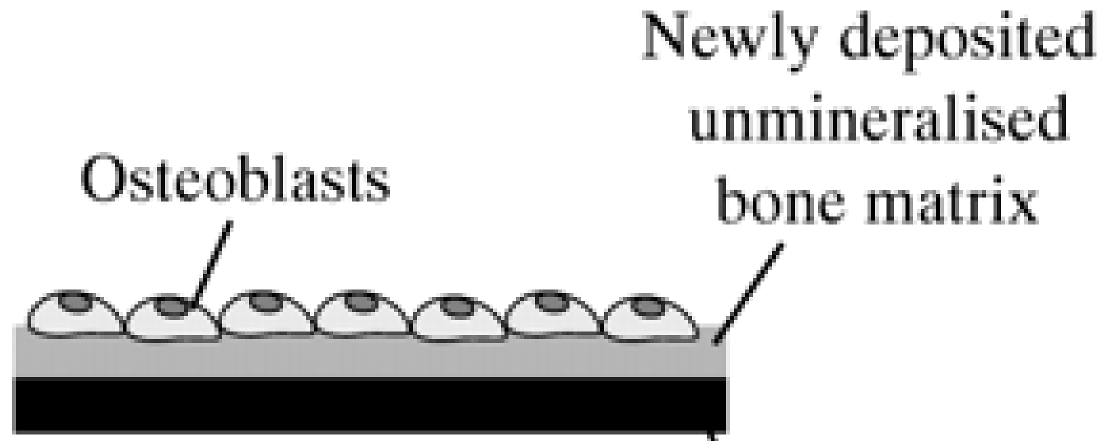
- Promote ante natal steroids
- Early Surfactant
- Gentle ventilation
- Fluid restriction
- Prophylactic indomethacin < 1000 gm
- Judicious post natal steroids / diuretics
- Meticulous attention to oxygen
- Aggressive nutrition

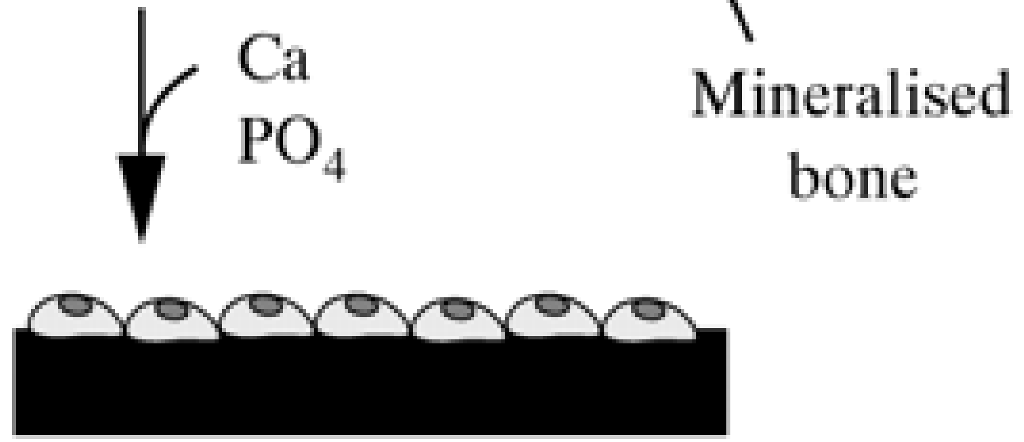




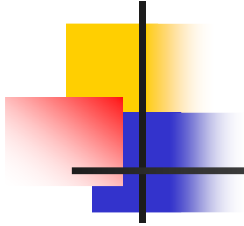
- **Metabolic bone disease**

Step 1:
Deposition of osteoid



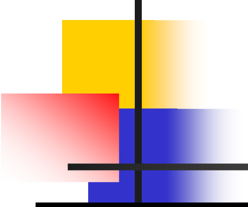


Step 2:
Mineralisation



“ Osteopenia is mild to severe degree of hypo-mineralization of the skeleton, when compared with the fetal accretion rate ”

BONE FORMATION	
Proteins, Energy Nutrition	Osteoid formation
Ca PO4	Calcification, ossification, muscle mass
Hormones	Growth
Physical activity	Re-modelling



Fetal accretion rate per day in mid to third trimester (mg/kg)		Human milk (/100ml)	Fortified EBM	Recomended
Ca	90-120	30 mg	146 mg	120-130 mg
Po4	60-75	15 mg	88 mg	60-140 mg

Risk factors for OOP

- < 30 w gestation
- < 1000 gm weight
- Drugs (diuretics, steroids, sodabicarb)
- Long-term parenteral nutrition
- Cholestatic jaundice
- Prolonged immobility

Clinical signs

- Majority are asymptomatic
- Craniotabes, frontal bossing, enlarged anterior fontanel, and widened cranial sutures
- Rachitic rosary
- Fractures
- Failure to wean from ventilator

Lab Tests

- Biochemical tests of osteopenia of prematurity are not definitive

- S. Phosphate:

  suspicious if <46, likely if < 34 mg
- S. Alk phos : > 600 IU /L
- S Calcium : N,low,elevated
- U calcium

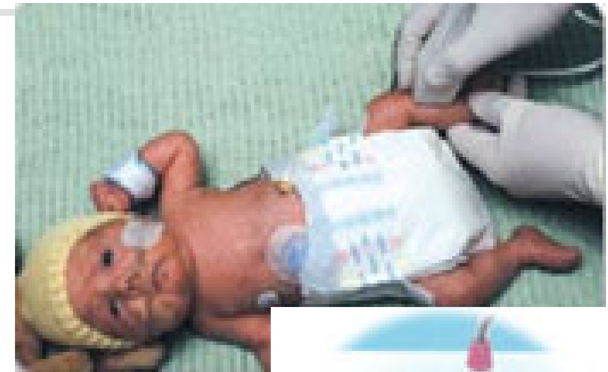
Bone X ray

- Depends on the severity and duration of the impairment of mineralization

- Does not pick up early changes
- Poor mineralization, rickets, fracture

Koo et al,Arch Dis Child 57:447–452, 1982

Role of densitometers



- Age related norms
- Not portable

- **Role of QUS**
- Independent of length / weight
- Measure metacarpal speed of sound (mc SOS) & metacarpal bone transmission time (mc BTT)

Pediatric Research 58:341-346 (2005)

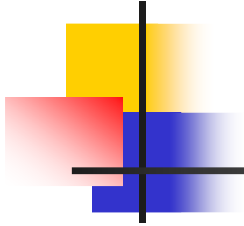
Role of Physical Activity

- Passive range of motion exercises results in increased rate of gain in body weight, forearm length, bone area, lean body mass, and bone mineralisation

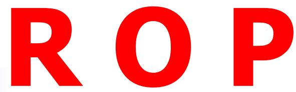
Pediatr Endocrinol Rev.
2005 Jun;2(4):675-82

Practical Strategies

- Ensure intake of calcium and phosphorous of 1.7 :1
- Fortify milk for < 1500 gm babies
- Ensure a daily intake of 400 IU Vitamin D per day
- Shorten use of : frusemide, theophylline, steroids.
- Promote passive physical exercises



- **RETINOPATHY OF PREMATURITY**



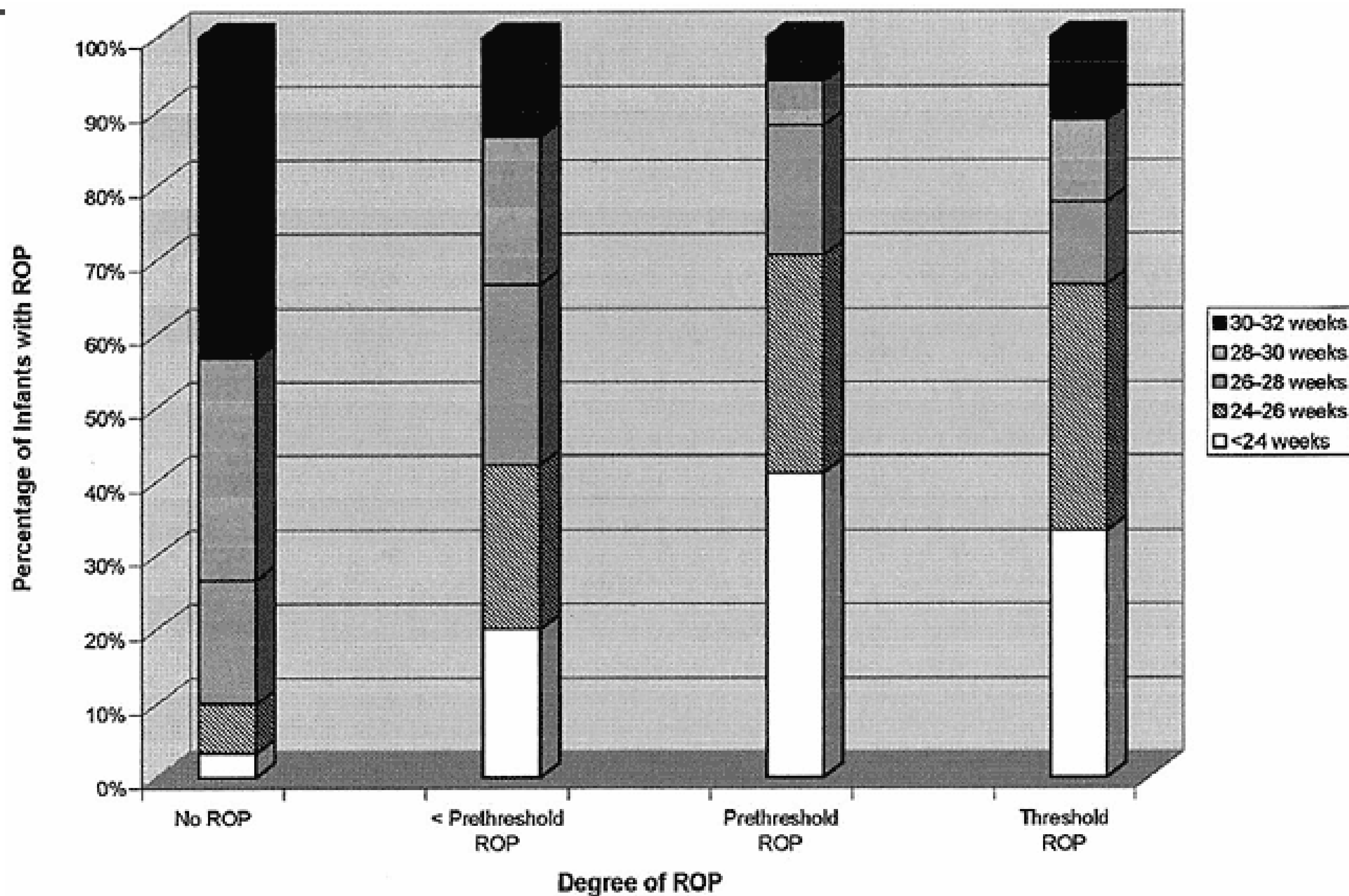
R O P

- A Vascular problem of retina of preterms
- ROP occurs when the normal pattern of progressive blood vessel growth within the retina is interrupted by premature birth

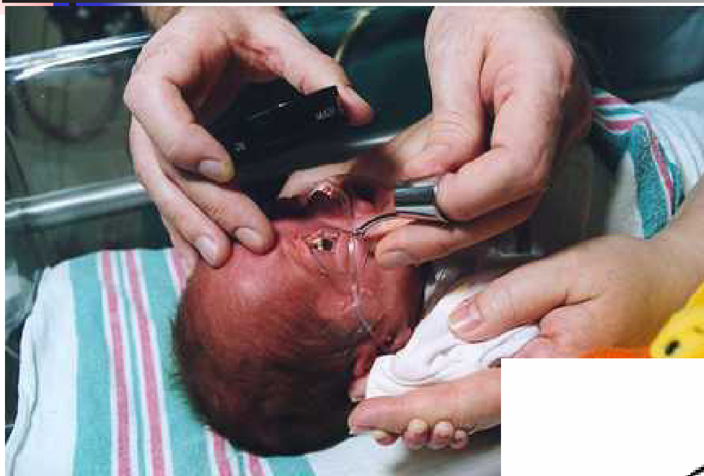
- Infants weighing less than 1250 g have a 65% risk of developing ROP

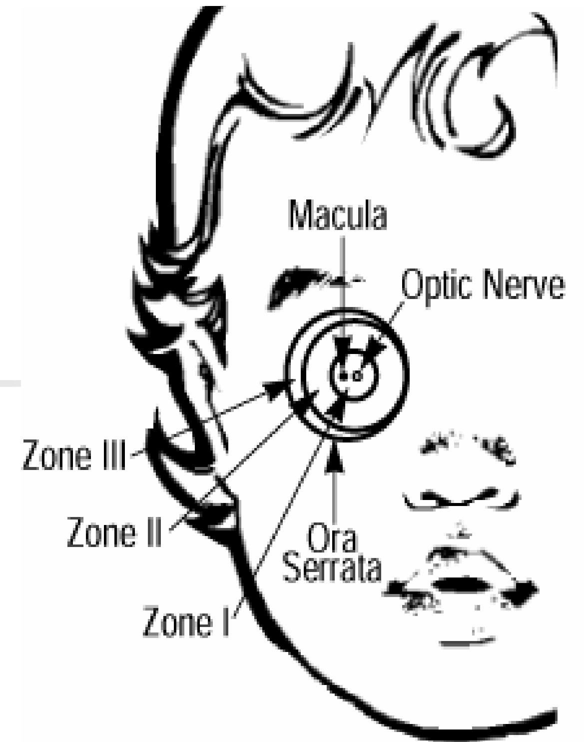
- Infants weighing less than 1000 g have an 81% risk

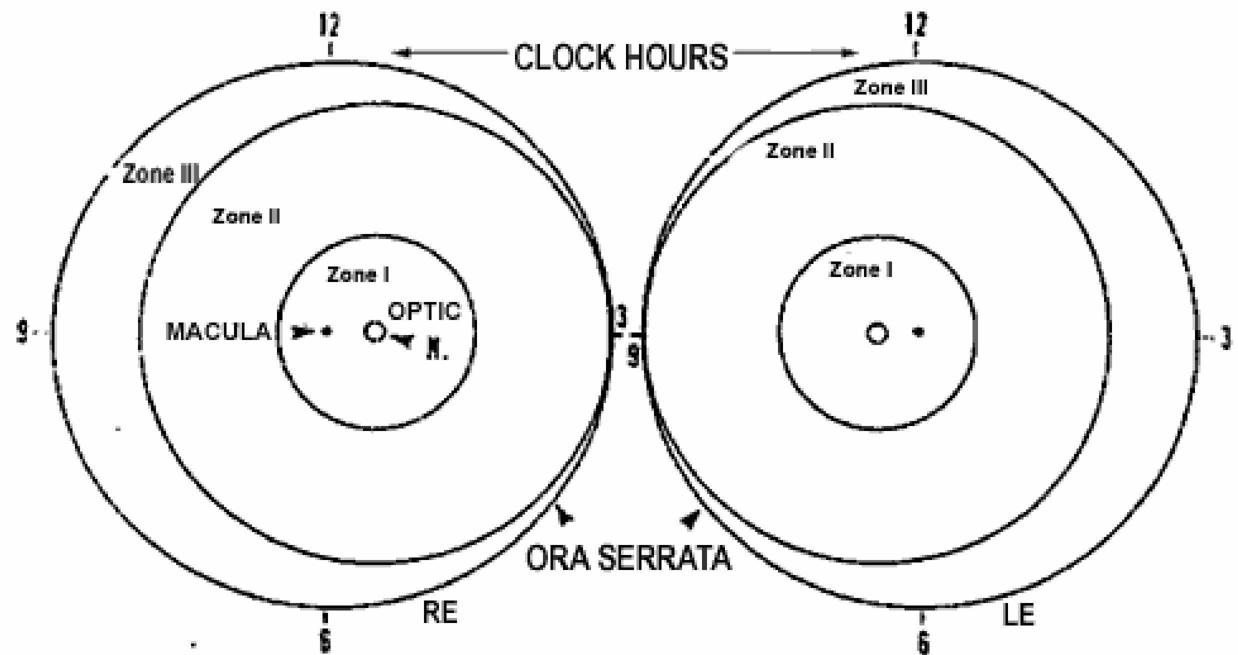
Incidence of ROP

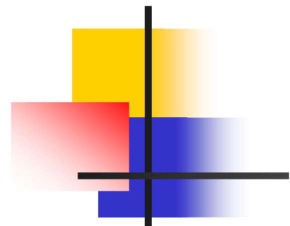


ICROP (1985)









- ROP Stage

NORMAL IMMATURE RETINA

Avascular retina

Tree branching

Demarcation line

STAGE I

Avascular zone

Broom bristle branching

Extra-retinal NV

Elevated ridge

STAGE III

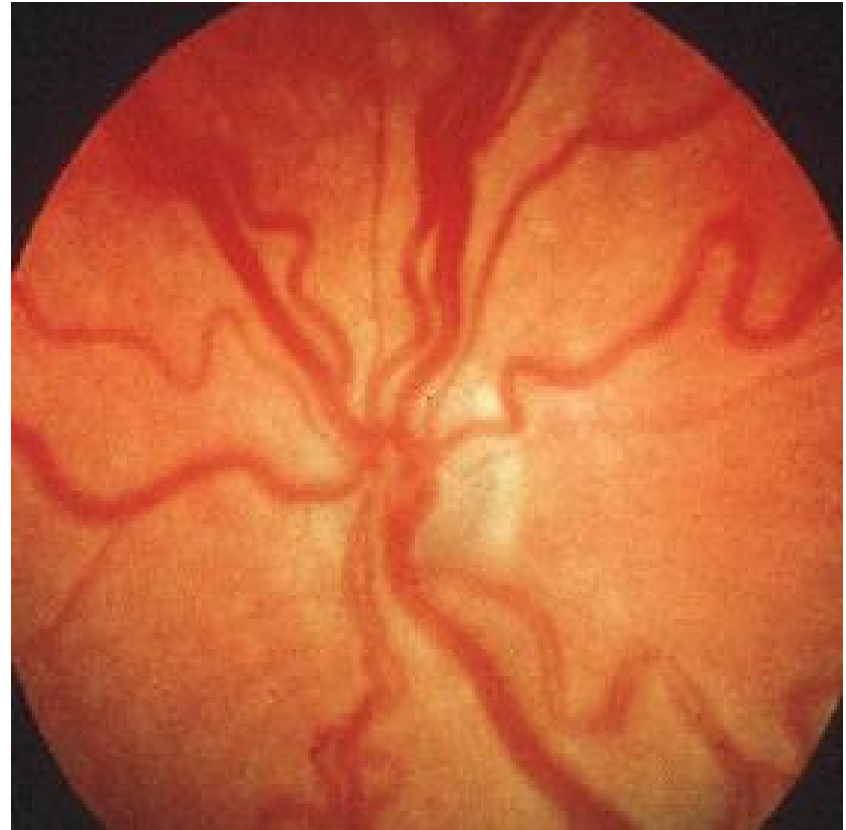
Elevated ridge

STAGE II

Plus disease

- Engorgement & tortuosity of the blood vessels near the optic nerve

- Can accompany any stage, but indicates greater likelihood of progression to Stage 3 (or greater)



Rush Disease

- Plus disease + Zone I ROP
- Progression occuring in days, rather than weeks.

Screening for ROP

WHOM ?

- < 28 w of gestation
- < 1500 gms
- >1500 gms

(Unstable clinical course)

WHEN ?

4-6w after birth or

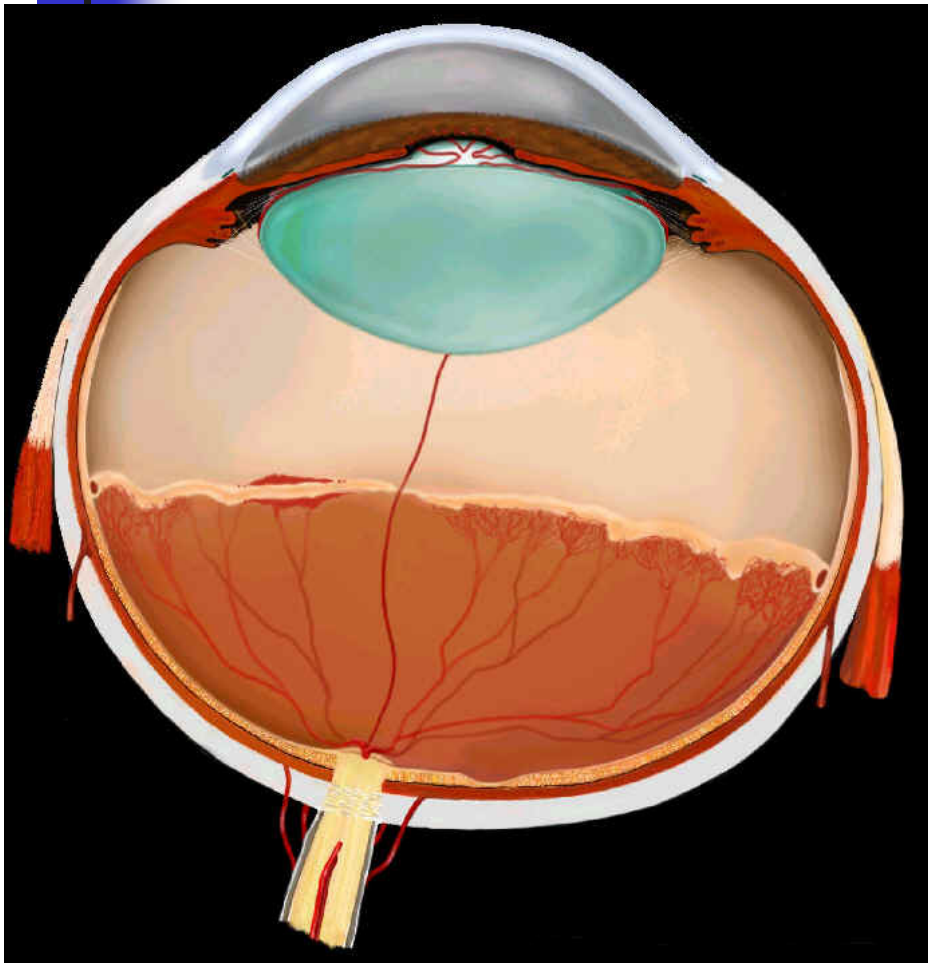
32 w of post conceptional age

How long to screen for ROP ?

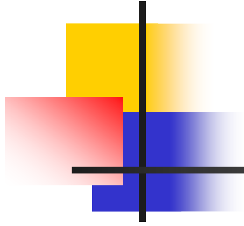
- Examine the child at **two-week** intervals if no retinopathy of prematurity is present
- Screen **one week** intervals if retinopathy of prematurity is present
- Follow up exam. at 6-18 mths age

Pediatrics 2001;108(3):809-11

ROP Management



- "The critical stage of ROP occurs when abnormal vessels begin to extend into the vitreous space"

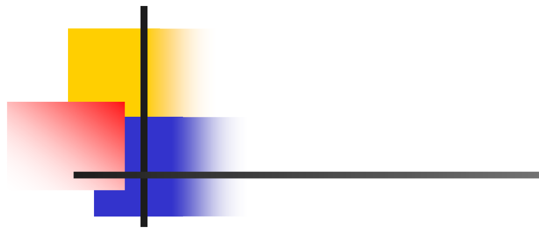


" With only mild involvement, spontaneous regression is the rule, and treatment is not necessary "

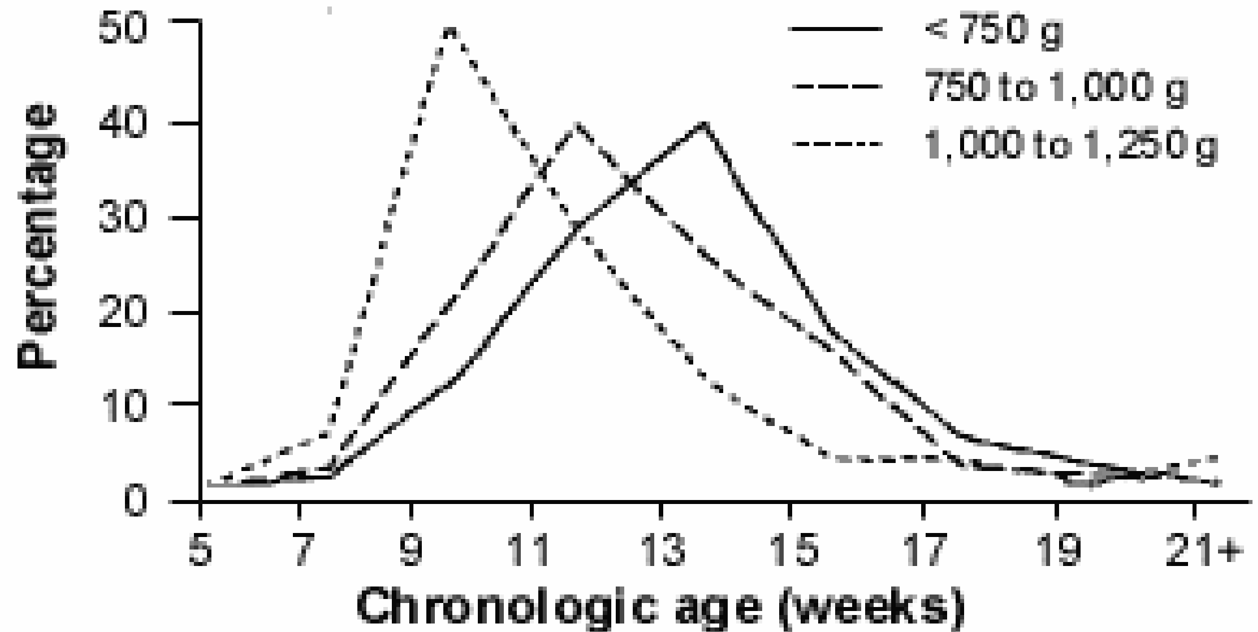
When to start treatment ?

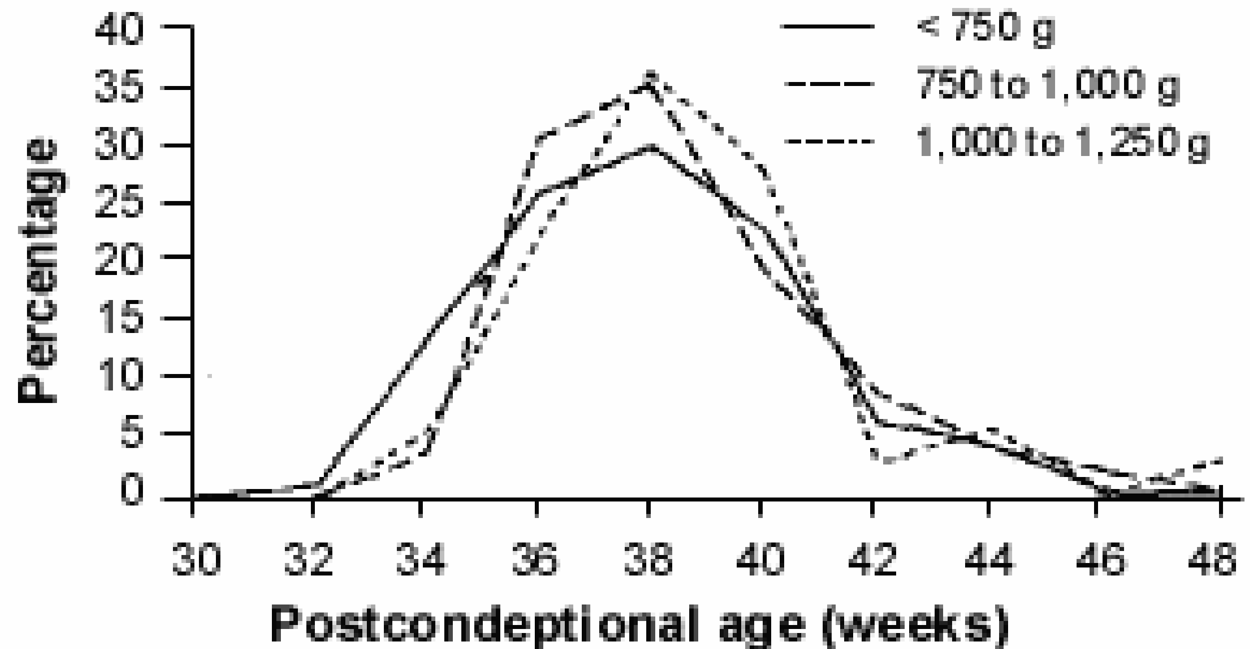
Threshold ROP

- ROP in zone I & II with 5 contiguous or 8 cumulative clock hours of stage 3 with plus disease
- 50% likelihood of progression to retinal detachement if left untreated



Onset of threshold ROP





Treatment of ROP

A) Treatment of the neovascular process :

- Laser Cryotherapy

B) Mechanically reattach the detached retina or prevent further detachment :

- Scleral buckle Vitrectomy
- Lensectomy

Supplementing therapeutic oxygen for pre-theshold ROP

STOP-ROP clinical trial

" Did not demonstrate a beneficial or deleterious effect of supplemental oxygen administered at a critical point during the disease course of ROP "

Pediatrics 2000;105:295-310

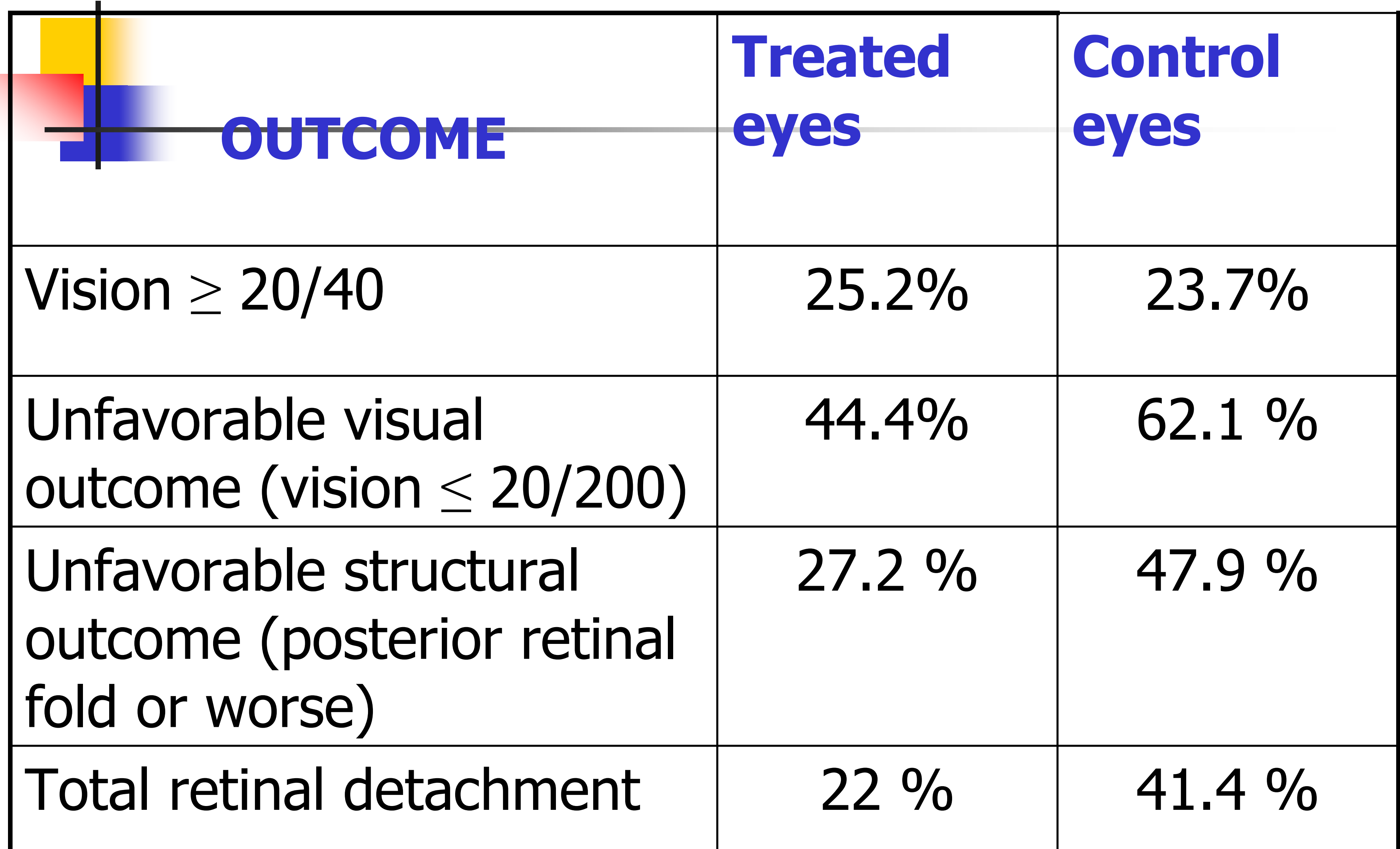
Light Reduction for Reducing Frequency of ROP

Light-ROP trial

" Average levels of nursery lights had no deleterious effects on children, and reducing light levels did not ameliorate or accelerate the disease "

N Engl J Med 1998;338:1572-6

Outcome of ROP



OUTCOME	Treated eyes	Control eyes
Vision ≥ 20/40	25.2%	23.7%
Unfavorable visual outcome (vision ≤ 20/200)	44.4%	62.1 %
Unfavorable structural outcome (posterior retinal fold or worse)	27.2 %	47.9 %
Total retinal detachment	22 %	41.4 %

Message

- Preterm infants must be monitored to detect for appearance of ROP
- Follow up post discharge is must
- The critical stage of ROP occurs when abnormal vessels begin to extend into the vitreous space

Anemia of prematurity

- **Role of erythropoietin**
- Cost
- Efficacy
- Long-term side effects

Prevention of AOP

- For cost effectiveness :
- Efficacy of Epo should exceed a difference of two transfusions
- If two doses can be obtained when a vial is entered

- Epo Vs conservative transfusion

Preventive practices

- Decreased phlebotomy loss
- Standard transfusion guidelines
- Weekly Epo from day 3 onwards till 36 w post conceptional age

THANK YOU