# *Normal* or not: the first 6 weeks

Pharmac seminars 2016


kidz first
Children's Hospital & Community Health
Tamariki Ma
Worth1000.com

The New Zealand Herald

Sunday 25th March 2012

Baby dies after scar ruptures

Wednesday 28th March 2012

Family's caesarean baby tragedy


kidz first
Children's Hospital & Community Health
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# Topics

- Growth (briefly)
- Resuscitation (briefly)
- Jaundice
- Congenital Heart Disease
- Hypoglycaemia
- Quick small topics
- GBS and other infections

# Latest NZ birth stats

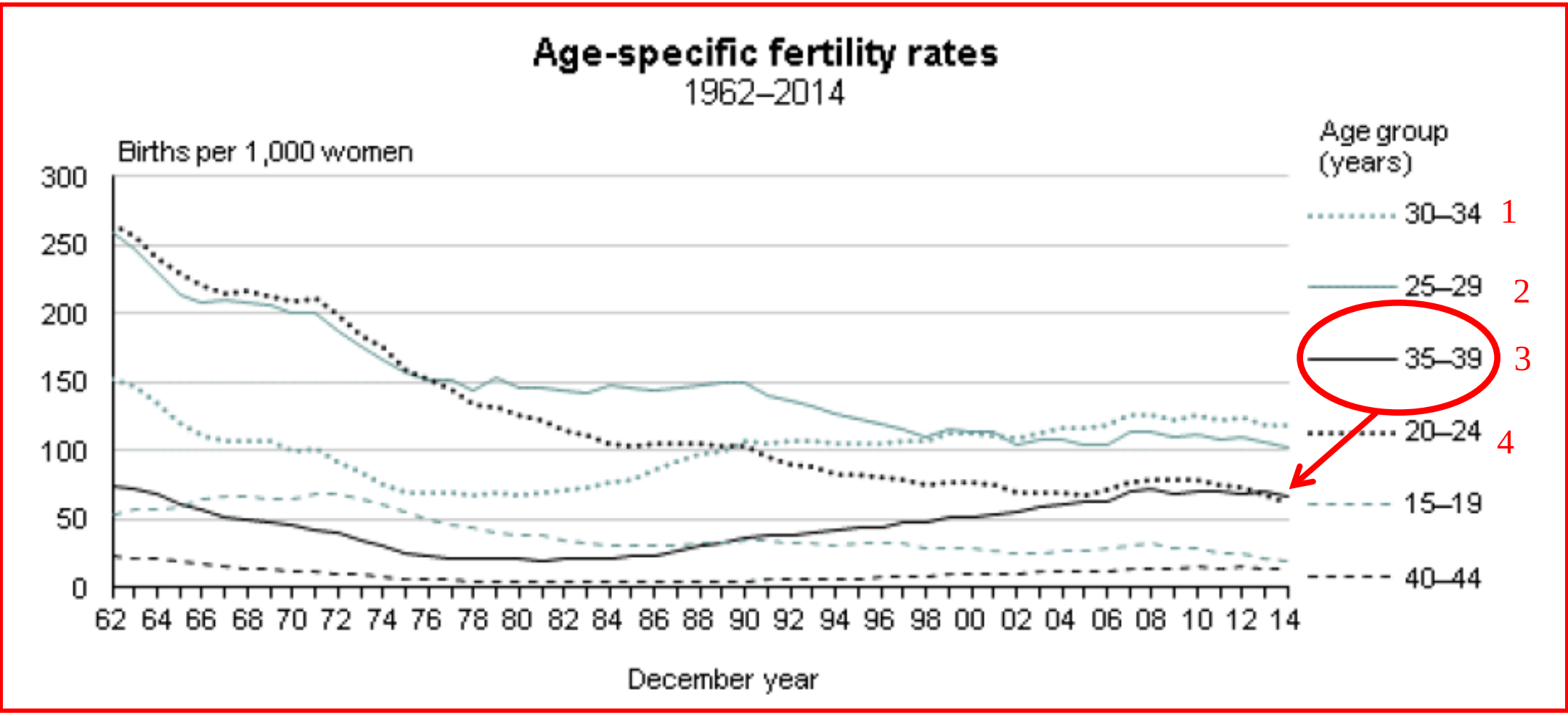
- **2008** there were **64,340** live births registered in New Zealand,
  - ❖ highest number since 1972

- **65,390 – 1961 = Peak**
  (NZ pop. 2.5million 1961)
  **54,020 – 2002 = Low point**

**62,540 – 2009 (↓ 3%)**
**63,900 – 2010 (↑ 2%)**
**61,403 – 2011 (↓ 1%)**
**57,242 – 2014 (↓ 2.5% 2013)**
**61,038 – 2015 (↑ 7.0% 2014)**

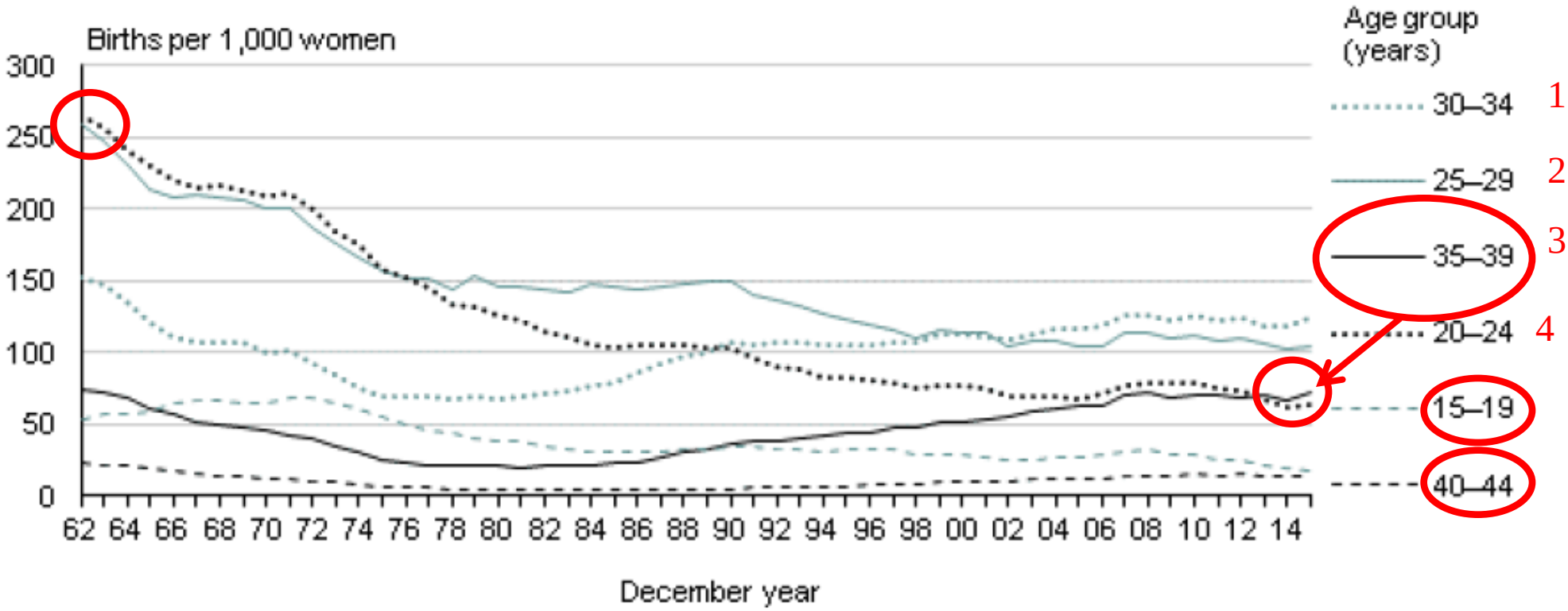
- New Zealand women averaged 1.99 births each (4.3 in 1961)
  (2.34 Maori esp Nthld)

- Births over death 29,430: Just sustains population without immigration (60K)


Age-specific fertility rates
1962–2014
Births per 1,000 women
300
250
200
150
100
50
0
62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14
December year
Age group (years)
30–34
25–29
35–39
20–24
15–19
40–44
1
2
3
4

## Age-specific fertility rates

1962–2015




Source: Statistics New Zealand

# NZ Stats 2016

- Median age **all** women giving birth was 30 years
- 20 - 24 yrs < 30 – 39 years = 62/1000 (1962: 20-24 yrs = 256/1000)
- Highest fertility age group 30 – 34 years 125 / 1000 women
- Stable now 10 years — 5 years older than 1977.
- Median age **first** child 28!! — Also Stable 10 years
- 2000 multiples (1000 1977) — 66% mothers > 30 years

Human Reproduction vol.15 no.11 pp.2433–2437, 2000

# The risks associated with pregnancy in women aged 35 years or older

**Table IV.** Delivery complications

| | Age group (years) | Proportion (%) | Odds ratio (99% confidence interval) |
|---|---|---|---|
| Induction of labour[b,c,f] | 18–34 | 16.88 | |
| | 35–40 | 16.88 | 1.04 (1.00–1.08) |
| | >40 | 19.22 | 1.19 (1.10–1.29) |
| Breech delivery[b,i] | 18–34 | 0.78 | |
| | 35–40 | 0.71 | 0.92 (0.78–1.08) |
| | >40 | 0.65 | 0.83 (0.56–1.22) |
| Operative vaginal delivery[b,f,j] | 18–34 | 11.36 | |
| | 35–40 | 10.83 | 1.50 (1.43–1.57) |
| | >40 | 10.23 | 1.60 (1.43–1.78) |
| Emergency Caesarean section [a,b,c,d,e,f] | 18–34 | 8.65 | |
| | 35–40 | 11.05 | 1.59 (1.52–1.67) |
| | >40 | 14.24 | 2.17 (1.97–2.39) |
| Elective Caesarean section[a,b,c,d,e,f] | 18–34 | 4.37 | |
| | 35–40 | 8.6 | 1.77 (1.68–1.87) |
| | >40 | 12.67 | 2.67 (2.42–2.95) |
| Postpartum haemorrhage[b,f,g,h] | 18–34 | 11.24 | |
| | 35–40 | 14.25 | 1.14 (1.09–1.19) |
| | >40 | 17.99 | 1.27 (1.15–1.39) |
| Postpartum haemorrhage ⩾1000 ml[b,f,g,h] | 18–34 | 1.46 | |
| | 35–40 | 2.19 | 1.28 (1.16–1.41) |
| | >40 | 3.10 | 1.55 (1.29–1.88) |

**Table V.** Fetal complications

| | Age group (years) | Proportion (%) | Odds ratio (99% confidence interval) |
|---|---|---|---|
| Delivery after 42 weeks gestation[b,d] | 18–34 | 0.16 | |
| | 35–40 | 0.16 | 1.14 (0.80–1.61) |
| | >40 | 0.19 | 1.19 (0.57–2.50) |
| Delivery before 37 weeks gestation[b,c,d,f] | 18–34 | 6.0 | |
| | 35–40 | 6.63 | 1.18 (1.11–1.25) |
| | >40 | 8.17 | 1.42 (1.26–1.60) |
| Delivery before 32 weeks gestation[b,c,d,f] | 18–34 | 1.03 | |
| | 35–40 | 1.33 | 1.41 (1.24–1.61) |
| | >40 | 1.58 | 1.64 (1.25–2.14) |
| Stillbirth [b,c,f,j] | 18–34 | 0.47 | |
| | 35–40 | 0.61 | 1.41 (1.17–1.70) |
| | >40 | 0.81 | 1.83 (1.29–2.61) |
| Delta birthweight <5th centile[b,c,d,f] | 18–34 | 5.81 | |
| | 35–40 | 6.13 | 1.28 (1.20–1.36) |
| | >40 | 7.63 | 1.49 (1.29–1.71) |
| Delta birthweight >90th centile[b,d] | 18–34 | 10.06 | |
| | 35–40 | 12.32 | 1.20 (1.13–1.27) |
| | >40 | 11.96 | 1.29 (1.14–1.45) |
| Apgar score <7[a,b,d,e,f] | 18–34 | 1.31 | |
| | 35–40 | 1.42 | 1.16 (1.03–1.23) |
| | >40 | 1.61 | 1.19 (0.92–1.55) |
| Apgar score <5[a,b,d,e,f] | 18–34 | 0.23 | |
| | 35–40 | 0.28 | 1.30 (1.05–1.61) |
| | >40 | 0.23 | 1.01 (0.60–1.69) |
| Admission to SCBU >24 h[a,b,d,e,f] | 18–34 | 5.20 | |
| | 35–40 | 5.33 | 1.05 (0.98–1.12) |
| | >40 | 5.92 | 0.9 (0.85–1.15) |
| Breast feeding [b,d,e] | 18–34 | 61.14 | |
| | 35–40 | 70.08 | 1.76 (1.70–1.82) |
| | >40 | 66.24 | 1.63 (1.52–1.75) |

# Growth (briefly)

# Case History

Day 6

Pale / Poor perfusion / Thready pulse

18% weight loss

| | | |
|---|---|---|
| Na+ | 165 | (135-140) |
| K+ | 3.1 | (3.0 – 5.0) |
| Urea | 23 | (<5) |
| Glucose | 3.2 | (2.6 – 6.0) |

**Serum osmolality (mOsm / l) =**

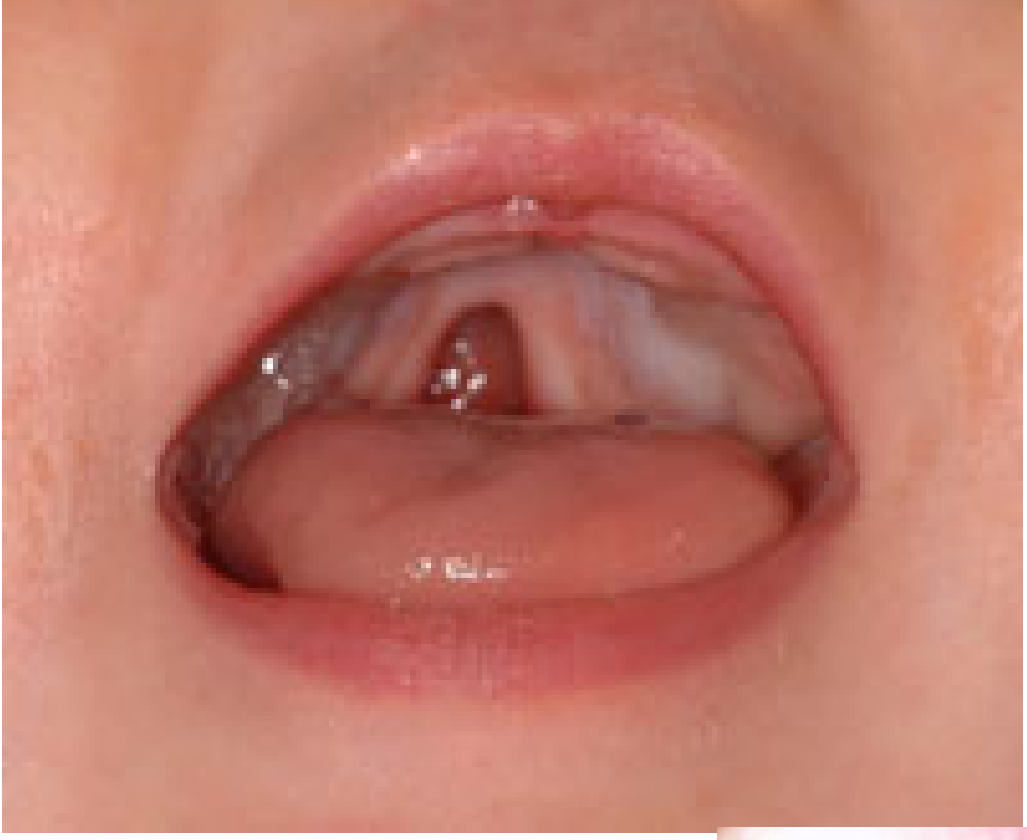
**(2x[Na+]) + (2x[K+]) + [Urea] + [Glucose]**

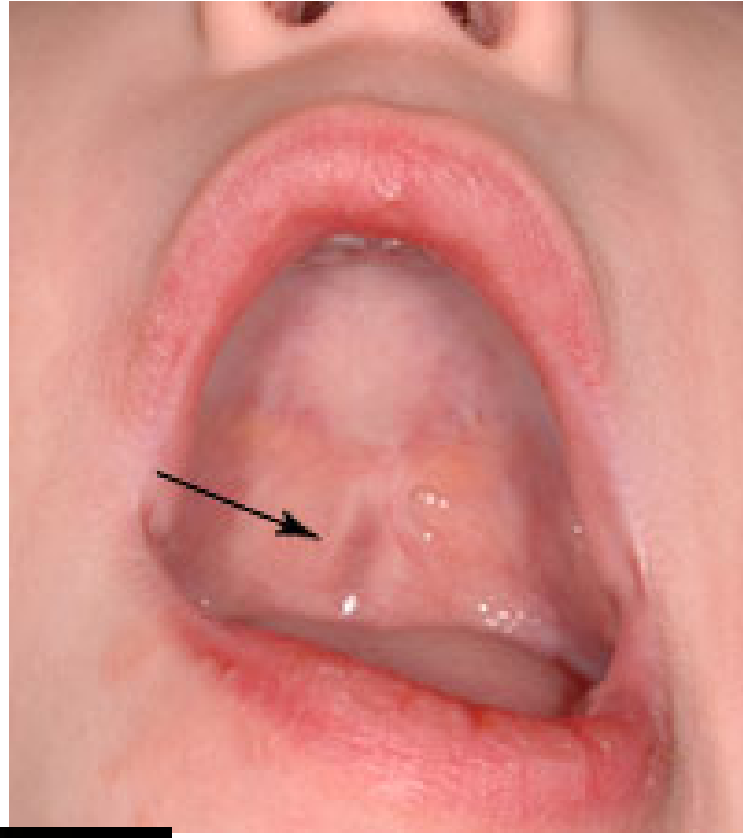
| | | |
|---|---|---|
| Osmolality | 362 | (270-290) |

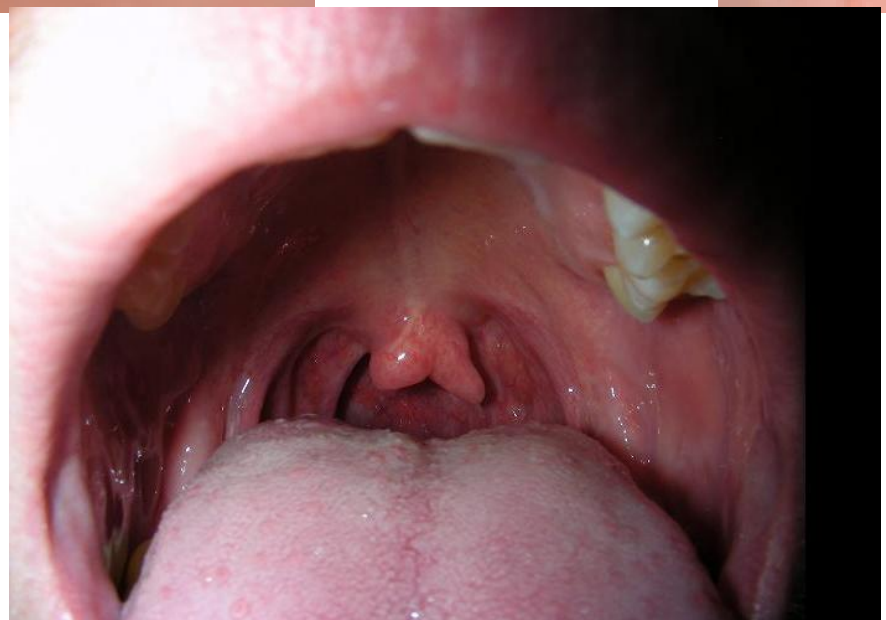
The New Zealand Herald

HDC report: Feb 2016

- 16% weight loss reported 3 days after discharge
- 22% weight loss when readmitted 3-4 days after this
- Dehydration / hypernatraemia, intracranial bleed
- Death



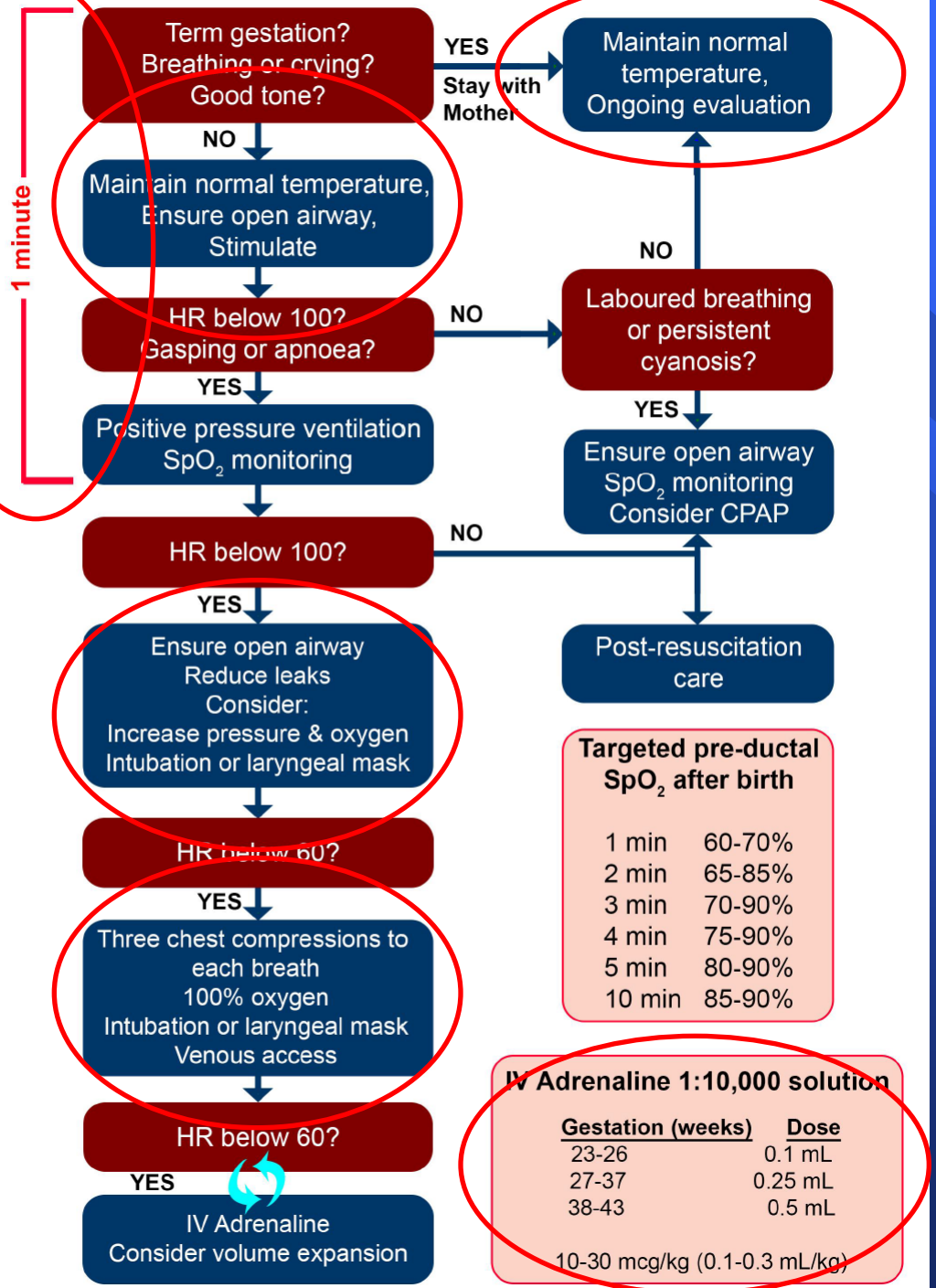




# Resuscitation

NZRC NLS

# At all stages ask: do you need help?




**Targeted pre-ductal $SpO_2$ after birth**

| | |
|---|---|
| 1 min | 60-70% |
| 2 min | 65-85% |
| 3 min | 70-90% |
| 4 min | 75-90% |
| 5 min | 80-90% |
| 10 min | 85-90% |

**IV Adrenaline 1:10,000 solution**

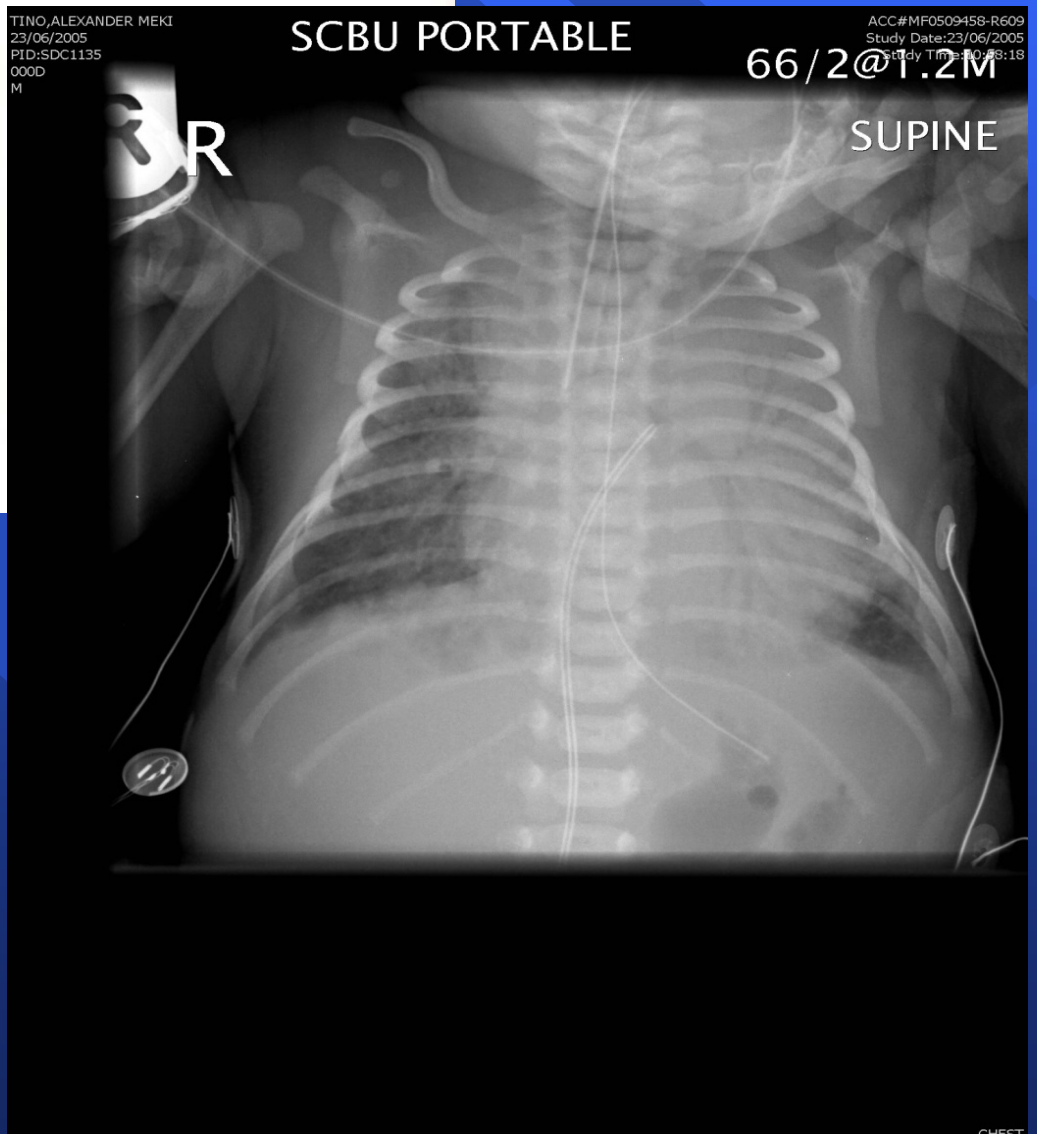
| Gestation (weeks) | Dose |
|---|---|
| 23-26 | 0.1 mL |
| 27-37 | 0.25 mL |
| 38-43 | 0.5 mL |

10-30 mcg/kg (0.1-0.3 mL/kg)

# The Golden Minute

- By 1 minute a newborn should
  - » be establishing breathing
  - » heart rate > 100
- If not intervention recommended
- Most effective intervention:
  - » Ventilation!

# What to do about perinatal exposure to meconium?

# What to do about perinatal exposure to meconium?

- Chettri 2015: RCT non vigorous randomised to ETT suctioning or oro/nasoph only (n = 61 per grp)
  - » MAS (30%), Deaths (12%) and NDT outcomes at 9 months; no difference between groups
  - » (PAS 2014 abstract: n=178 Similar result)

- ILCOR 2015: Insufficient human evidence to suggest routine tracheal intubation for suctioning of meconium in nonvigorous infants born through MSAF as opposed to no tracheal intubation for suctioning.

# Meconium

- Crying babies :

  Airway will be open  support breathing as needed

- Not breathing and floppy: These babies likely in trouble

  If unskilled: do not delay ventilation

  If skilled:  before stimulation have a look
  suction below cords till clear
  ventilation

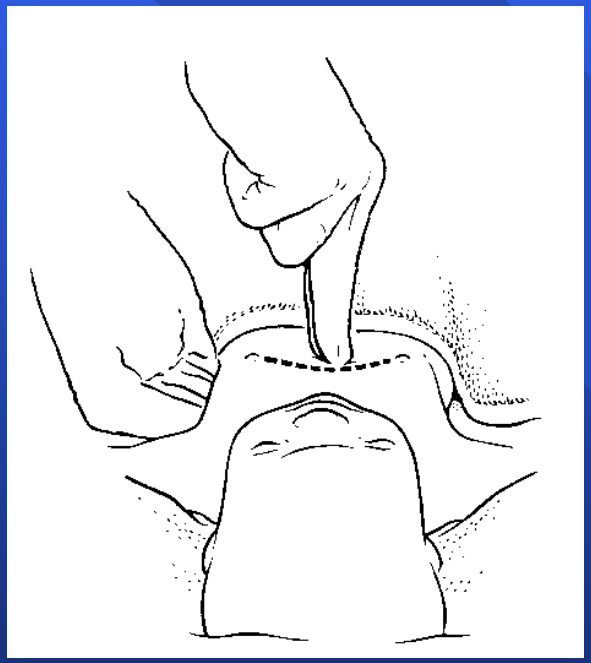
  All:  Keep warm (if asphyxiated do not overheat)

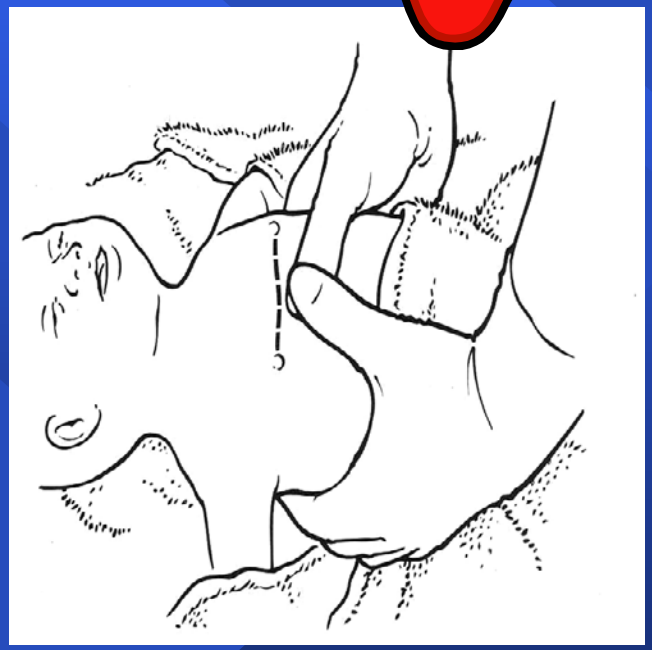
# Delayed Cord Clamping

- Consider in ALL well Term babies
- Suggested in pre term babies not needing resuscitation
- Delay clamping for 30-60 seconds
- Cord milking < 28w; no evidence of benefit

# Chest Compressions

- Chest compressions 3:1 (forget 2 finger method)





# 15:2

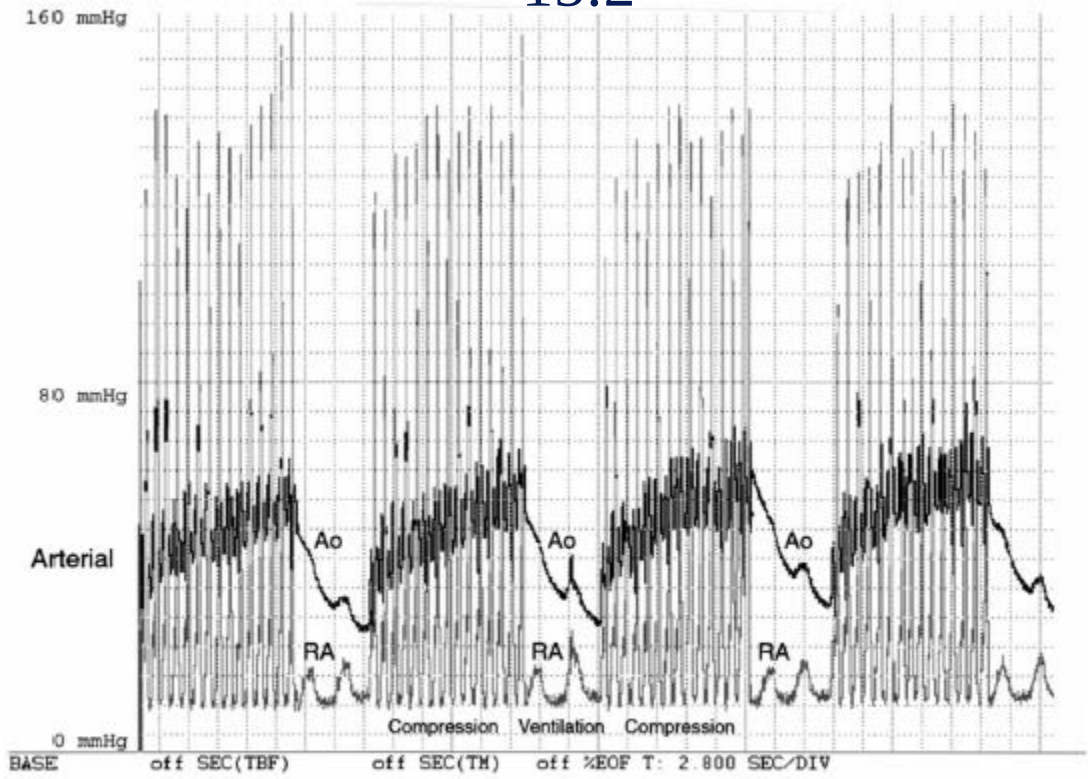


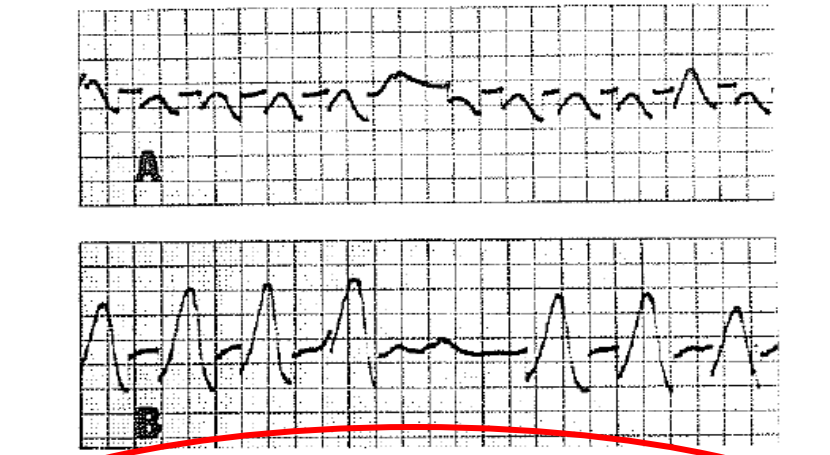

Fig. 2. Aortic and right atrial pressures measured during standard CPR and ventilation using a 15:2 compression to ventilation ratio. The interruptions of aortic diastolic pressure (lower border of the dark band) during ventilation is easily recognized resulting in a sub-optimal coronary perfusion pressure during that time. Right atrial diastolic pressure is seen as the most inferior border of the pressure waves. The difference is the coronary perfusion gradient. Maximal coronary perfusion occurs only a third of each compression–relaxation–ventilation cycle.

Coronary perfusion pressure = Aortic end diastolic pressure - Right atrial pressure

# *Key data from key studies*

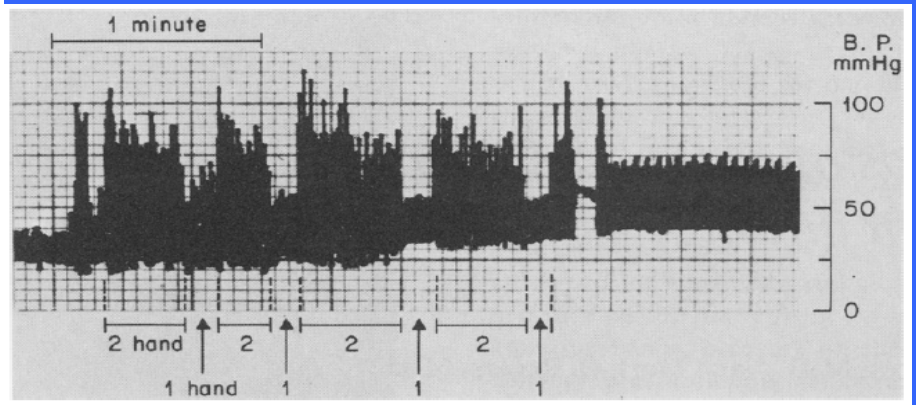
Reference: Case Hx: David, 1988; Moya, 1962; Thaler, 1963; Todres, 1975

- P: Neonates receiving chest compressions
- I: TT
- C: TF
- O:




| RESUSCITATION TECHNIQUE | MEAN ARTERIAL PRESSURE | PULSE PRESSURE | HEART RATE |
|---|---|---|---|
| (PRE-ARREST) | 32 mm Hg | 18 mm Hg | 140 B/min. |
| A TWO FINGERS | 14 | 6 | ~120 |
| B ENCIRCLE CHEST | 30 | 16 | ~100 |

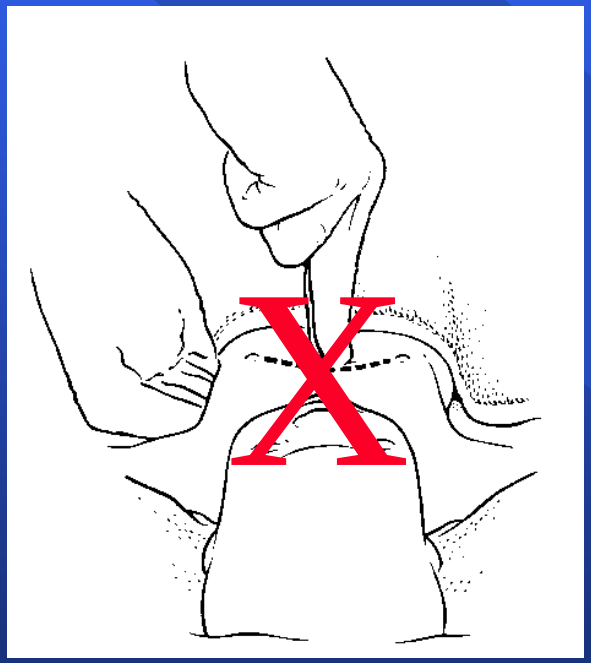
David 1988, 552




Todres 1975, 781

# Chest Compressions

- Chest compressions 3:1 (forget 2 finger method)



Jaundice!

# Why we worry about SBR's

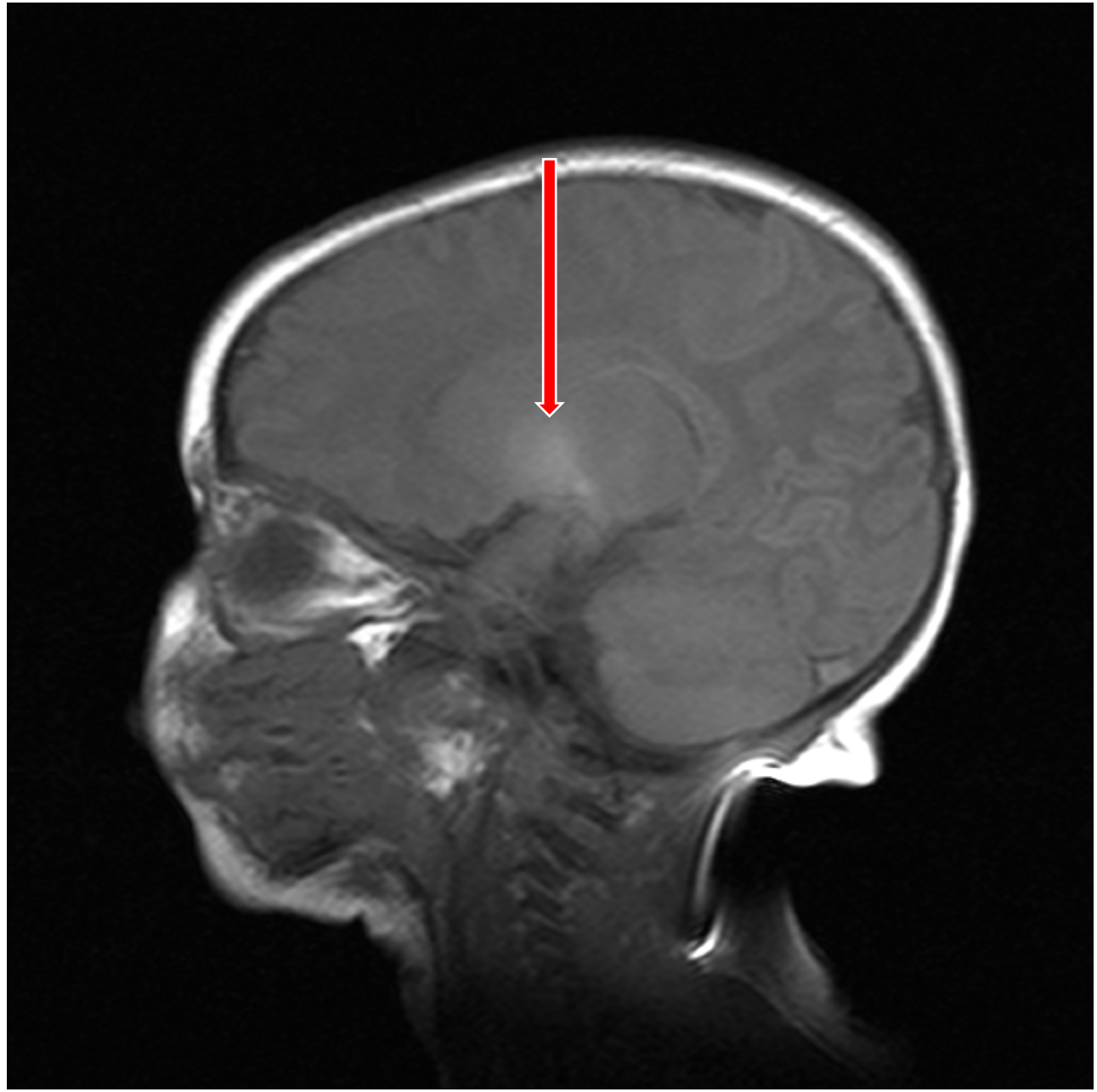
- Term NVD Indian baby BW 3565
- Thrombocytopenia ? Cause
- Home Day 4 ?Mild jaundice Feeding OK
- Represented Day 7 SBR 630
- Opisthotonos

# A Three Stage Encephalopathy

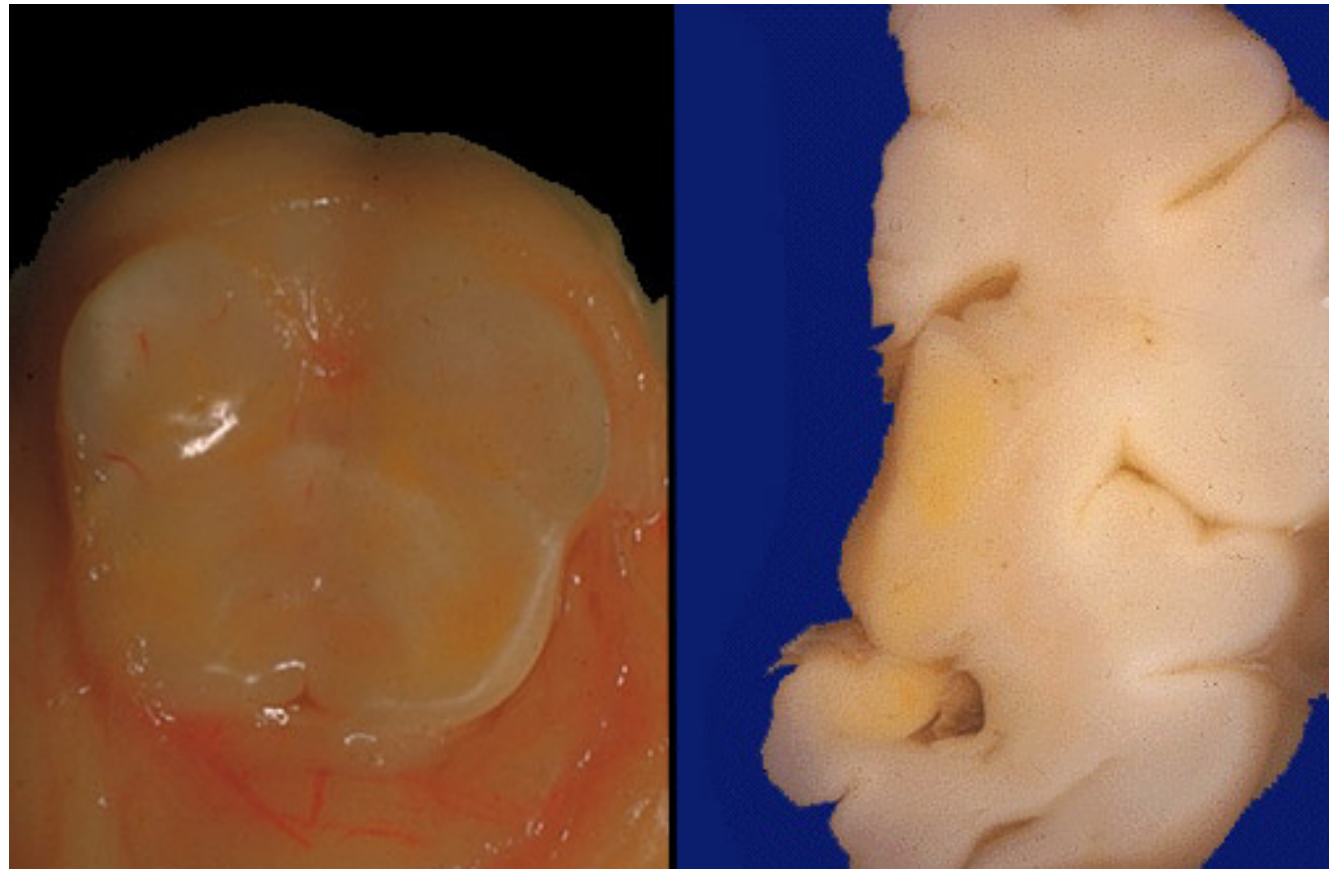
- Stage 1
  - Lethargy / poor feeding / hypotonia
- Stage 2 (after first several days)
  - Fever / Hypertonia / Opisthotonos
- Stage 3 (after 1st week)
  - Muscle rigidity / paralysis of upward gaze / periodic oculogyric crisis, and irregular respirations (IQ spared)

# Why we worry about SBR's

- Mother Blood group B +ve  Baby B +ve  DCT –ve
- G 6 P D / P K  screens –ve  Metabolic –ve
- 2 volume exchange transfusion + PTU → 342
- $Na^+$ 143  Not weighed on readmission. ↓10% when done



# Kernicterus



# Status: Age 9 years

1. Cerebral palsy (choreoathetoid)
2. Global developmental delay
3. Increasing dystonic movements / tone
4. Recurrent tongue lacerations
5. Chronic respiratory infection – aspiration
6. Feeding ( fundoplication gastrostomy February 2008)
7. Hiatus hernia repair
8. Visual impairment – wearing glasses
9. Seizure disorder

# NZ Kernicterus

**Authors Full Name:** **Stanley**, TV.

**Institution:** Department of Paediatrics, Wellington School of Medicine, University of Otago, New Zealand.

**Title:** A case of kernicterus in New Zealand: a predictable tragedy?

**Source:** Journal of Paediatrics & Child Health. 33(5):451-3, 1997 Oct.

# NZ Kernicterus

- Wellington case 1997 (G6PD)
- Christchurch case 2000 (anti-E)
- Auckland case: From Tonga 33/40 ABO SBR 680
- Auckland case: 2005 (presented)
- Auckland 2010 ( Day 2 surgical abdomen, haemolysis)

# Middlemore 5 year Audit

- SBR > 375μmols/l (375 – 609)
- 60% no obvious cause but ABO high in PI
- When proportions compared with delivery population some PI groups overrepresented
- No audiology problems or kernicterus in this period

# Commonest Neonatal Problem: Definitions

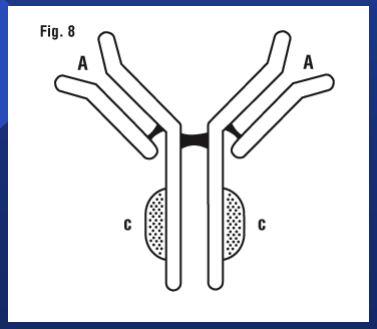
- Unconjugated vs Conjugated (lipophobic)
- Physiological vs Pathological (first 24 hours)
- Haemolytic vs Non haemolytic
- Late (> 2 weeks) vs Early

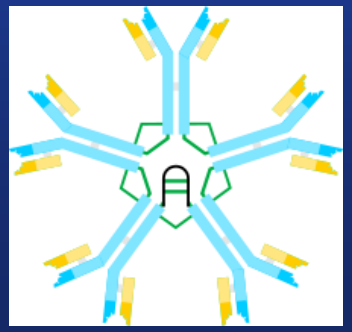
# Pathological

- Haemolytic Disease newborn:
- Rhesus disease ‘D’ D,d,C,c,E,e ABO protects
- ABO disease (Kell / Duffy / Kidd) Coombs Test
- Group O mothers: anti-A, anti-B **IgG** naturally occurring
- Group A (anti-B) or B mother (anti-A) : **IgM** naturally occurring
- Others: G-6-PD/PK, spherocytosis and other RBC shapes

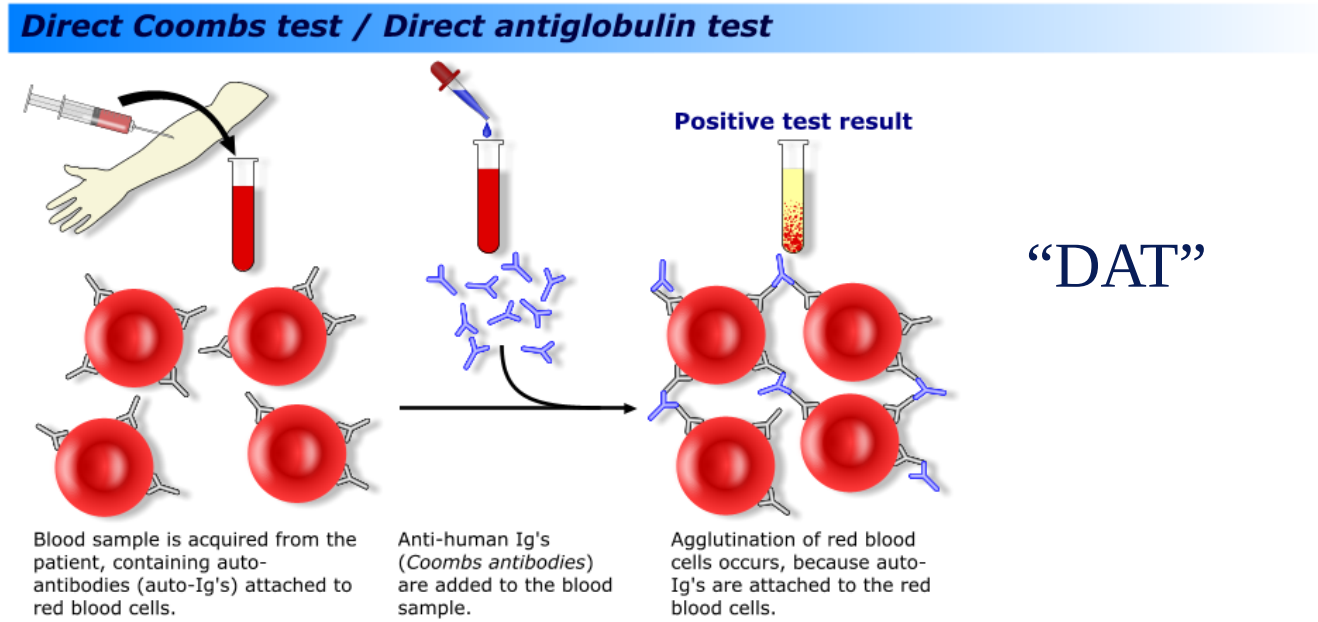
# RBC Ag

- Haemolytic disease related to antigenicity of RBC Ag's
- At Term Rh very well developed / ABO less well.
- Kell (K), Duffy (Fy), Kidd (Jk), Lewis (Le), M, S have occurred
- Usually anti Jk, anti-E, **anti-c**
- Anti-Le and anti-P usually an IgM

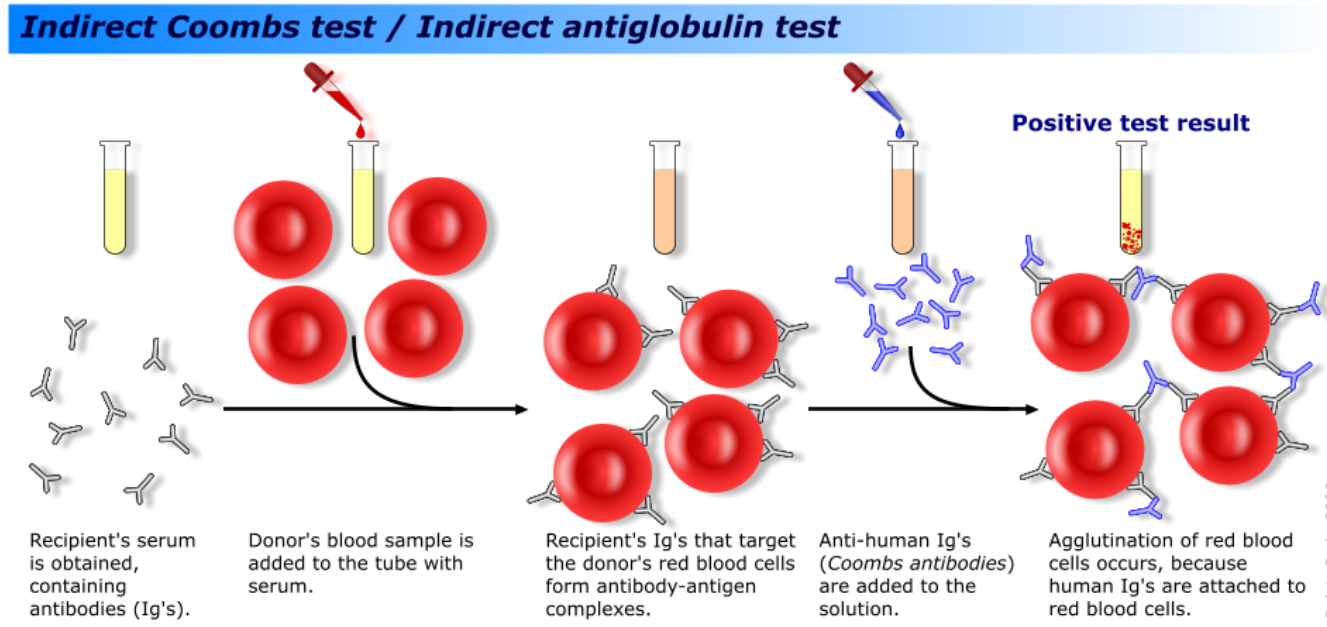


# Coombs Test




"DAT"



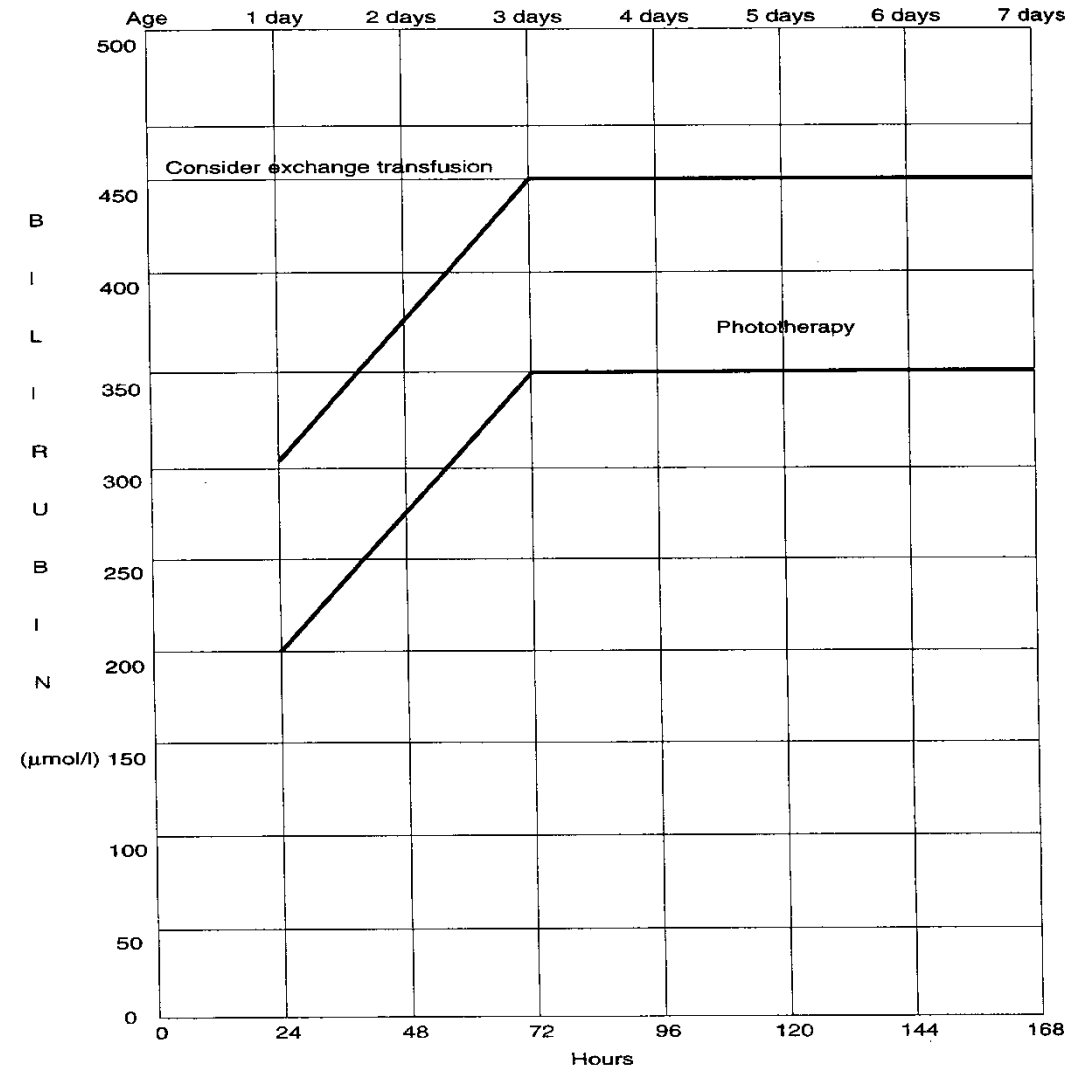
# Physiological

- Early discharge
- Feeding problems
- 10% weight loss (7 – 10 days)
- Breast milk jaundice

South Auckland HEALTH
A Community Partnership

[redacted]

# MANAGEMENT OF JAUNDICE IN THE HEALTHY TERM NEWBORN




WH 006 June 2000

MANAGEMENT OF JAUNDICE IN THE HEALTHY TERM NEWBORN

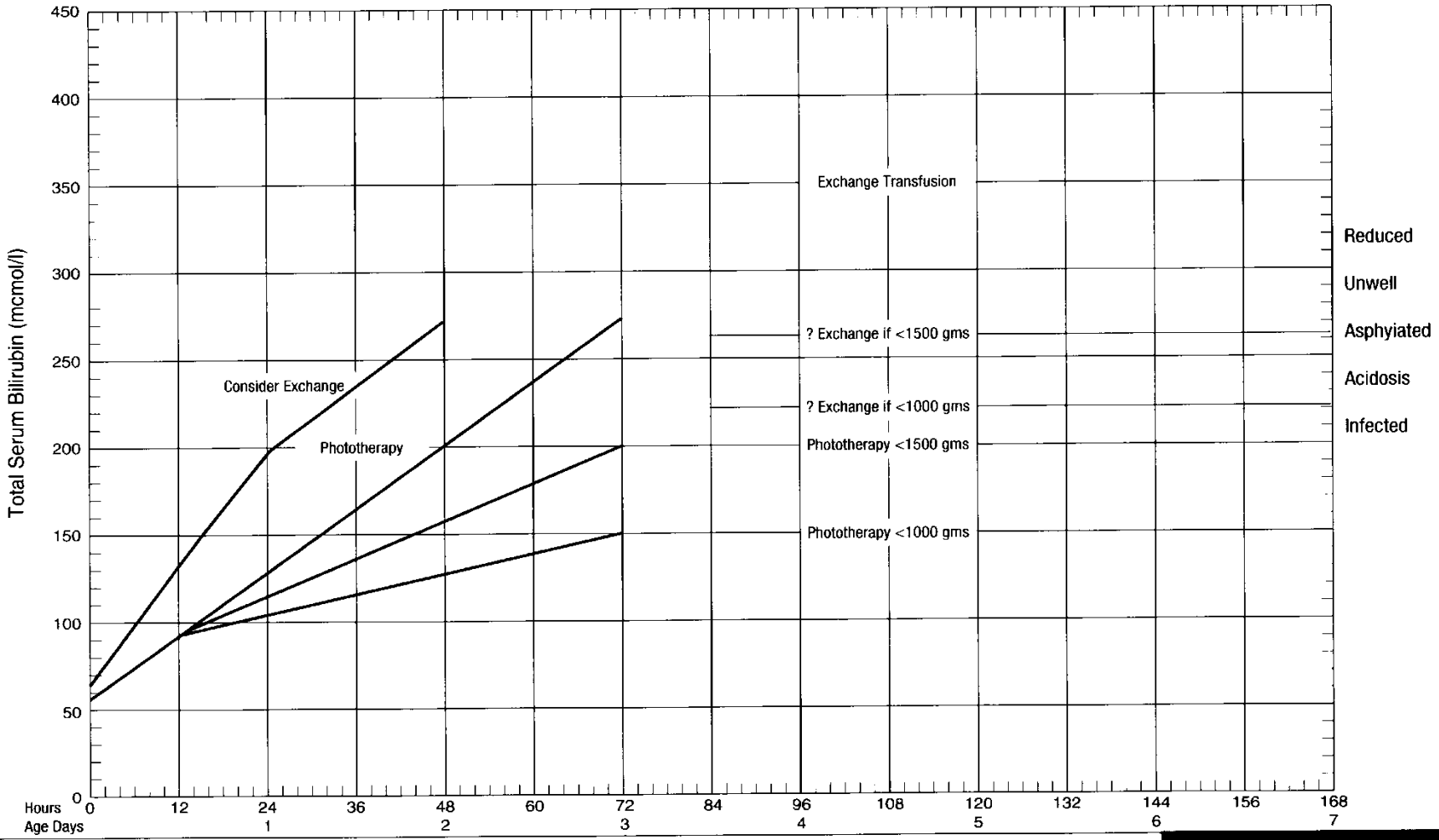
Diagnosis: _____ Cord haemoglobin: _____ Coombs: _____

Gestational age: _____ Time: _____ Bilirubin: _____

Blood groups: Mother: _____ Birth weight: _____

Baby: _____ Antibodies: _____

**Use Only for Haemolytic Disease or Preterm Infants**




# CHILD & YOUTH SERVICES NEONATAL UNIT BILIRUBIN GRAPH

South Auckland HEALTH

*Affix patient identification label here*

Kidz 021 June 2000

CHILD & YOUTH SERVICES NEONATAL UNIT BILIRUBIN GRAPH

# Late

- Unconjugated (Indirect):
  - Breast milk Jaundice
  - Physiological / Pathological
  - **Hypothyroidism**

- Conjugated (Direct) Usually < 20µmols/l
  - Biliary atresia
  - **Hypothyroidism**

# Treatments (unconjugated)

- Fluids
- **Phototherapy**
- Exchange transfusion (mortality 1 in 100/200)
- Underlying condition

# Basic Guideline

| | Total bilirubin (umol/L) |
|---|---|
| Cord blood | ≤ 50 |
| Up to 24hrs | ≤ 150 |
| >1 to ≤2days | ≤ 200 |
| >2 to ≤3 days | ≤ 250 |
| >3 to ≤7 days | ≤ 300 |
| >7 days to ≤3 wks | ≤ 100 (200-300) |
| >3wks to ≤4wks | ≤ 50 |
| >4wks to Adult | ≤ 24 |

# Breast Milk Jaundice

- True cause of prolonged unconjugated jaundice
- Exact mechanism unknown
- Diagnosis of exclusion; Stop feeding!!!!!!
- Benign?

# Clinical signs

Jaundice longer than 2 weeks

| | **Direct bilirubin (umol/L)** | **Comment** |
|---|---|---|
| ≤4wks | <20 or <10% | ≥30 umol/L require attention |

# Biliary atresia

- 1 in 15000 – 20000 (highest in French Polynesia)
- Syndromic (other associations) and non syndromic
- Non Syndromic later in gestation and progressive
- 5 - 10% only are correctable

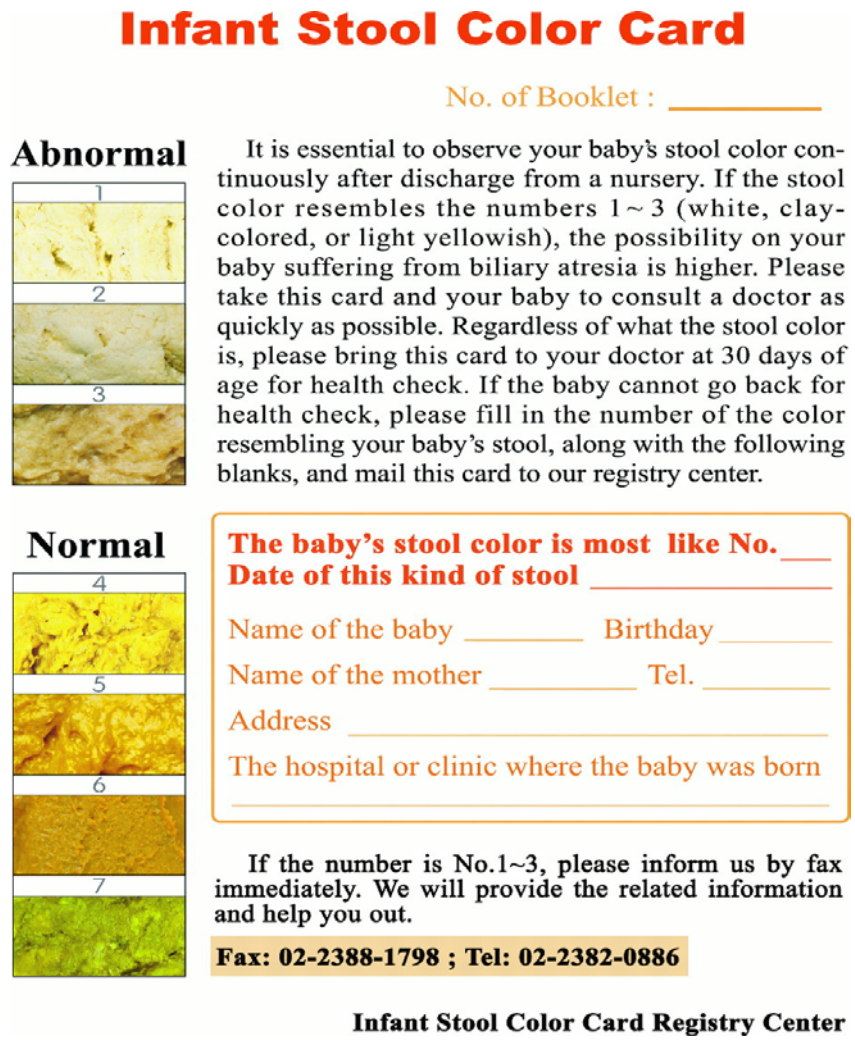
# Aetiology

- Unknown! Many theories
- Evidence that is progressive
- Timing of surgery seemingly important

# Clinical signs

- Green
- Clay coloured stools (dark urine)
- Hepatomegaly
- Differential diagnosis: Neonatal hepatitis
  Interlobular bil. hypoplasia

**FIGURE 1 English version of the infant stool color card (first edition)**



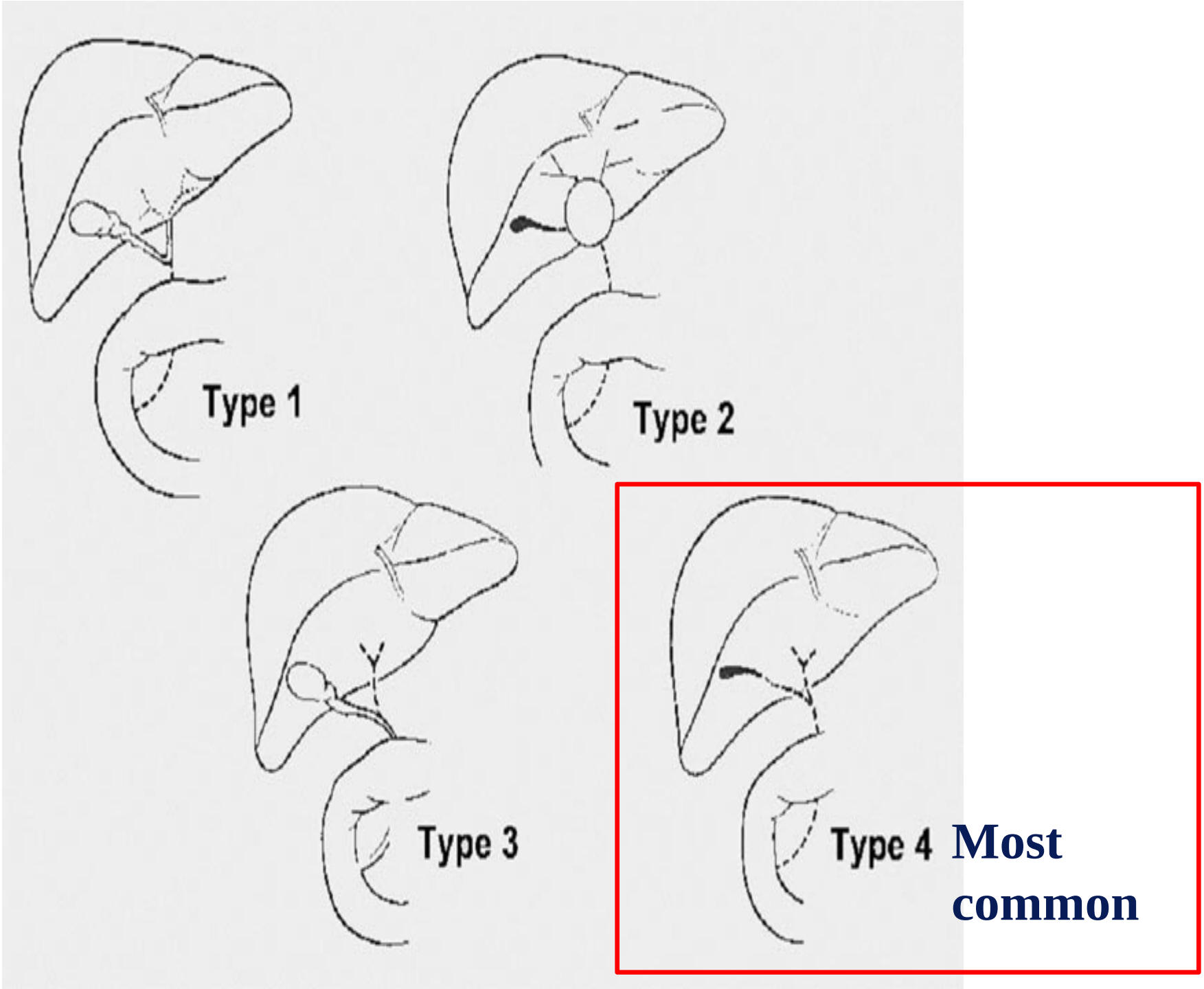

**Chen, S.-M. et al. Pediatrics 2006;117:1147-1154**



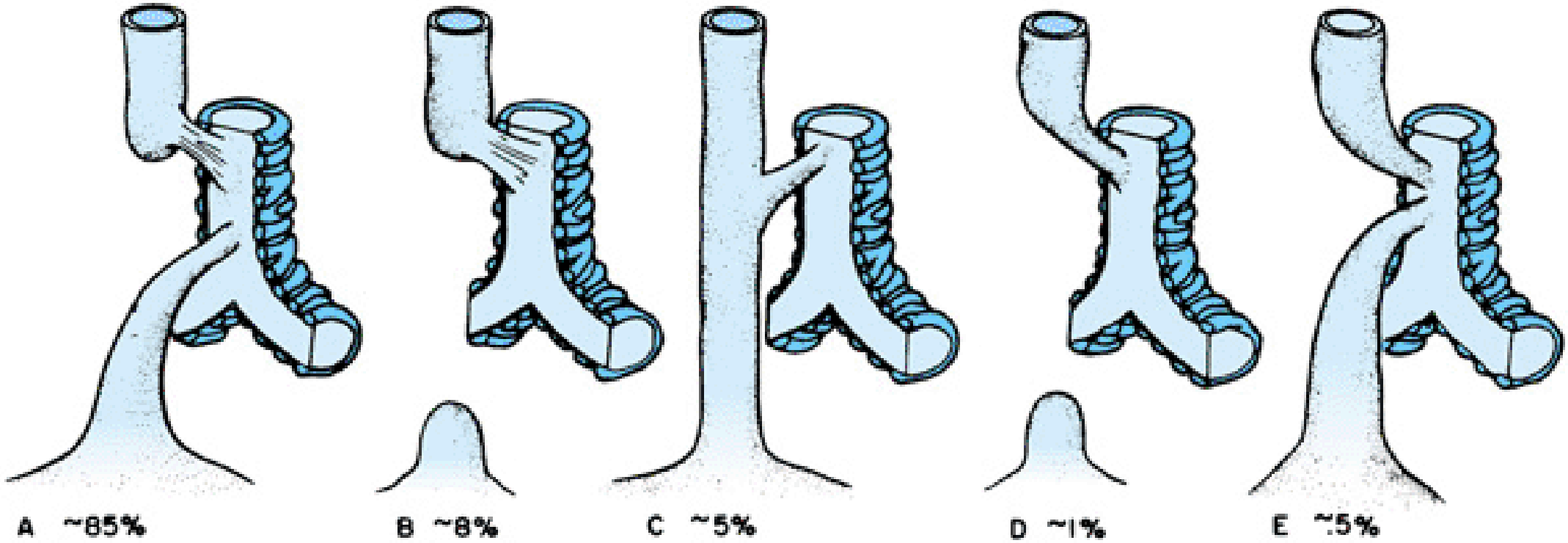
PEDIATRICS®

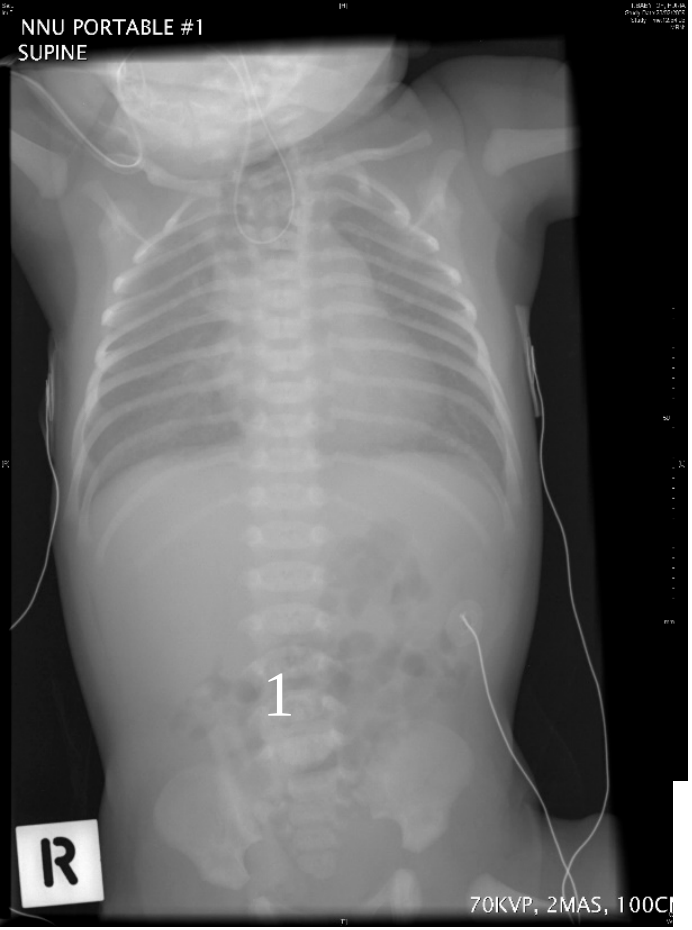
# Treatment and Outcome

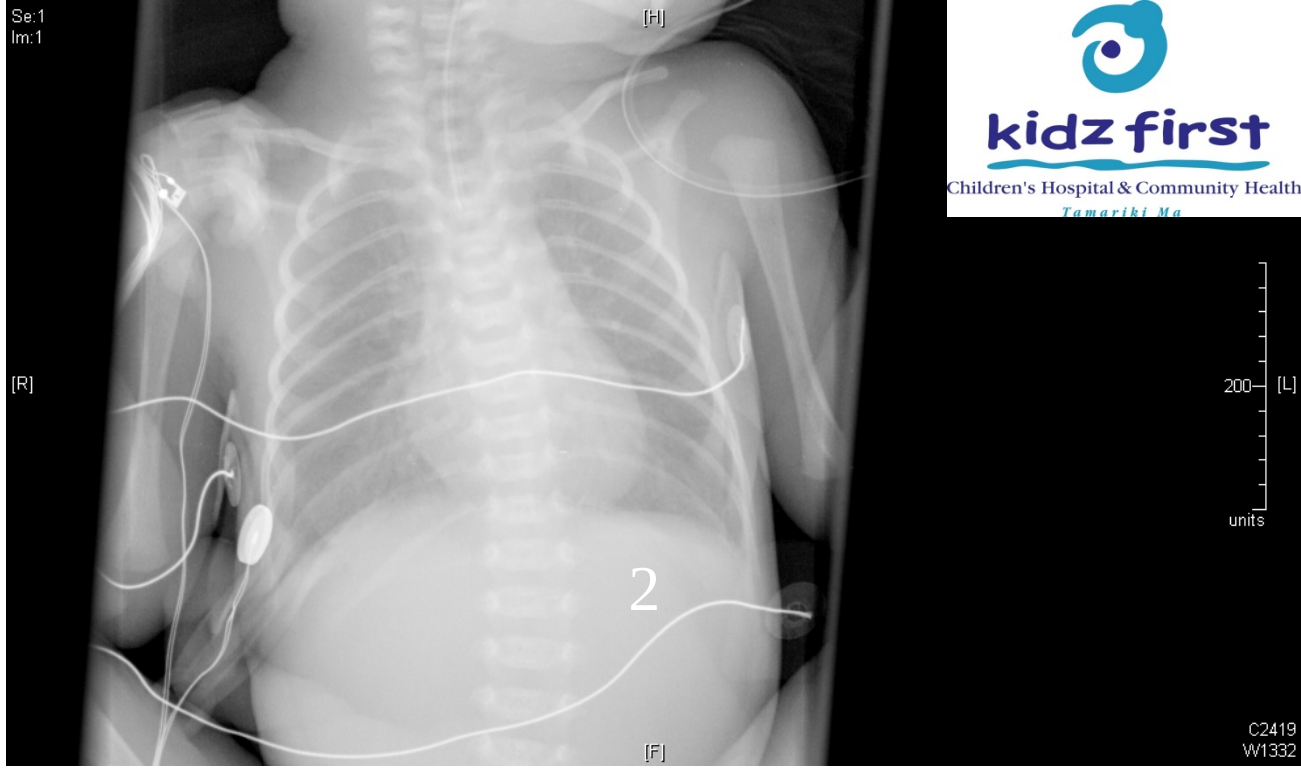
- Surgery initially
- 10 year survival 70% **IF** surgery before 60 days
- (Other reports 25-60%). Much worse if > **100 days**
- Majority will eventually need liver transplant
- 5 year survival after liver transplant = 80-90%


Type 1
Type 2
Type 3
Type 4
Most common

# Other surgical conditions


A ~85%
B ~8%
C ~5%
D ~1%
E ~5%

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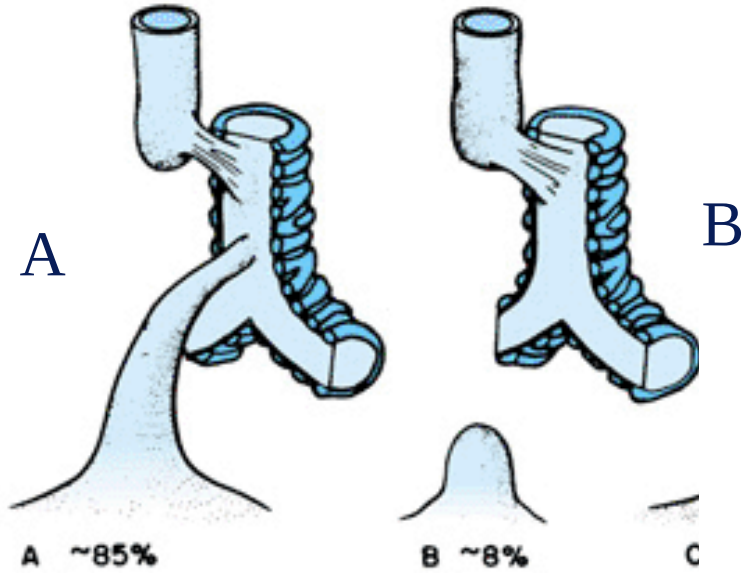
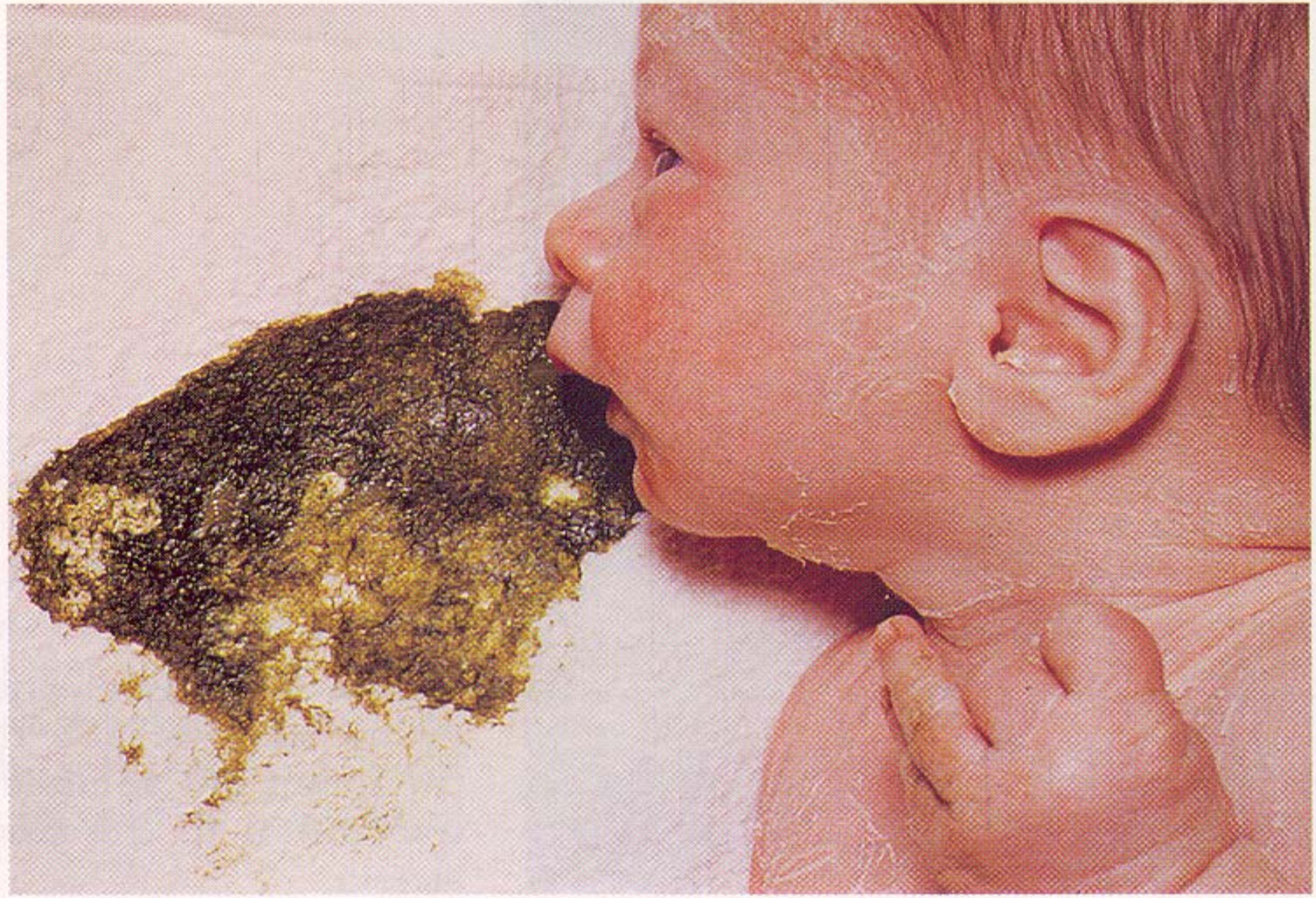
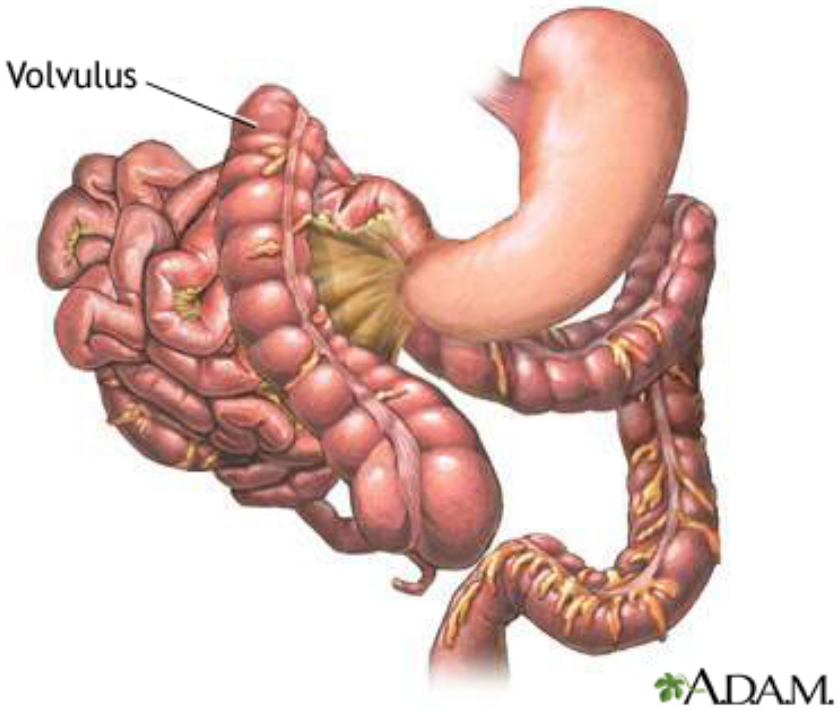
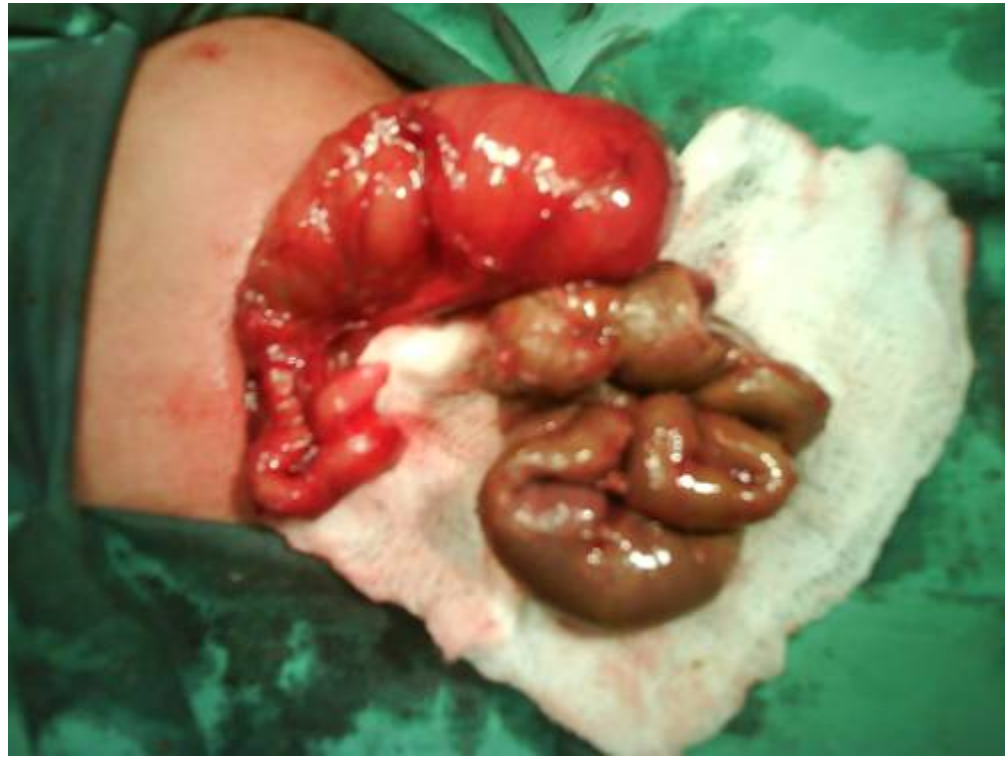
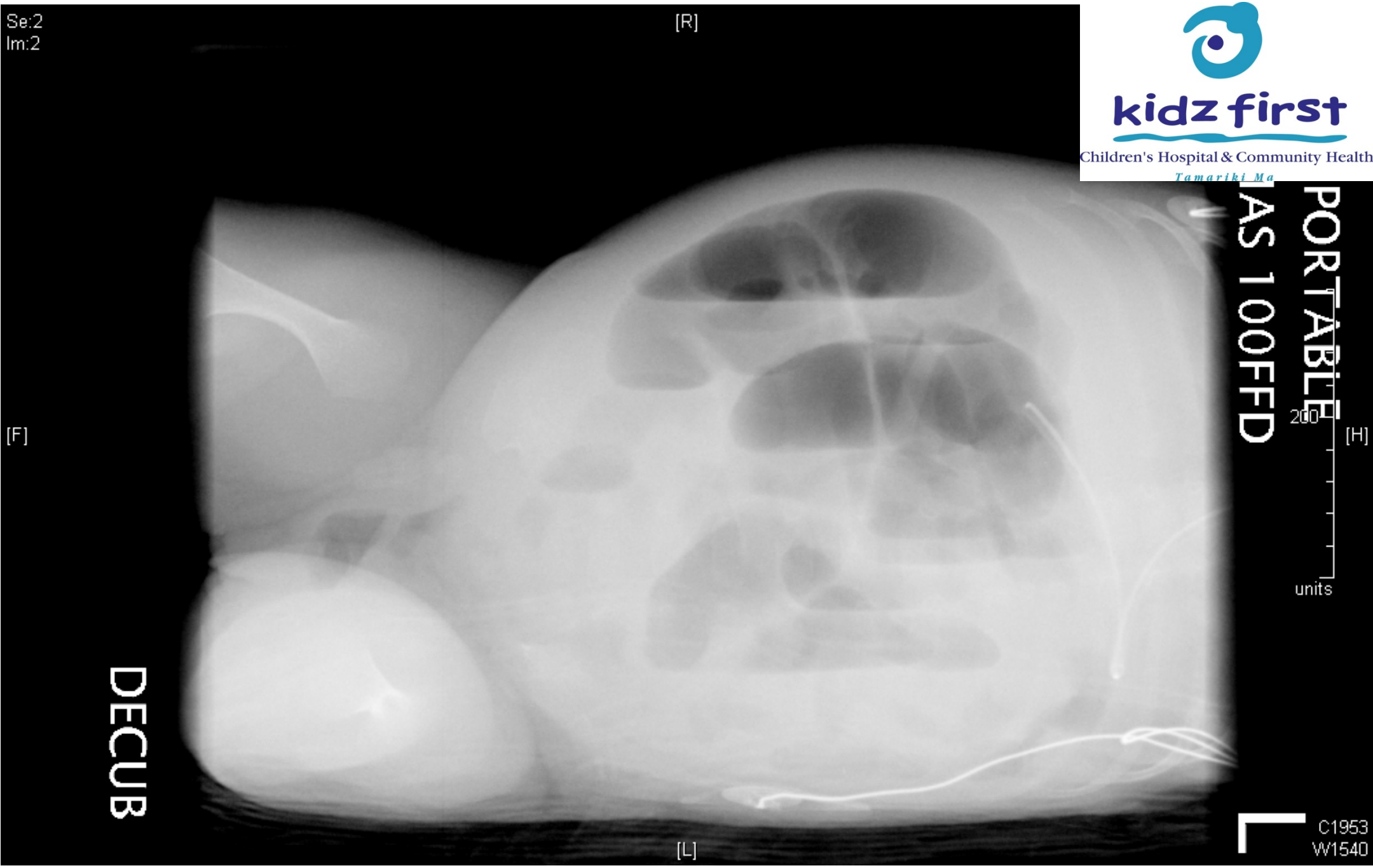





Volvulus
A.D.A.M.



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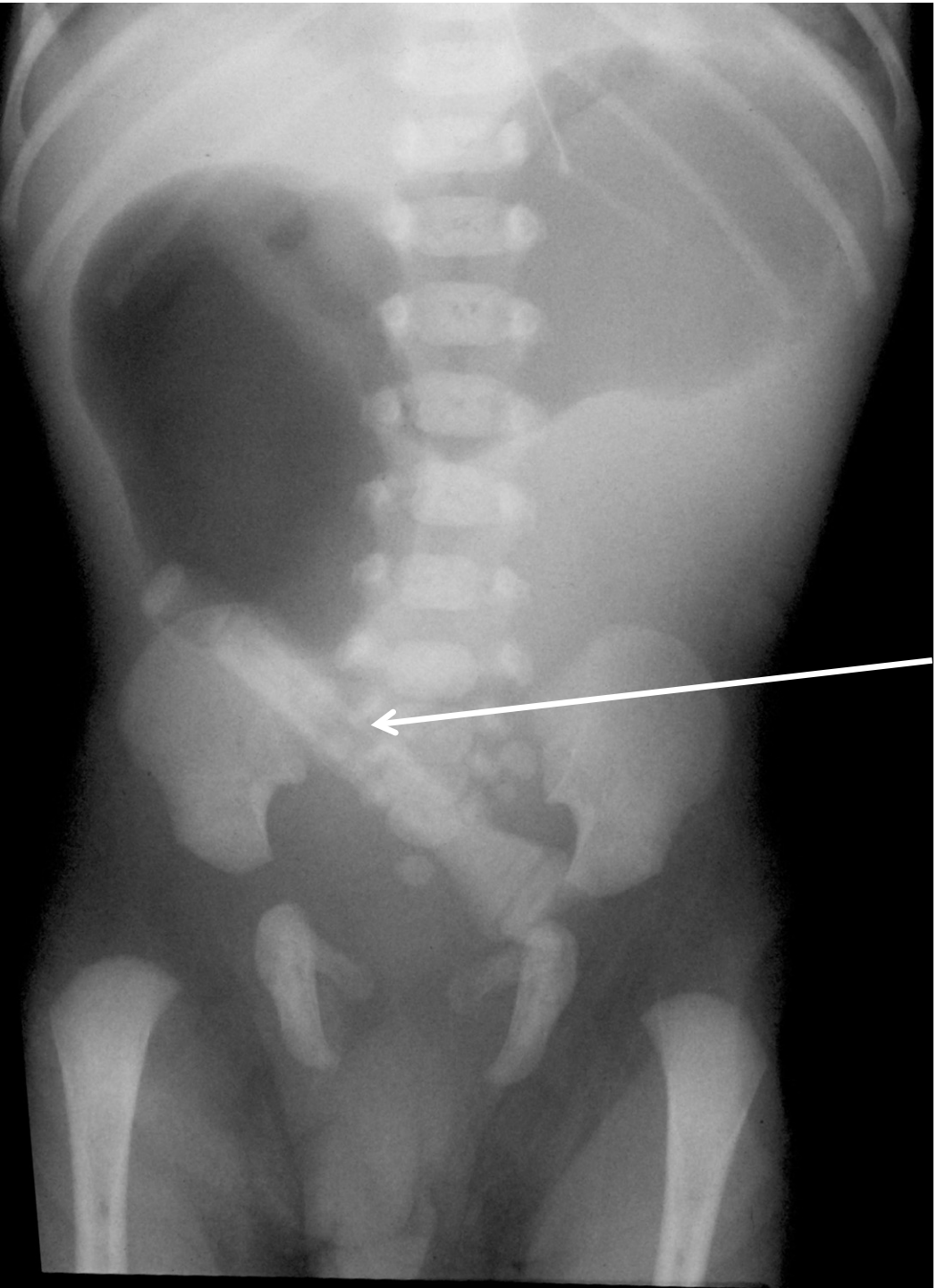
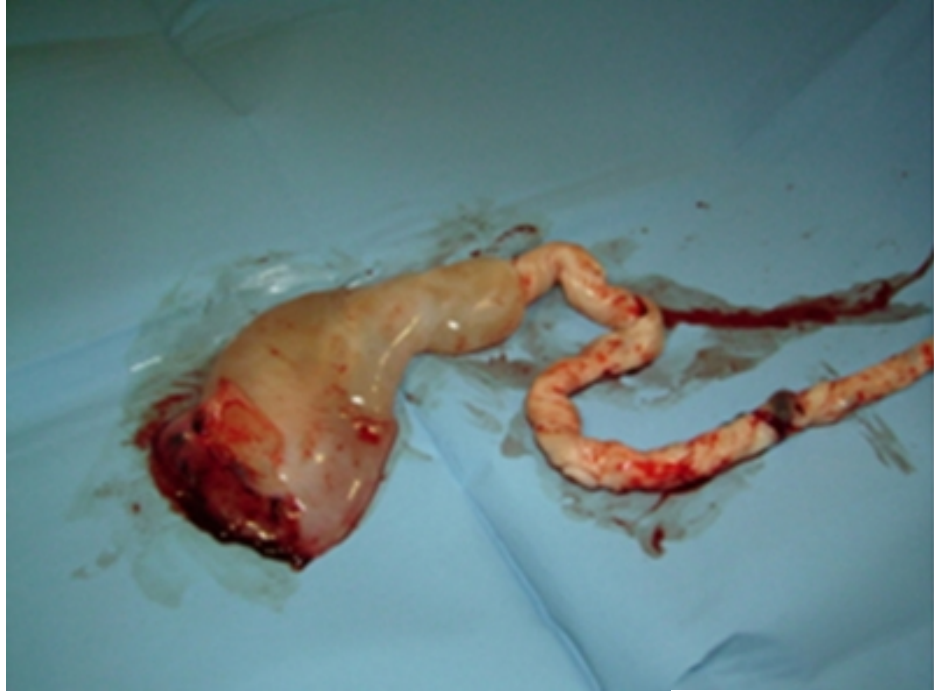
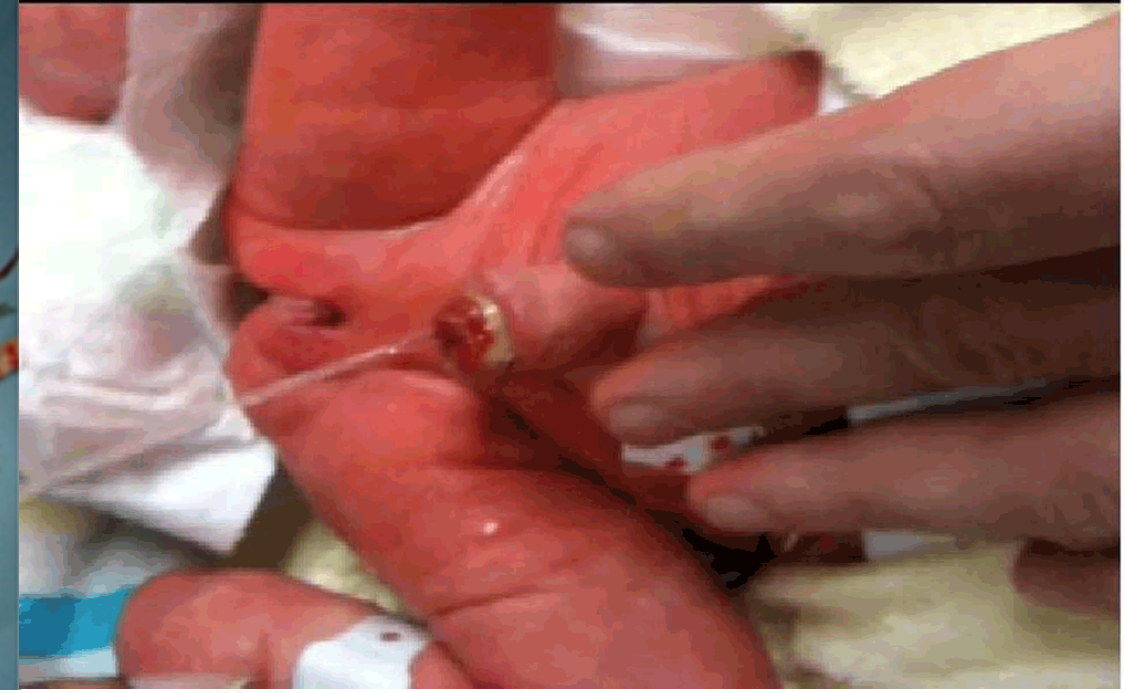
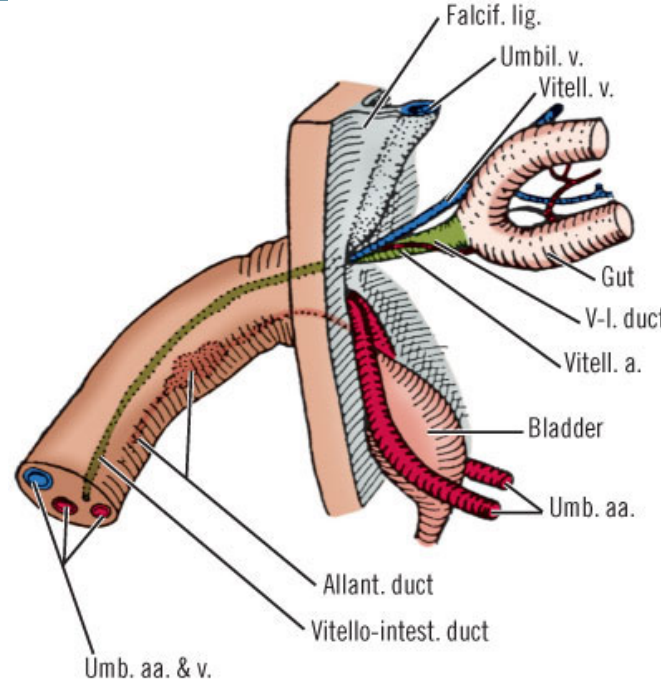


Would this baby have bilious vomiting?

Umbilical clamp







# First meconium

- Within 24-48 hours
- Is there an anus?
- Mucous plug syndrome: 2cms mec; white cap
- Other conditions: CF, hypothyroid, Hirschsprungs

14.32

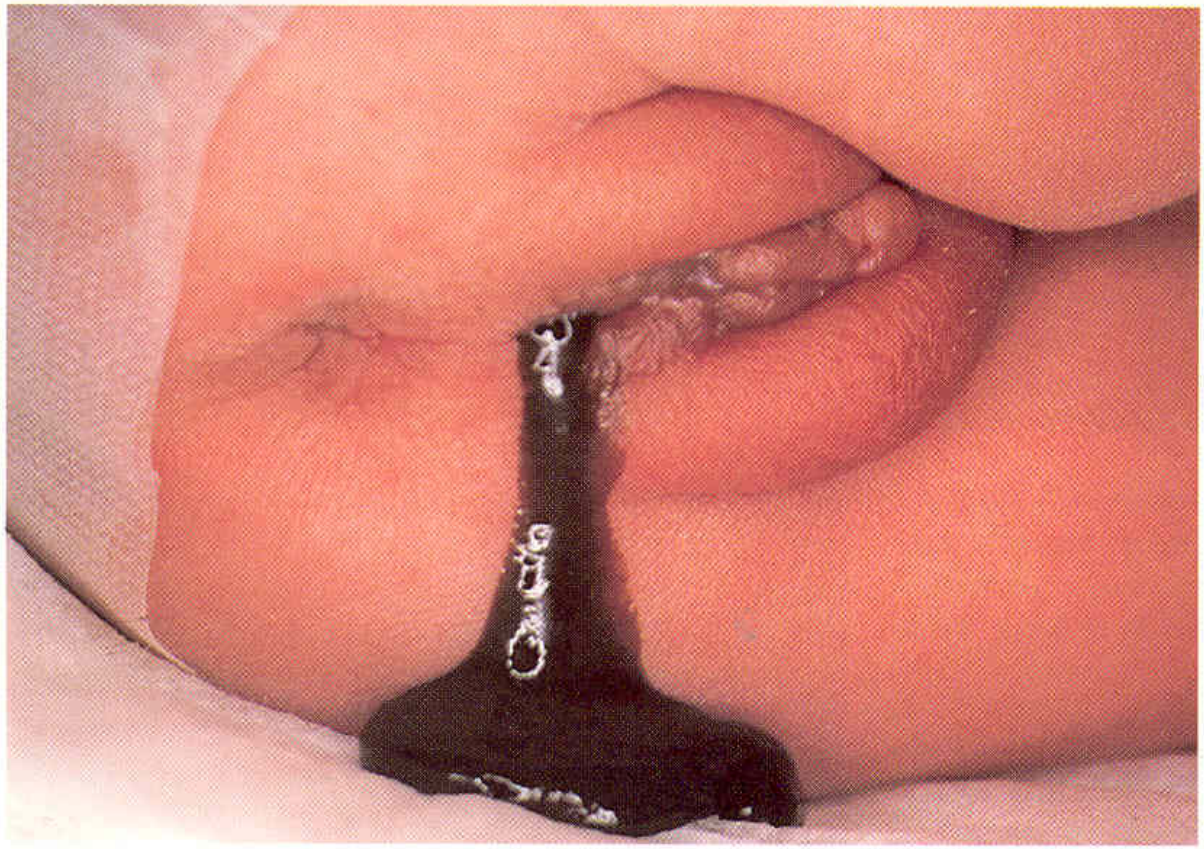


**Figure 14.32.** Imperforate anus with a rectovaginal fistula. The large fistulous tract allows for free passage of meconium hence this infant had no abdominal distention.

# Vitamin K

Phytomenadione

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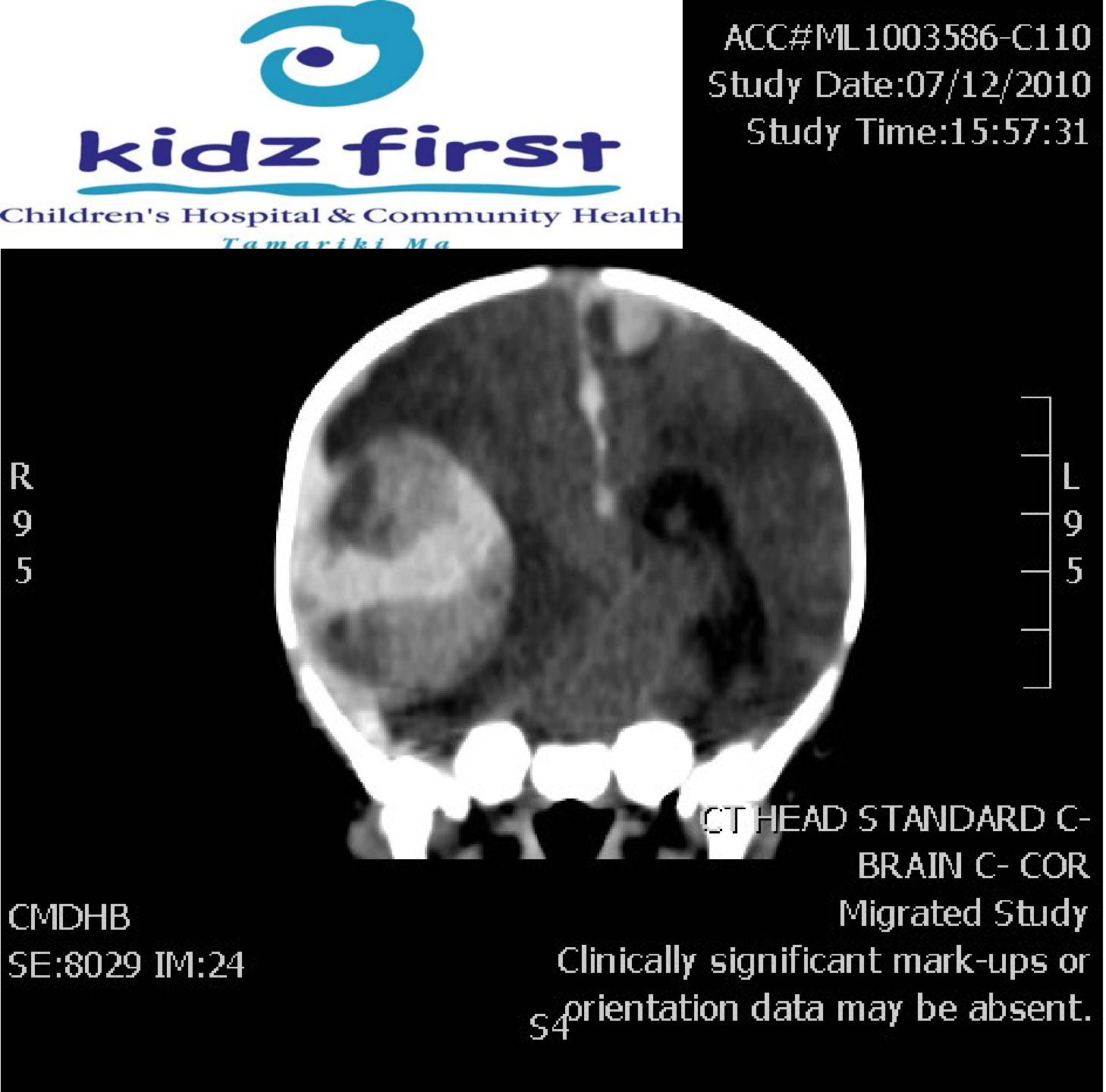



The New Zealand Herald

**Baby suffers cerebral haemorrhage after midwife failure**

By Martin Johnston

5:29 PM Monday Jun 24, 2013

Day 5

PR = 5.2

# The Problem

- Early: 1st week of life:
  - » bleeding in 0.25-1.7 %
  - » Parenteral and oral Vitamin K virtually ***eliminates***
- Late: 2-12 weeks with no or inadequate Vit K prophylaxis
  - » 4.4 to 7.2/100,000 births
  - » breast fed, cholestatic jaundice especially important
  - » Intracranial therefore often significant sequelae
  - » single dose oral Vit K ***reduces*** 1.4- 6.4 / 100,000
  - » Parenteral virtually ***eliminates***

# Vit K and Leukaemia

# Discredited

# Beware

- Mothers on anticonvulsants:
  - » Phenobarbitone
  - » Phenytoin
  - » Carbamazepine
    - Sodium valproate seems OK
- Mothers on anti-TB drugs:
  - » Isoniazid
  - » Rifampacin
- Warfarin!
- Instrumental deliveries

# Neonatal Hypoglycaemia

- Blood sugar < 2.6 mmol/l
- (Hyperglycaemia = BG > 7.0mmols/l)

# Why 2.6? 1988: 2 papers

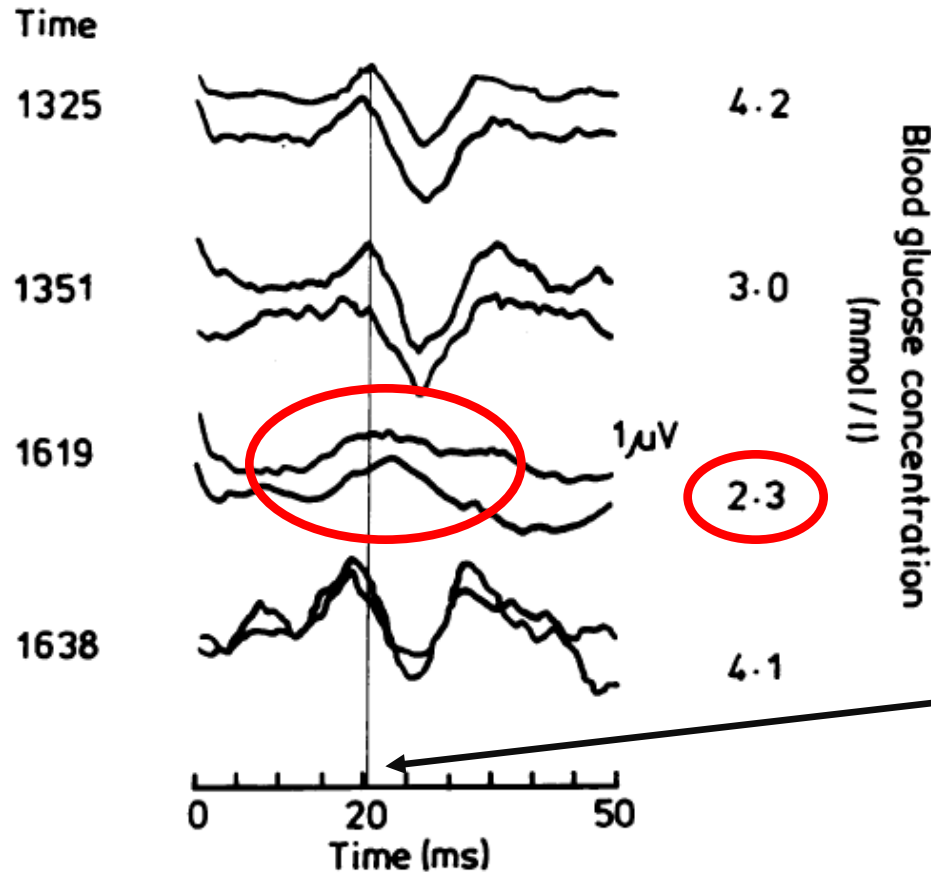
- 17 children (5 neonates) with:
  - endocrine disorders (having induced hypo's with insulin)

OR

  - Recurrent spontaneous hypo's

- Latency of auditory/ somatosensory evoked potential in response to clicks

*Archives of Disease in Childhood*, 1988, **63**, 1353–1358




Time for pulse to arrive at cortex

Fig 1 *Serial somatosensory evoked potentials recorded in subject 6 in relation to her blood glucose concentration. The vertical line indicates the latency of $N_1$ in the initial recording during normoglycaemia.*

*Archives of Disease in Childhood,* 1988, **63,** 1353–1358

# Neural dysfunction during hypoglycaemia

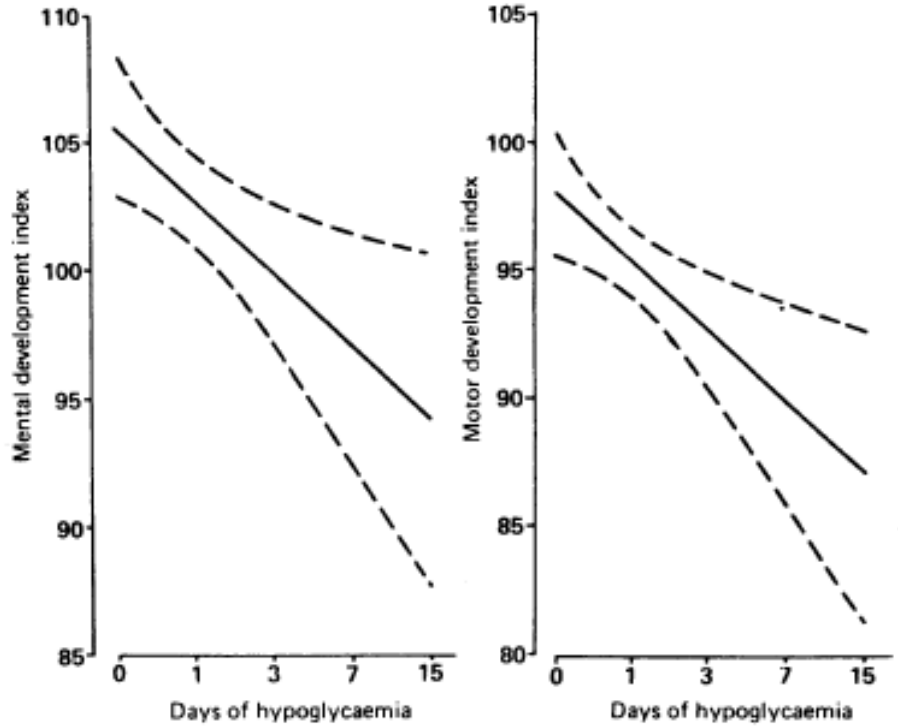
T H H G KOH, A AYNSLEY-GREEN, M TARBIT, AND J A EYRE
*Department of Child Health, University of Newcastle upon Tyne*

**Adverse neurodevelopmental outcome of moderate neonatal hypoglycaemia**

A Lucas, R Morley, T J Cole

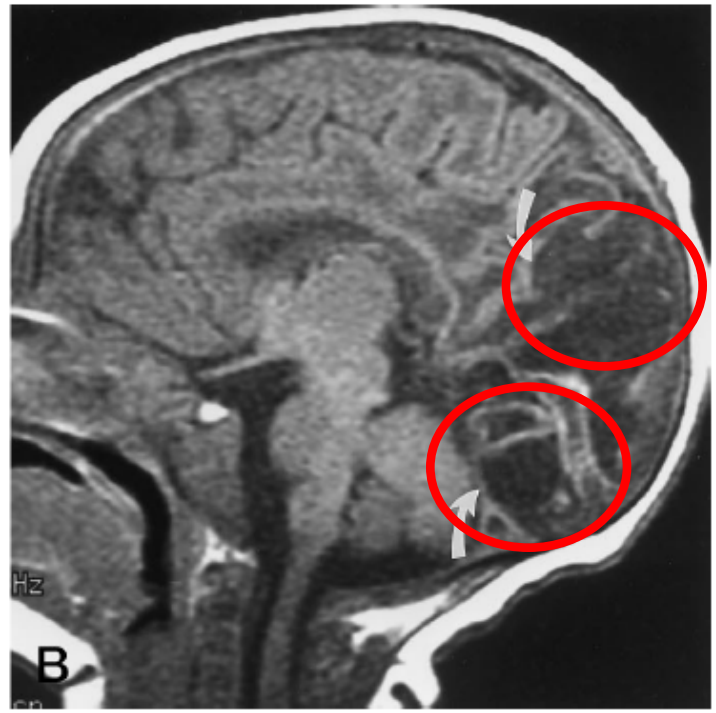
- 661 preterm infants
- If moderate hypoglycaemia (< 2.6) recorded on 5+ days; 18 months corrected age scores:
  - » Mental / Motor Developmental scores ⇩ 14 / 13 points
  - » Cerebral palsy / Developmental delay ⇧ 3.5x

BMJ VOLUME 297 19 NOVEMBER 1988




*Logarithm of days of recorded hypoglycaemia <2·6 mmol/l related to Bayley mental development index and Bayley psychomotor development index at 18 months (corrected age). Regression slopes and 95% confidence intervals (broken lines) are shown adjusted for days of ventilation, sex, social class, birth weight, and fetal growth retardation. Data shown are for both sexes and all social classes combined and for no ventilation. For infants ventilated for 1-6, 7-14, or >14 days subtract 5, 10, or 15 points respectively for mental development index and 4·5, 9·0, or 13·5 points for psychomotor development index.*

# Profound / Prolonged Hypoglycaemia

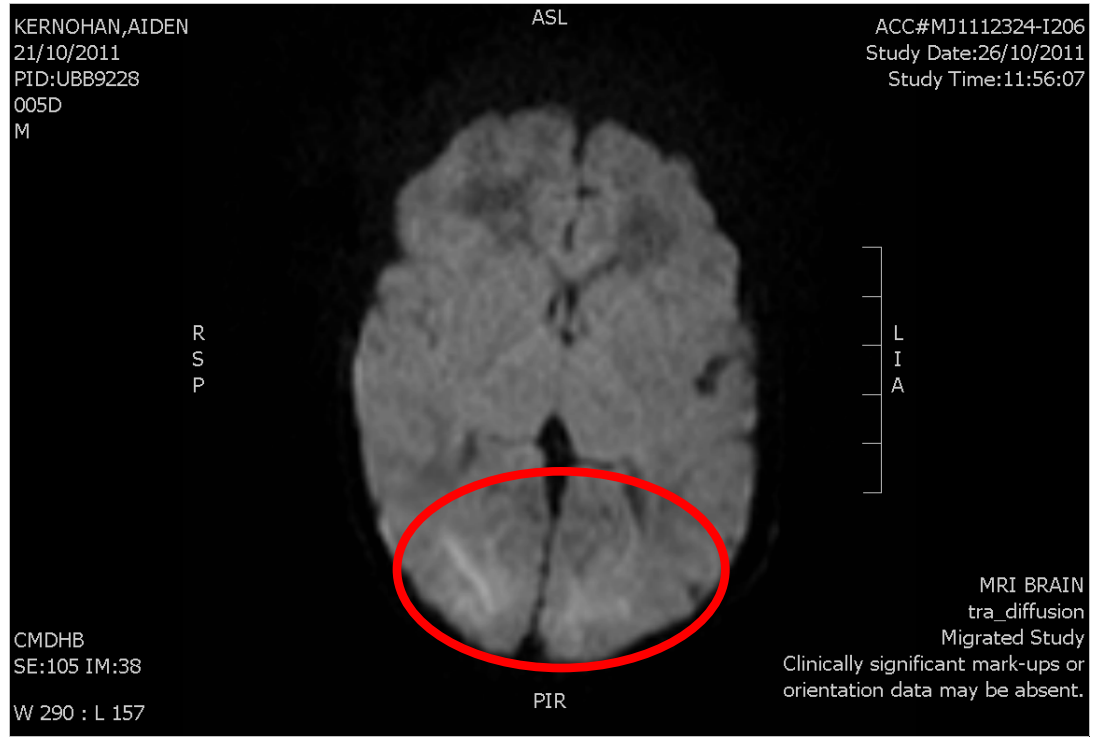


# At risk babies

- Infants born preterm (< 37 weeks)
- Infants of diabetic mothers
- Small (<2.5 kg or <10$^{th}$ centile)*
- Large (>4.5 kg)

- Babies at risk after birth for hypoglycaemia:
  - Hypothermic babies
  - Babies not feeding well
  - Babies unwell for any reason

# Out of left field




| | | |
|---|---|---|
| Glucose | 0.9 mmol/l | (3 – 11) |
| B Hydroxy Butyrate | 0.61 mmol/l | (0 – 0.27) |
| Insulin | 9.0 mIU/l | (3 – 11.0) |

# Why screen?

- (Supposed) Clinical signs:
  - Jitteriness
  - Sweating
  - Apnoea
  - Seizures
- Subtle and non specific

# Screening and Dextrose Gel

- Blood glucose measurement within one hour of birth regardless of feeding, followed by three to four hourly pre-feed measurements.

- Babies at risk after birth should have a blood glucose measurement as soon as the problem is recognised.

# Screening

- Discontinue blood glucose measurements when:
  - Babies feeding well without dextrose gel
  - have three pre-feed blood glucose concentrations ≥ 2.6 mmol/l, three to four hours apart.

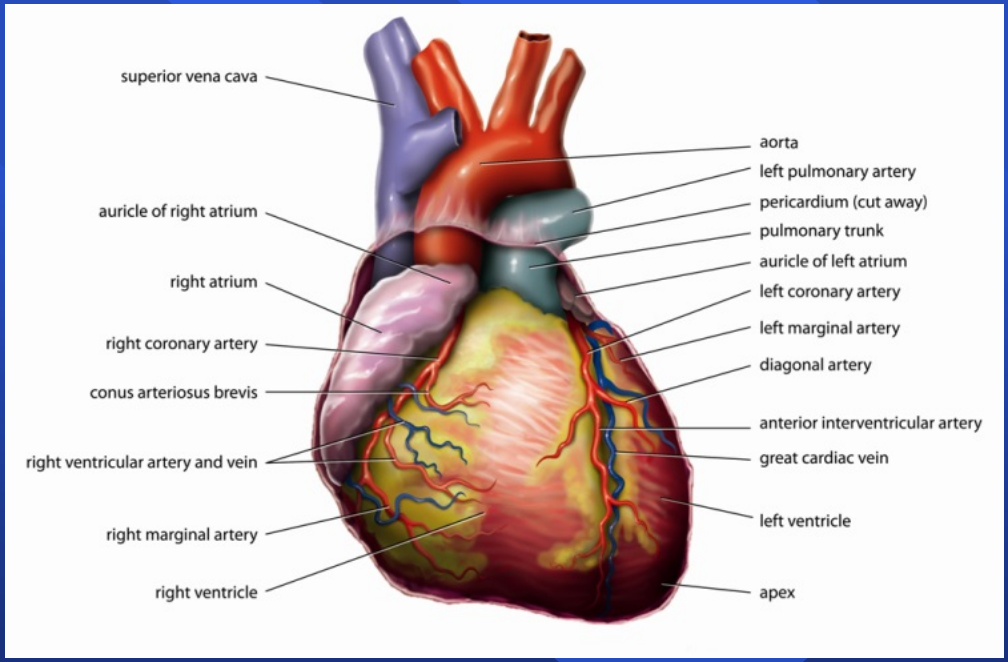
# Dextrose gel treatment

- Aim to keep baby with mother
- Aim to avoid infant formula
- Aim to keep blood glucose within normal limits

# Dextrose gel treatment

- Syringe draw up 40% dextrose gel, 0.5 ml/kg.dose to buccal mucosa then feed (breast etc)
  - Recheck blood glucose 30 mins after the gel
  - BG ≥ 2.6 mmol/l then normal cares
  - BG < 2.6 mmol/l then repeat steps
- Then:
  - BG after 30 mins or after the feeding event
  - BG ≥ 2.6 mmol/l then normal cares
  - BG < 2.6 mmol/l (for a second time) then escalate care to paediatrics.

# Cardiac Examination



# Case History

- 18 year old primigravida
- Anatomy scan 20 weeks……..Normal
- NVD at Term
- LMC care: discharged at 12 hours of age

# Case History

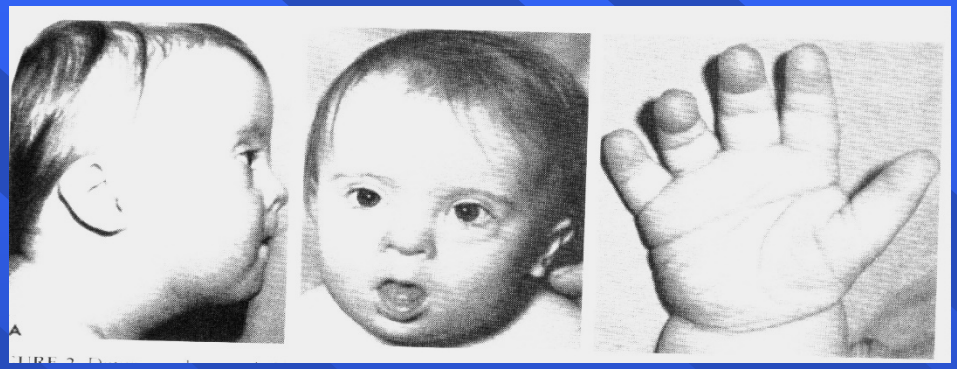
- Midwife visits at 36 hours
- Baby not feeding / low temp
- Parents to EC
- Saturations: 40%
- Blood glucose unrecordable

# Case History

- Hypoxic ischaemic changes on Head MRI
- Severe acute tubular necrosis – PD for 2 weeks
- Arterial switch at 2 weeks (2nd hit)
- Cost so far $100,000

# Cardiac Examination

- Dysmorphic?



- Central colour (pulse oximetry > 95%)
- Peripheral perfusion
- Pulses: Femorals / Brachials

# Cardiac Examination

- Auscultate heart:
  - » Base
  - » Apex
  - » Supraclavicular
  - » Back
- Murmur

# Clinical examination

- Routine newborn examination will fail to detect > 50% of infants with significant cardiac disease

- Trisomy 21
  - » not more effective
  - » Sensitivity of 53%[Ψφ]

Ψ Wren C, et al. Presentation of congenital heart disease in infancy: implications for routine examination. Arch Dis Child Fetal Neonatal Ed. 1999;80(1):F49-53.
φ Tubman TR, et al. Congenital heart disease in Down's syndrome: two year prospective early screening study. BMJ. 1991;302(6790):1425-7.

# Clinical examination

- Mild cyanosis difficult to detect
  - Ethnicity
  - Perfusion
  - Environmental factors

- Murmurs often absent
  - No correlation between severity of cardiac malformation and likelihood of detecting a murmur[Ψ]

Ψ Wren C, et al. Presentation of congenital heart disease in infancy: implications for routine examination. Arch Dis Child Fetal Neonatal Ed. 1999;80(1):F49-53.

# Congenital Heart Disease

**Individually rare but collectively common**

Difficult to diagnose

Can we screen for this?

Elza Cloete: Neonatologist Auckland

# Definitions: 5 year NZ audit

- Major congenital heart disease: Structural abnormality of the heart or intra-thoracic great vessels which require intervention, or is associated with death in fetal life or in the first year of life.

- Critical congenital heart disease: Major CHD that is duct-dependent, or requires intervention or results in death at $\leq$ 28 days of age.

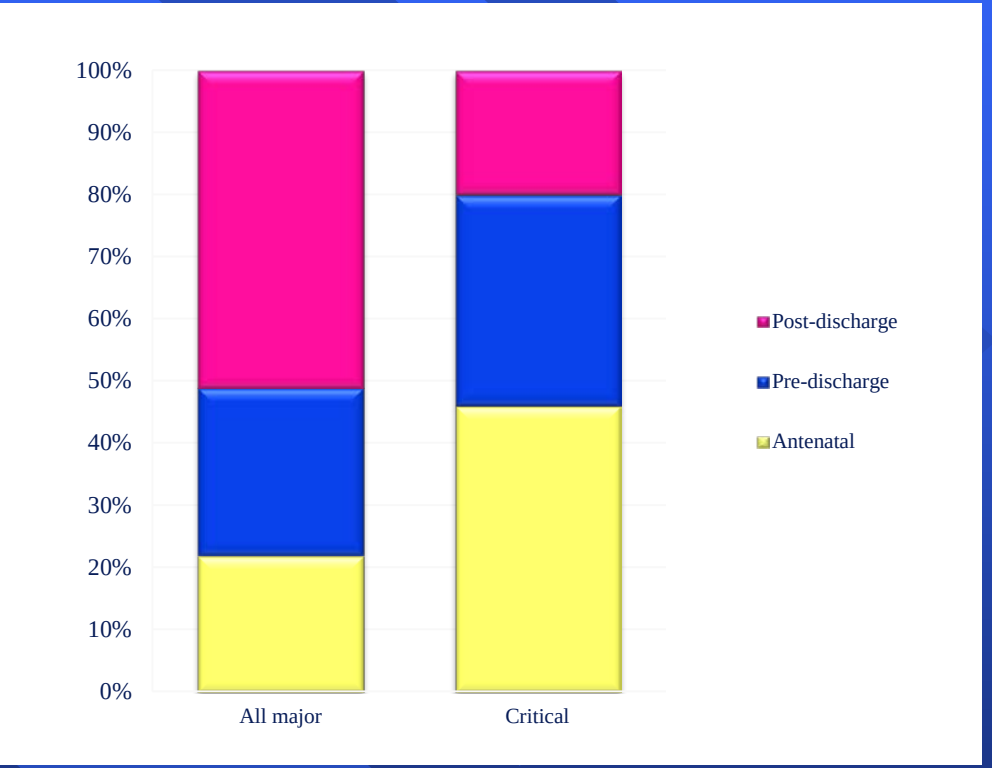
# Key findings: 5 year NZ audit

- 734 cases of major CHD
- 353 critical
- Incidence

  Major: 2.34 per 1000

  Critical: 1.12 per 1000

- Timing of diagnosis:




- Late diagnosis associated with higher mortality risk (27% vs. 16%)

# Antenatal ultrasound

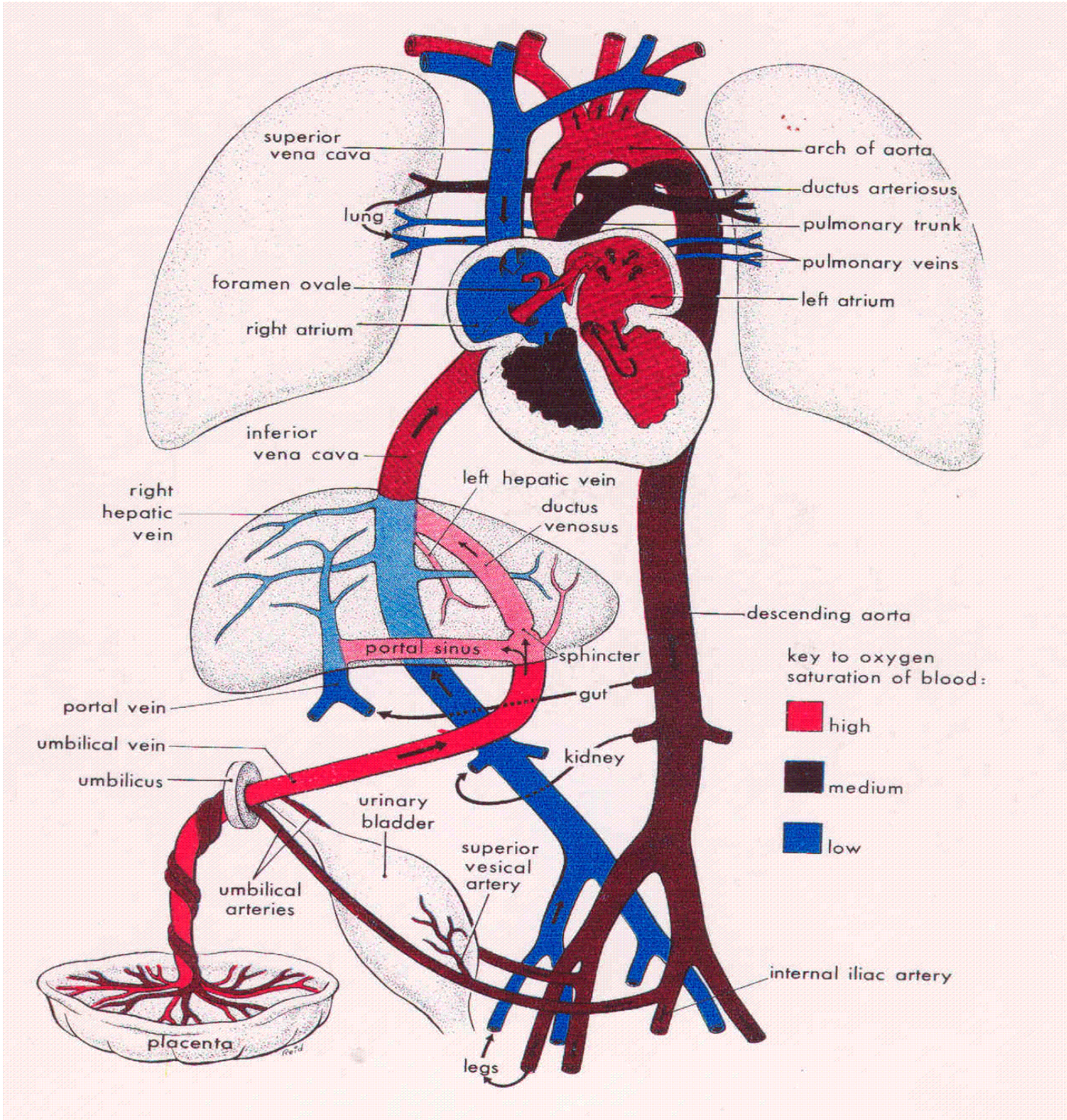
Modest sensitivity

- Service delivery
  - Availability/quality of equipment
  - Skills (Tertiary v. rural, extracardiac defects, type of defect)

- Service utilisation
  - Education
  - Ethnicity
  - Geography
  - Parity
  - Age

- Maternal BMI

What type of lesions we talking about?




In utero: 2 pumps in parallel

Ex utero: 2 pumps in series

# Congenital Heart Disease

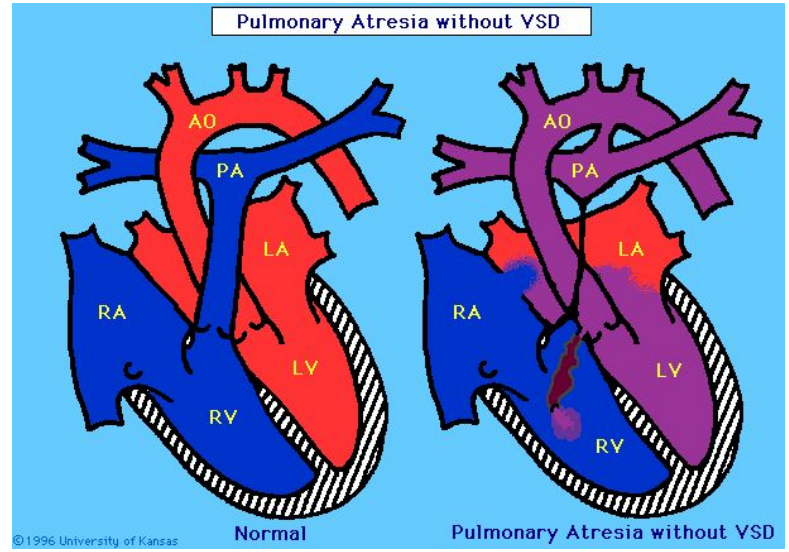
- Cyanotic*
  - Duct Dependent, Not breathless
  - Duct Dependent, Breathless
  - Not Duct Dependent and Breathless

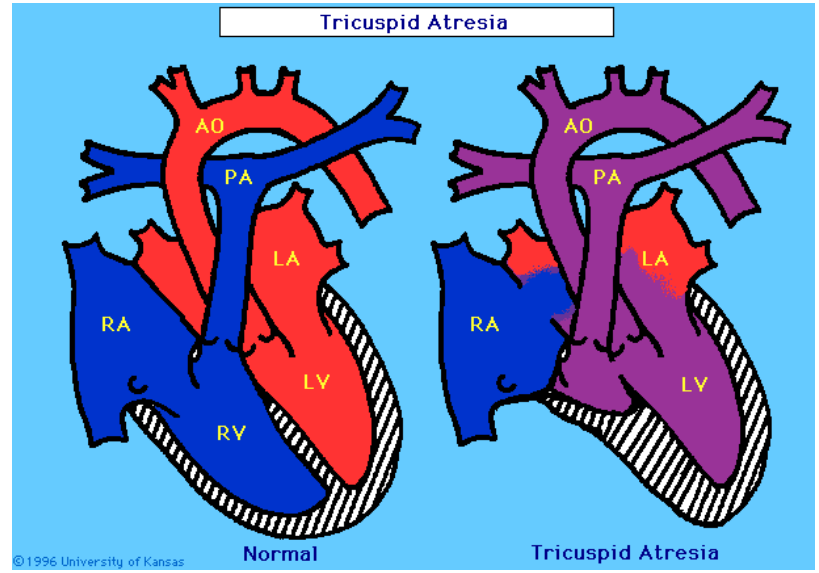
- Pink
  - Duct dependent and Breathless
  - Breathless

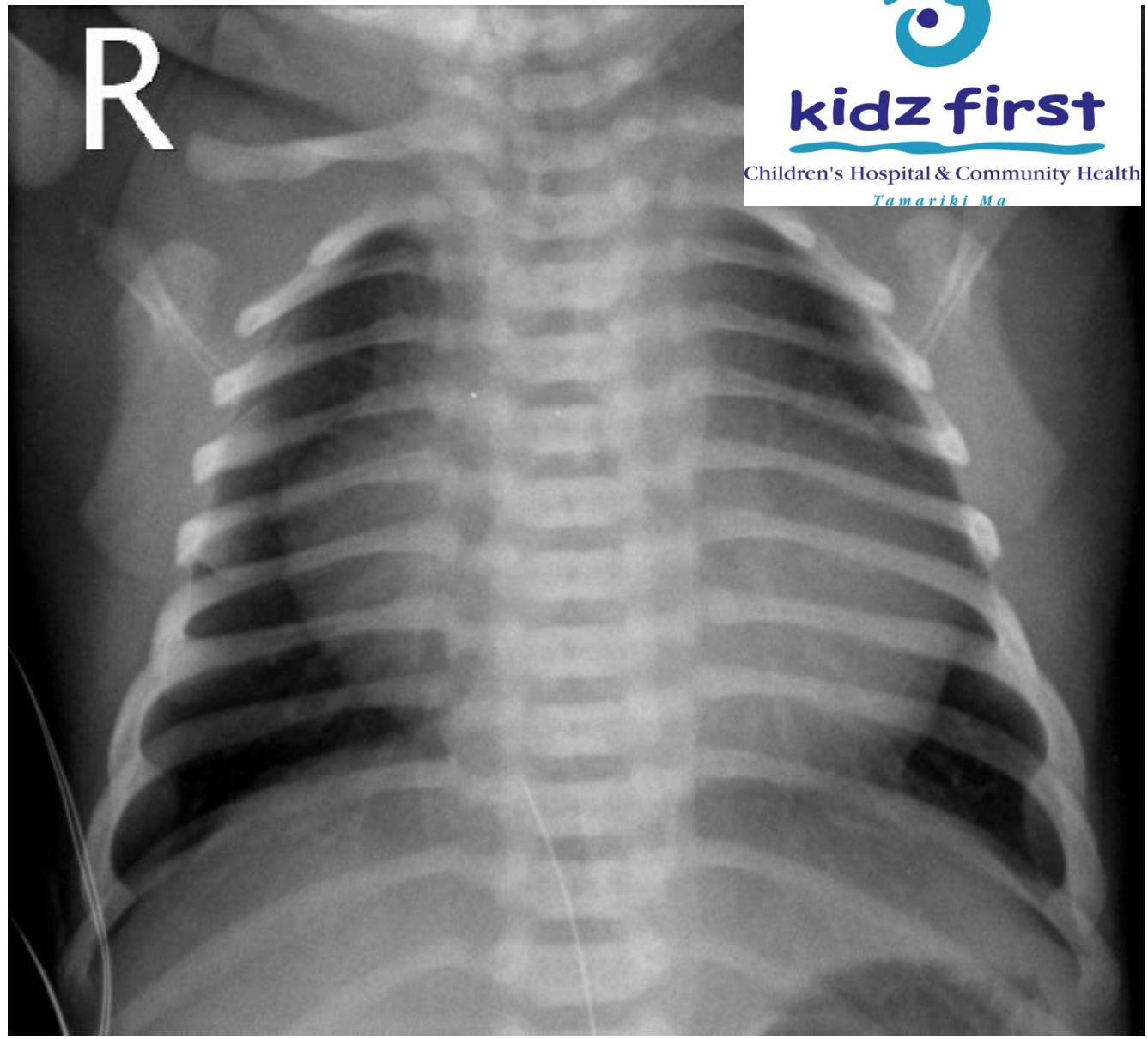
* Oximetry screening will detect

# Congenital Heart Disease

Duct Dependent, Not breathless + Blue


Pulmonary Atresia without VSD
AO
PA
LA
RA
LV
RV
AO
PA
LA
RA
LV
RV
©1996 University of Kansas
Normal
Pulmonary Atresia without VSD


Tricuspid Atresia
AO
PA
LA
RA
LV
RV
AO
PA
LA
RA
LV
©1996 University of Kansas
Normal
Tricuspid Atresia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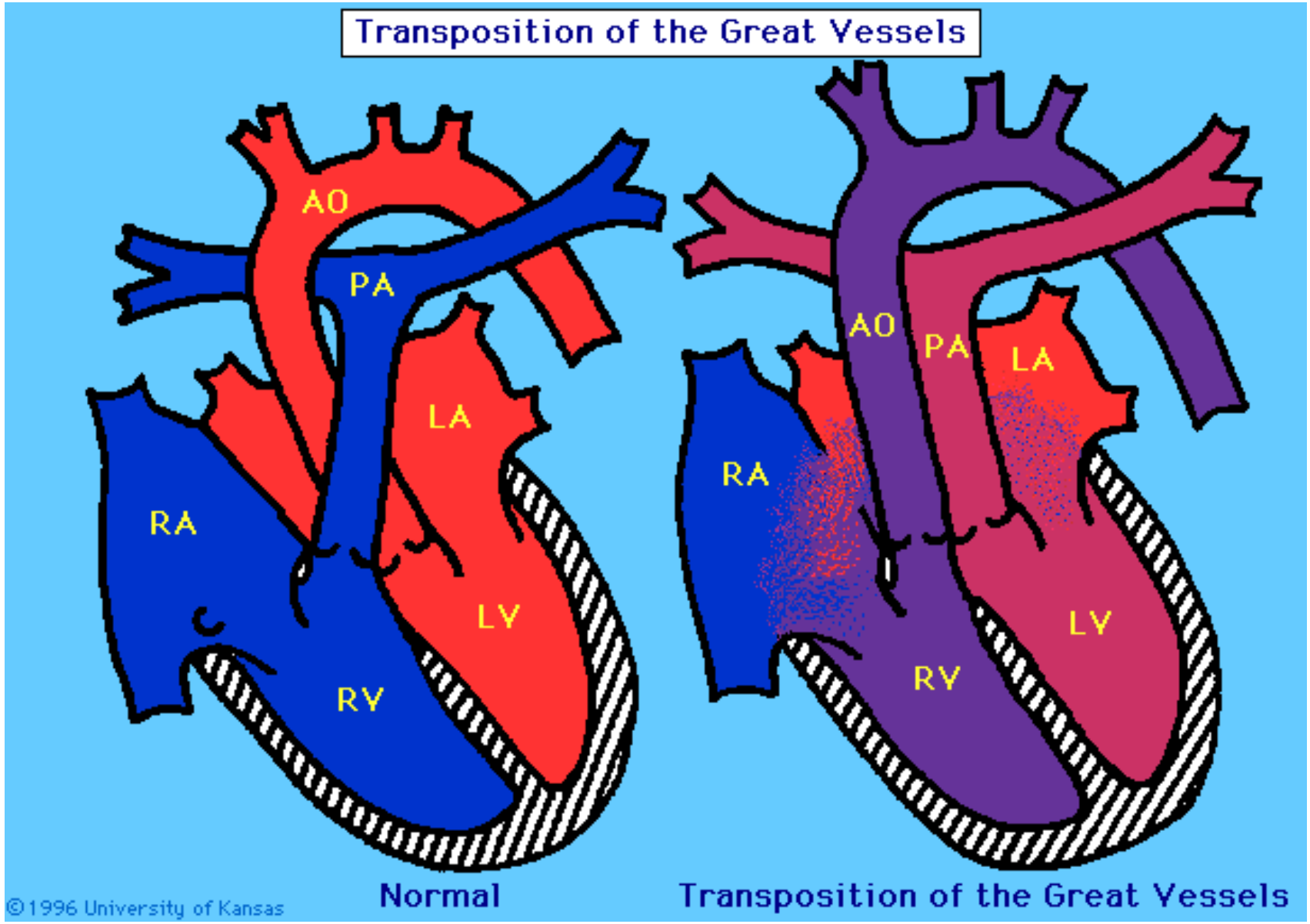
# Congenital Heart Disease

Duct Dependent, Breathless
+ Blue


Transposition of the Great Vessels
AO
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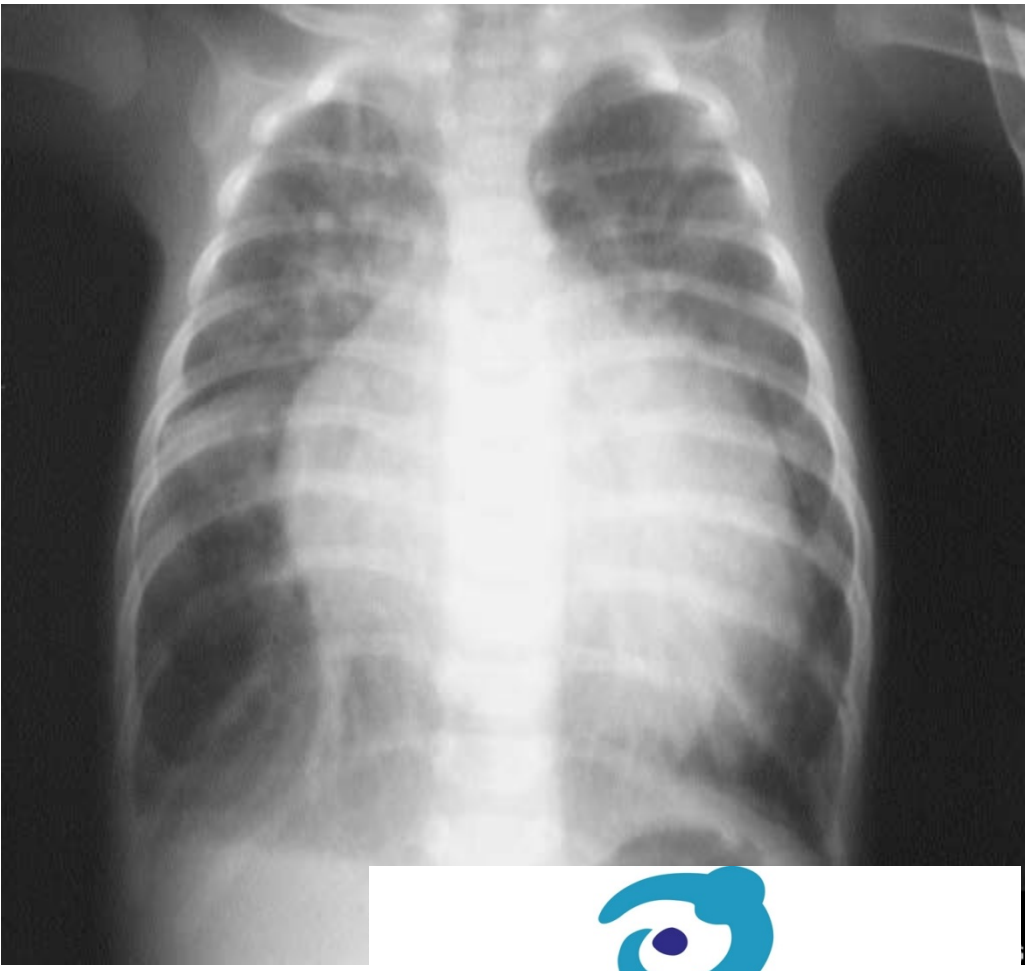
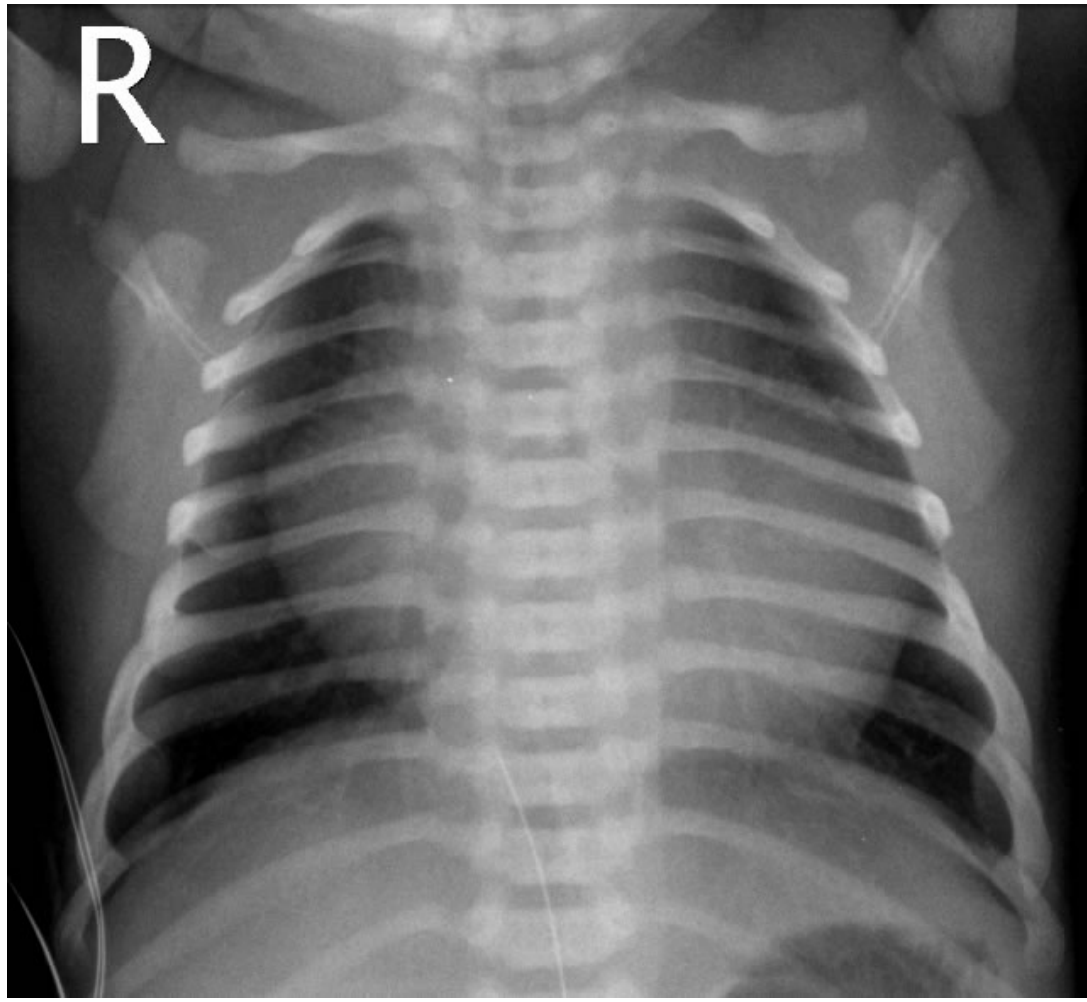
RA
LV
RV
AO
PA
LA
RA
LV
RV
Normal
Transposition of the Great Vessels
©1996 University of Kansas



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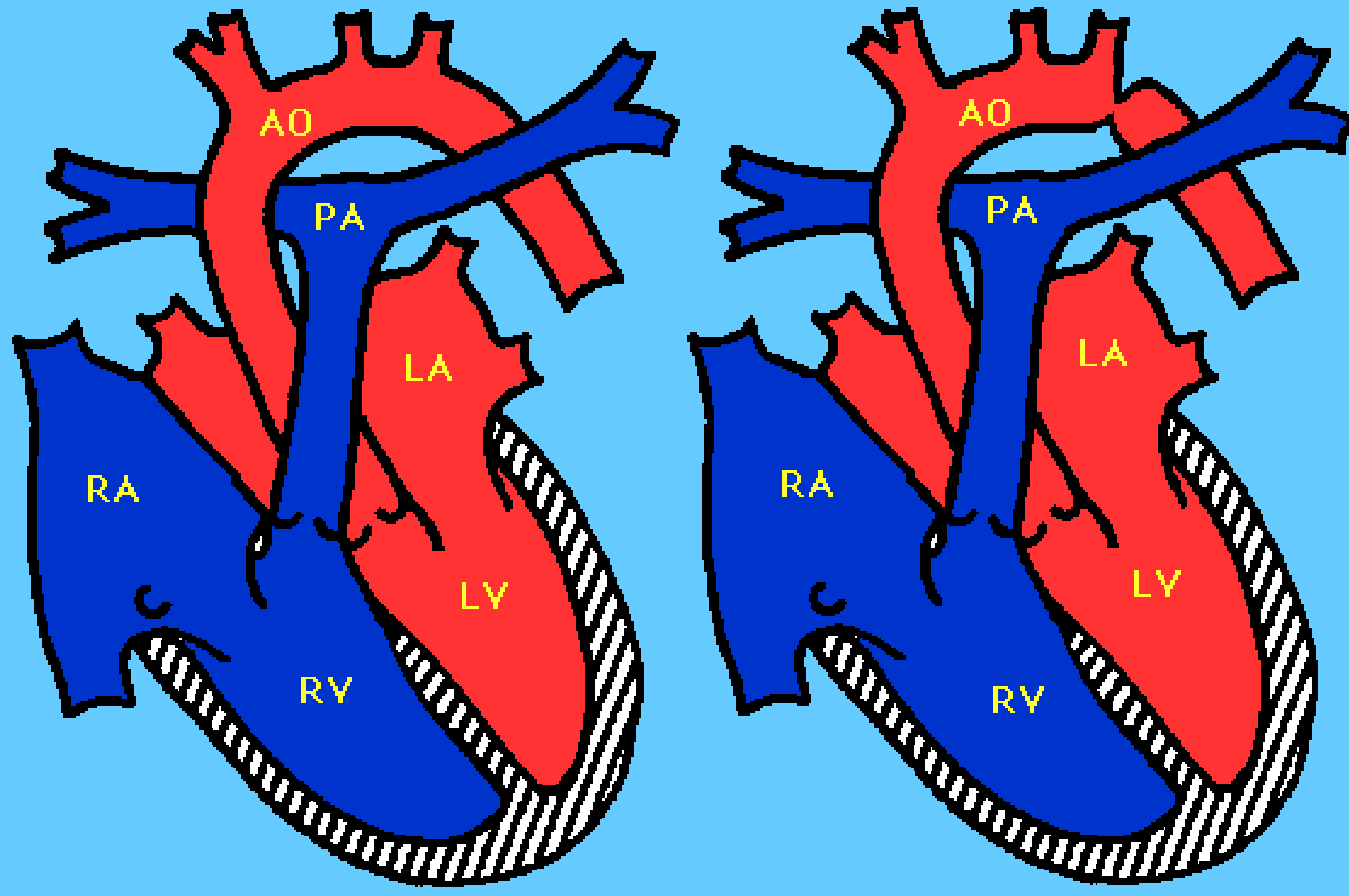
# Emergency Treatment

$PGE_1$

# Congenital Heart Disease

Duct Dependent, Breathless
+ Pink

# Coarctation of the Aorta




Normal

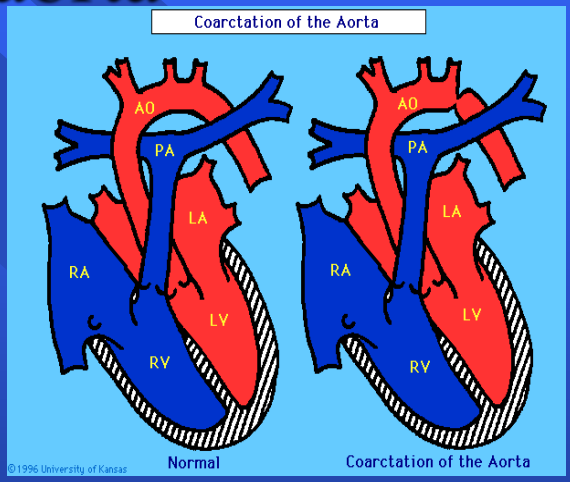
Coarctation of the Aorta

# Coarctation

- Rarely isolated (17%)
- Severe isolated: heart failure weeks
- + large VSD: heart failure days

# Coarctation

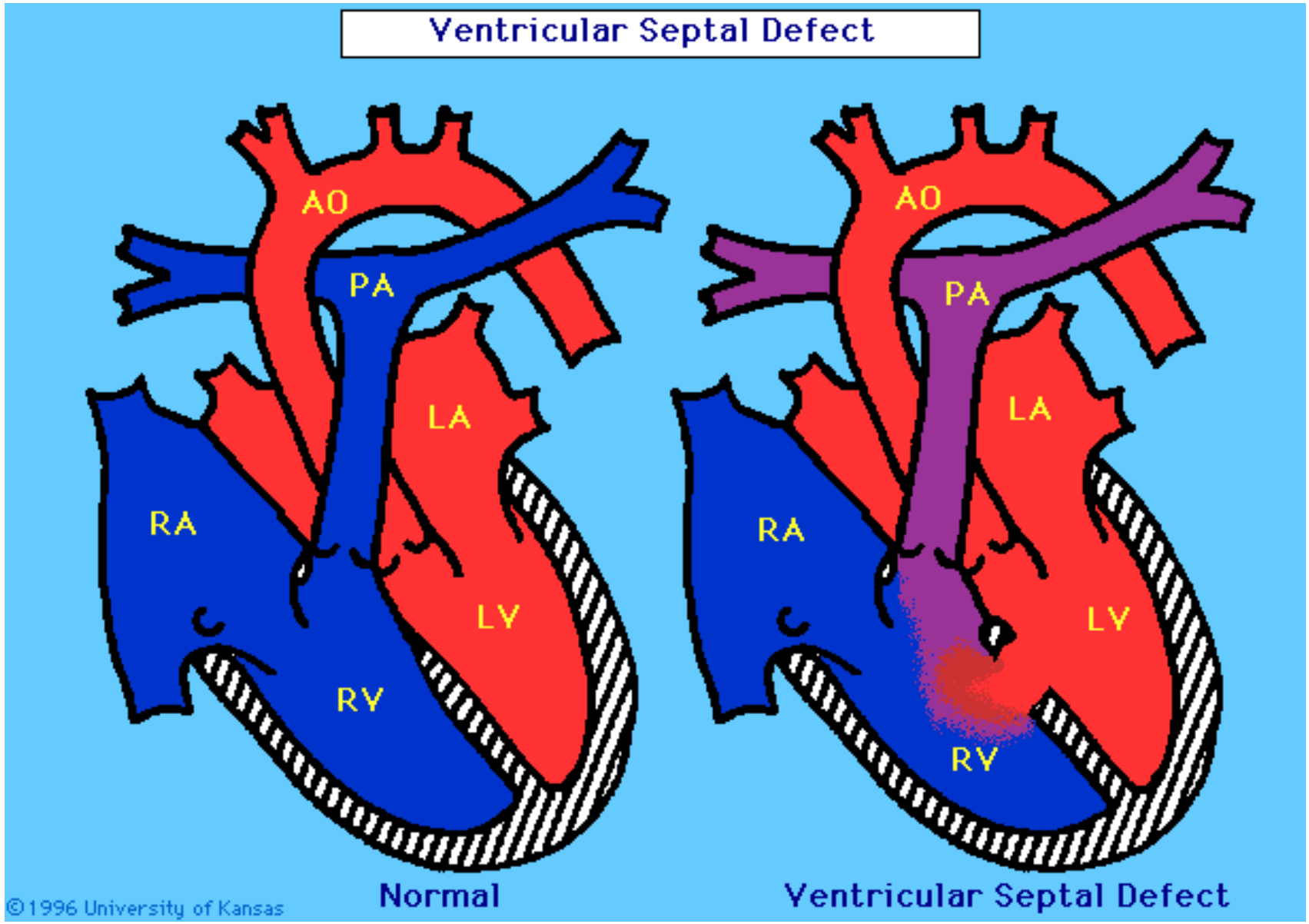
- ?extension of ductal tissue into wall of aorta
- Becomes more obstructive with time

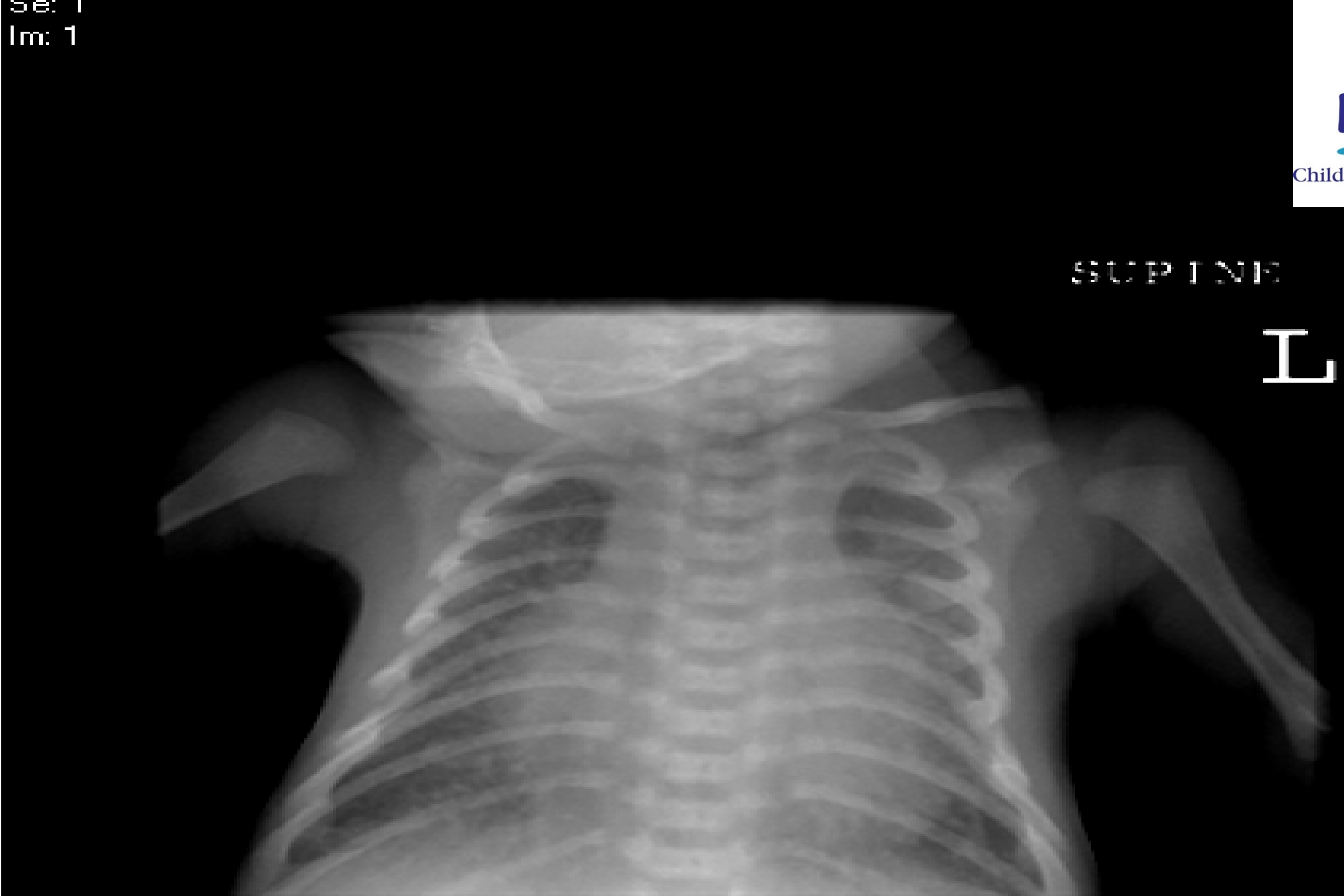



- Collaterals: internal mammary, scapular & intercostals
- Average BP difference between upper/lower body = 30-40mmHg

# Congenital Heart Disease

Breathless + Pink


Ventricular Septal Defect
AO
PA
LA
RA
LV
RV
AO
PA
LA
RA
LV
RV
Normal
Ventricular Septal Defect
©1996 University of Kansas


Se: 1
Im: 1
Child
SUPINE
L

# VSD

- Most common 2.5/1000 livebirths
- If parent has one; 2.9% chance of VSD recurrence
- Flow through VSD dependent on pulmonary vascular resistance
- Resistance falls with 1st breath then over hours

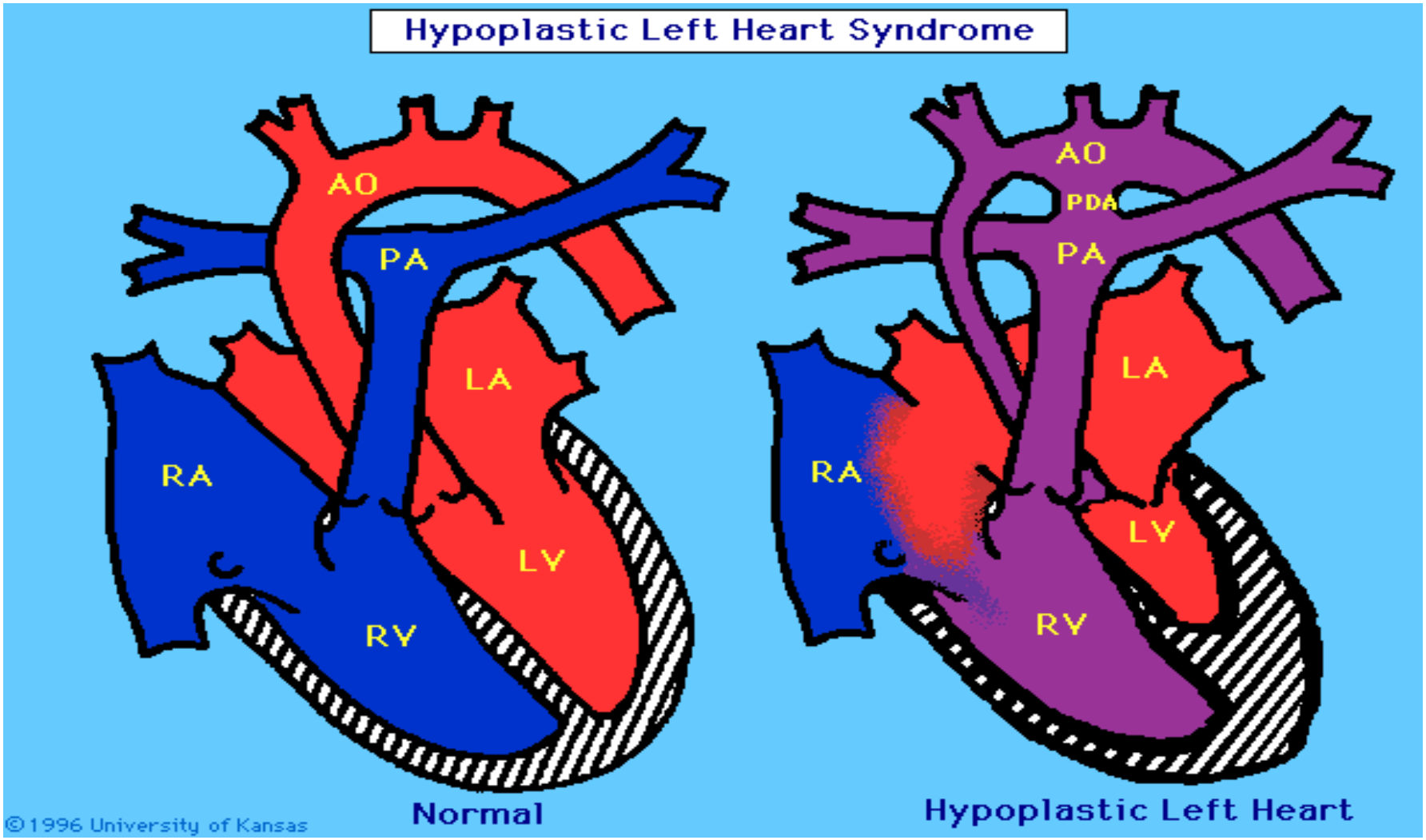
# VSD

- Size of L→R shunt determined by hole size & PVR
- Failure if pulmonary blood flow 2.5x systemic
- If VSD 50% diameter of aorta; goes into failure
- Usually delayed until 3rd week of life

# VSD-Clinical signs

- No initial murmur; appears @ day3+ (maybe none!)
  - Most are small & asymptomatic
- Tachypnoea (>60) often first sustained sign
- Feedings taking longer, growth slowed
- Vomiting / regurgitation↑

Moribund!


Hypoplastic Left Heart Syndrome
AO
PA
LA
RA
LV
RV
Normal
AO
PDA
PA
LA
RA
LV
RV
Hypoplastic Left Heart
©1996 University of Kansas

# Hypoplastic Left Heart

- Hours – days:  poor colour or sudden, profound shock
- Series of operations to create single ventricle system
- Long term survival 50-75%

# Screening for Cyanotic Heart disease

Joining the rest of the World

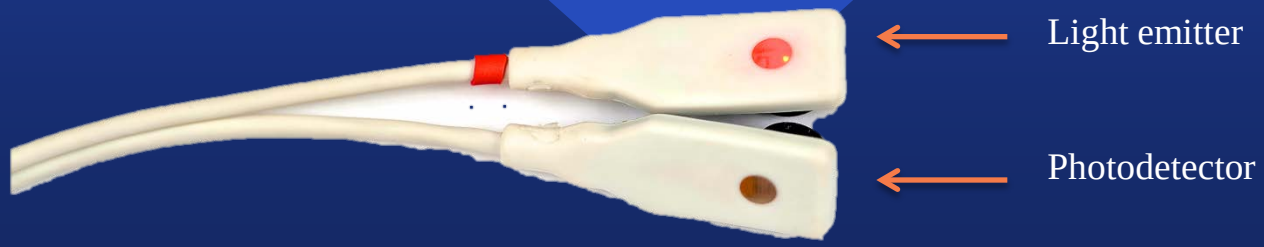
(USA, UK, Scandinavia, Australia)

# Criteria for screening test

- Important health problem ✓
- Valid Test available ✓
- Effective treatment ✓
- Benefits of screen exceed harm of test ✓
- Health care system can support ?
- Screening is socially / ethically feasible ?
- Cost benefit vs harm effective ?

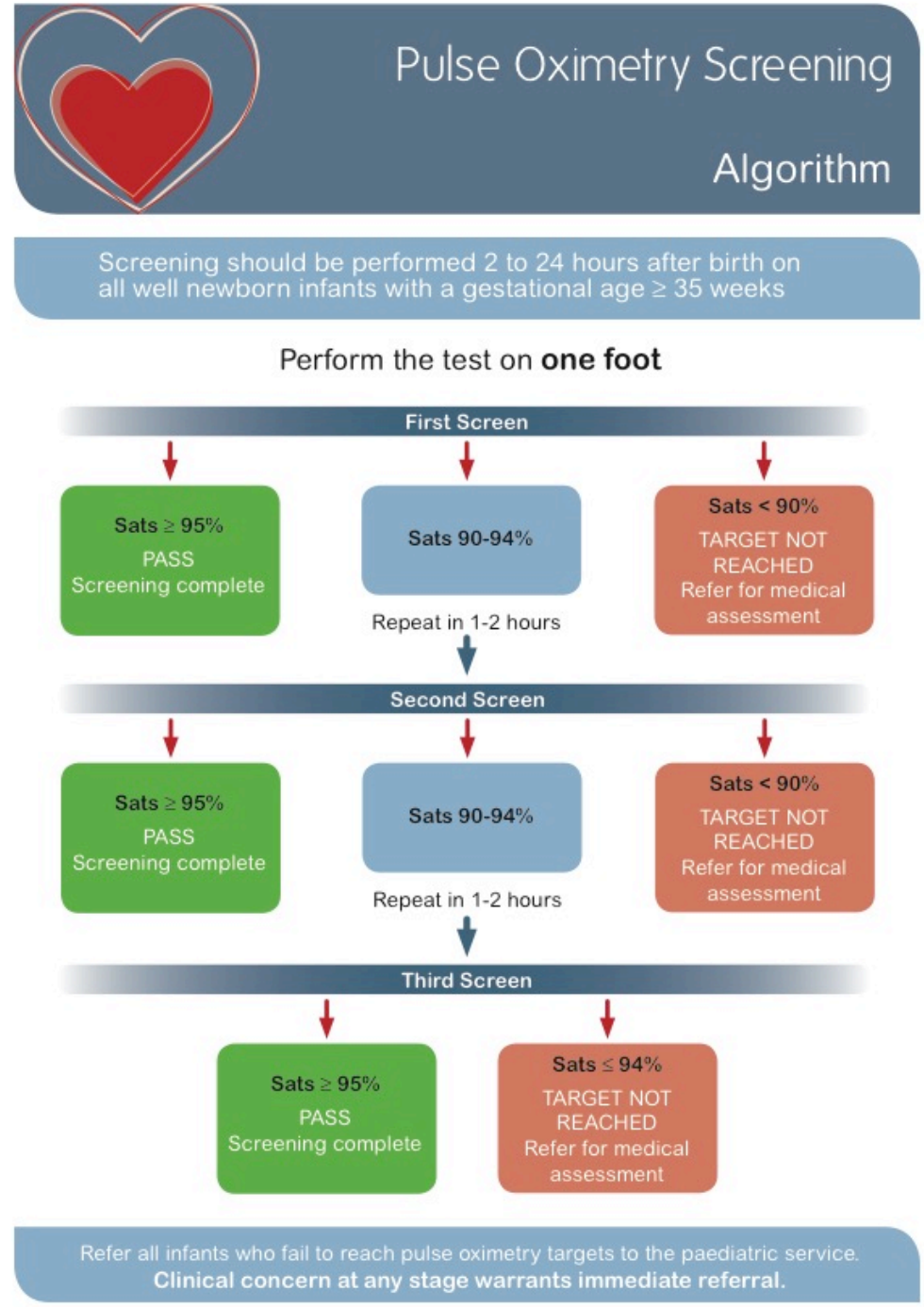
# What is pulse oximetry?

- A tool that provides continuous, non-invasive measurement of arterial oxygen saturation levels in the blood
- Oxygenated and deoxygenated blood differ in their absorption of red and infrared light
- Light passes through a capillary bed and then light absorption is measured



# Pilot study Auckland

Test time: 2- 4 minutes



ACTA PÆDIATRICA
NURTURING THE CHILD

Acta Pædiatrica ISSN 0803-5253

EDITORIAL

DOI:10.1111/apa.13082

# Newborn pulse oximetry screening is not just for heart defects

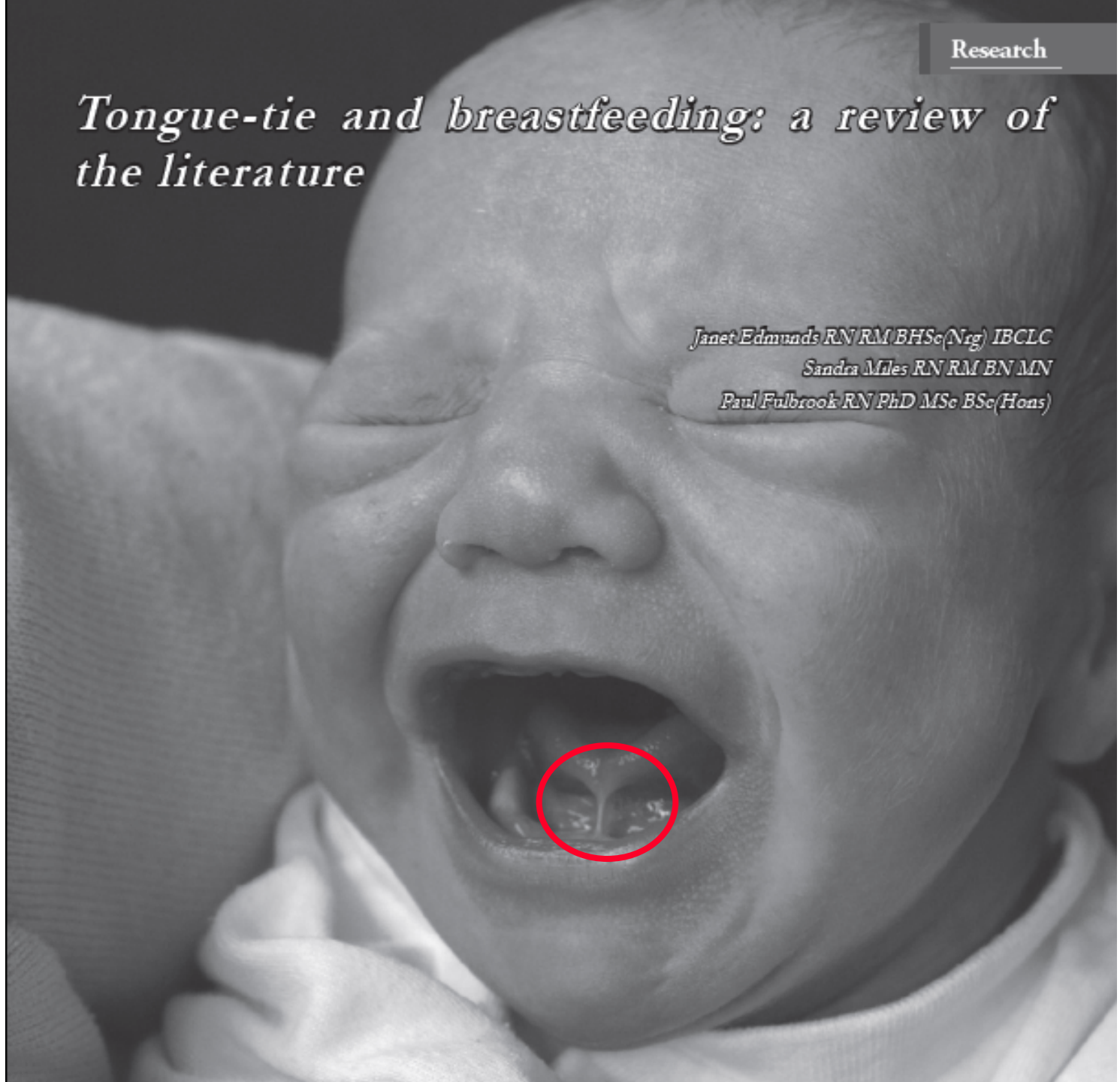
**Table 1** Distribution of disorders causing 324 newborn infants to fail first-day-of-life pulse oximetry screening (3)

| Disorder | n | (%) |
|---|---|---|
| Congenital heart defect | 43 | 13 |
| - critical | 27 | 8 |
| - noncritical | 16 | 5 |
| Pneumonia/septicaemia | 55 | 17 |
| Transient tachypnoea | 54 | 17 |
| Persistent pulmonary hypertension | 6 | 2 |
| Pneumothorax | 6 | 2 |
| Amniotic fluid aspiration | 5 | 2 |
| Hypoglycaemia | 3 | 1 |
| Pulmonary atelectasis | 1 | |
| Hyperviscosity syndrome | 1 | |
| Respiratory distress syndrome | 1 | |
| Cardiomyopathy | 1 | |
| Unclassified | 1 | |
| Transitional circulation | 147 | 45 |

Meberg A. Newborn pulse oximetry screening is not just for heart defects. Acta Paediatr. 2015;104(9):856-7

# Tongue-tie and breastfeeding: a review of the literature

Janet Edmunds RN RM BHSc(Nrg) IBCLC
Sandra Miles RN RM BN MN
Paul Fulbrook RN PhD MSc BSc(Hons)

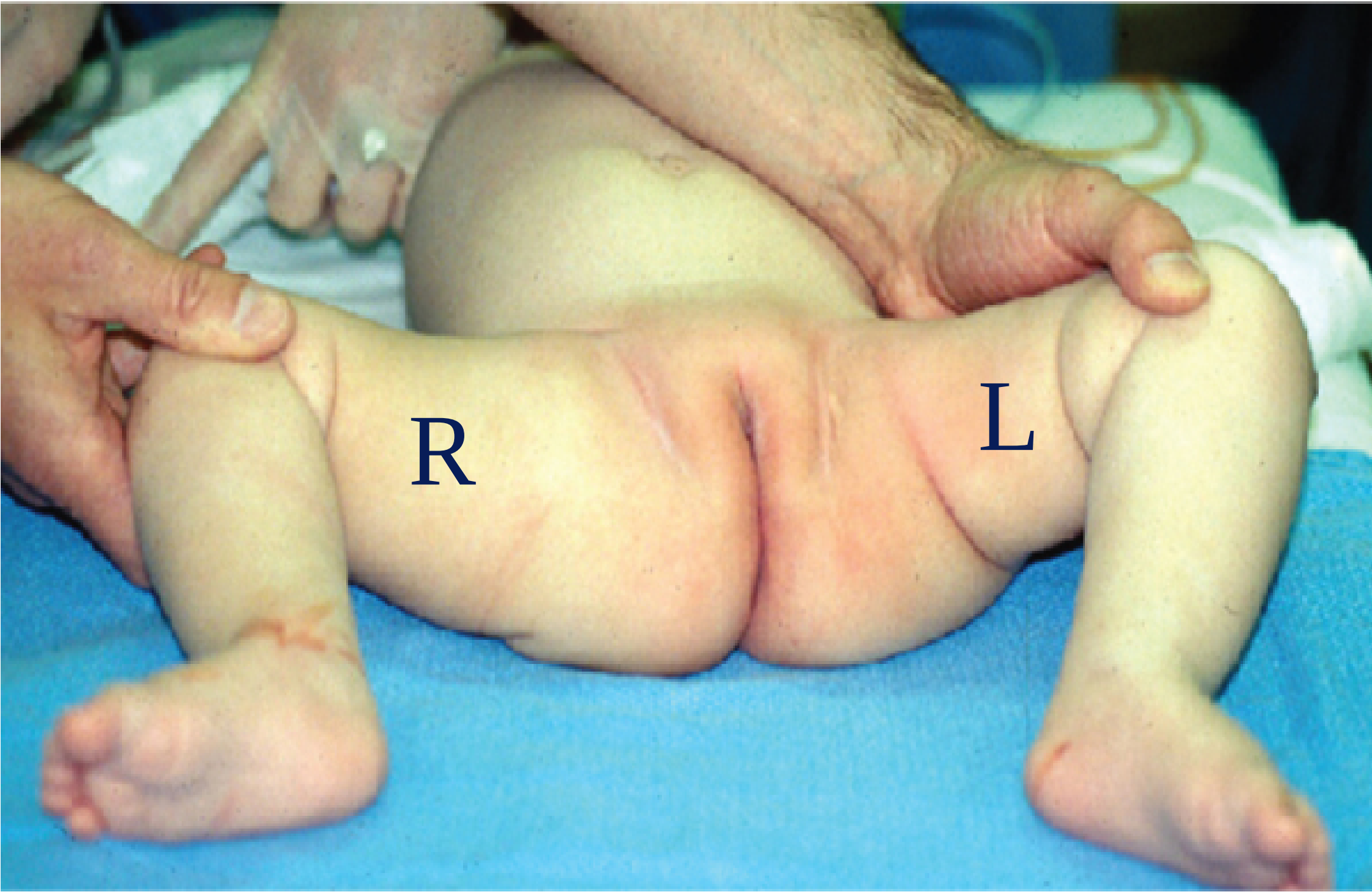


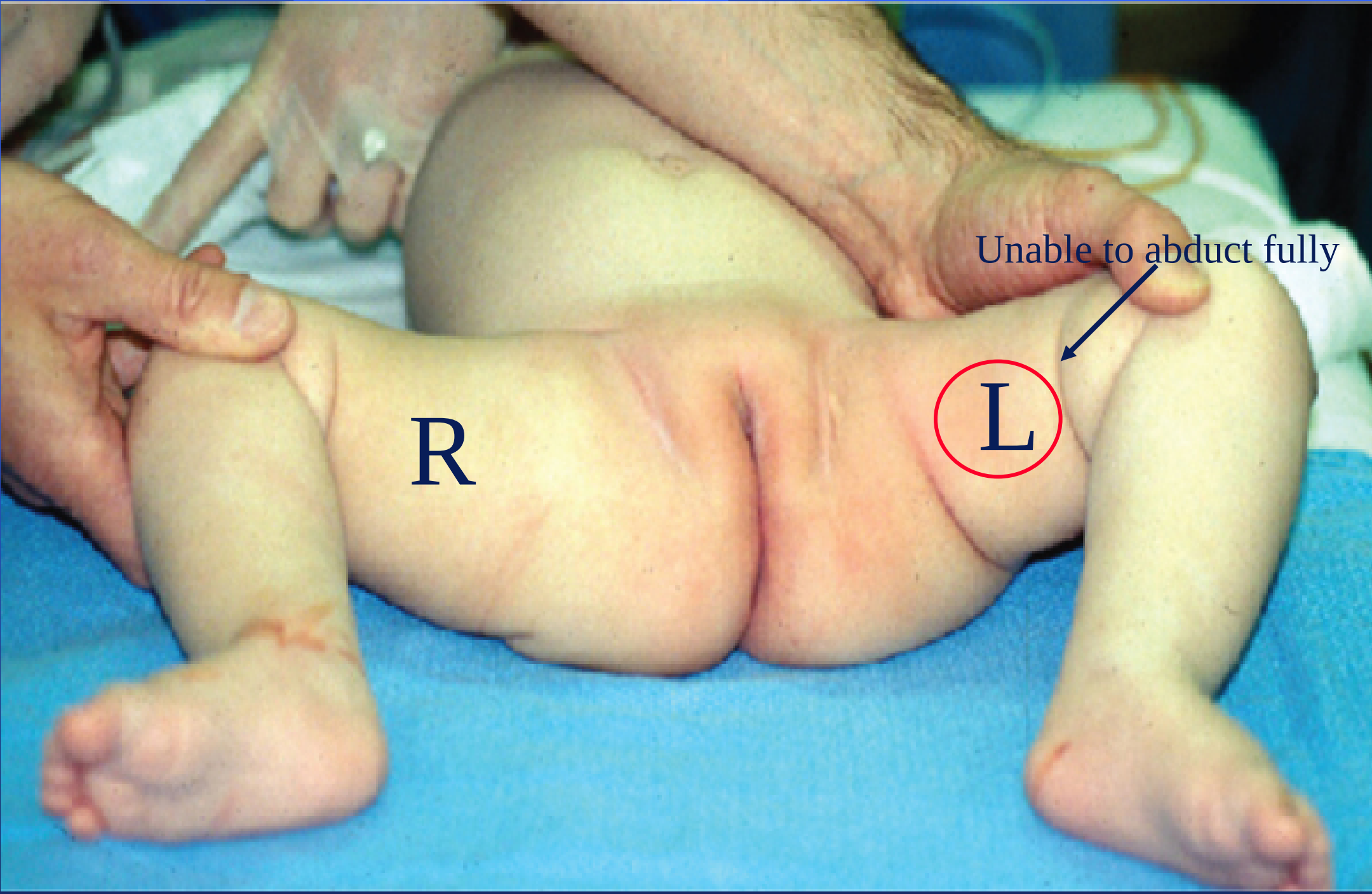
# Ankyloglossia breast feeding and frenotomy

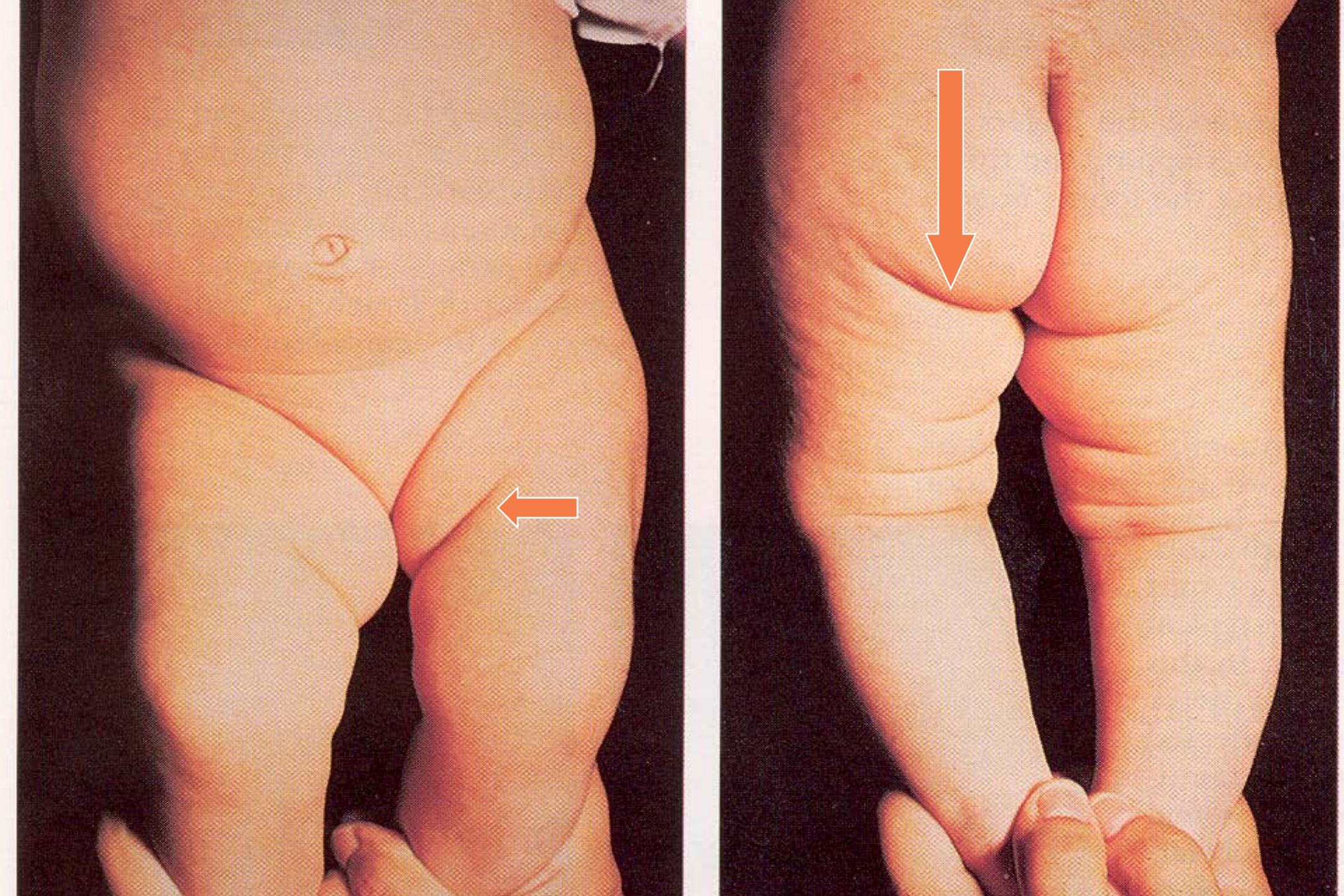
- Problem a true entity but:
  - » RCT studies seriously flawed
  - » Which Patients to snip (How to diagnose?: Functional vs Anatomical)
  - » When to snip
  - » Who should do the snip
  - » Neonatal pain

# Developmental Hip Dysplasia

(Congenital Dislocation of the Hip)


R
L


Unable to abduct fully
R
L



# Developmental Hip Dysplasia
## (Congenital Dislocation of the Hip)

- 2 types:

1. Classic: Neurologically normal child (1 in 1000)
2. Secondary to underlying CNS disorder (rare)

# Developmental Hip Dysplasia

- 9:1 female predominance
- Positive family history (20%)
- Generalized ligamentous laxity (oestrogens) / shallow sockets
- 60% firstborn
- 30–50% breech (extended leg, flexed hip worst)
- Left hip

# Developmental Hip Dysplasia

- A dislocated ***hip*** rests in a dislocated (posterior) position and reduces only with manual effort
- physical examination for a gentle clunk of the ***hip*** out of (adduct-Barlow sign) or into (abduct-Ortolani sign) the acetabulum shows the problem
- Affected ***hip*** may rest in slight adduction and may have a deeper proximal thigh crease
  ***but these signs are not constant***

# Developmental Hip Dysplasia

- Baby warm, quiet, and relaxed on parent's lap
- 1 ***hip*** at a time
- Gentle downward pressure on knee or thigh with adduction
- Feel whether ***hip*** goes partially or fully out (Barlow test).
- Abduct to feel it slide back in (Ortolani test).

# Clicks

- A click may be felt in the ***hip***, but very nonspecific
- Click often is felt in normal ***hips*** and comes from the meniscus of the knee, fascia lata, or a synovial fold.
- The clunk of instability usually is lost after ~6 months, when the dislocation becomes more fixed.

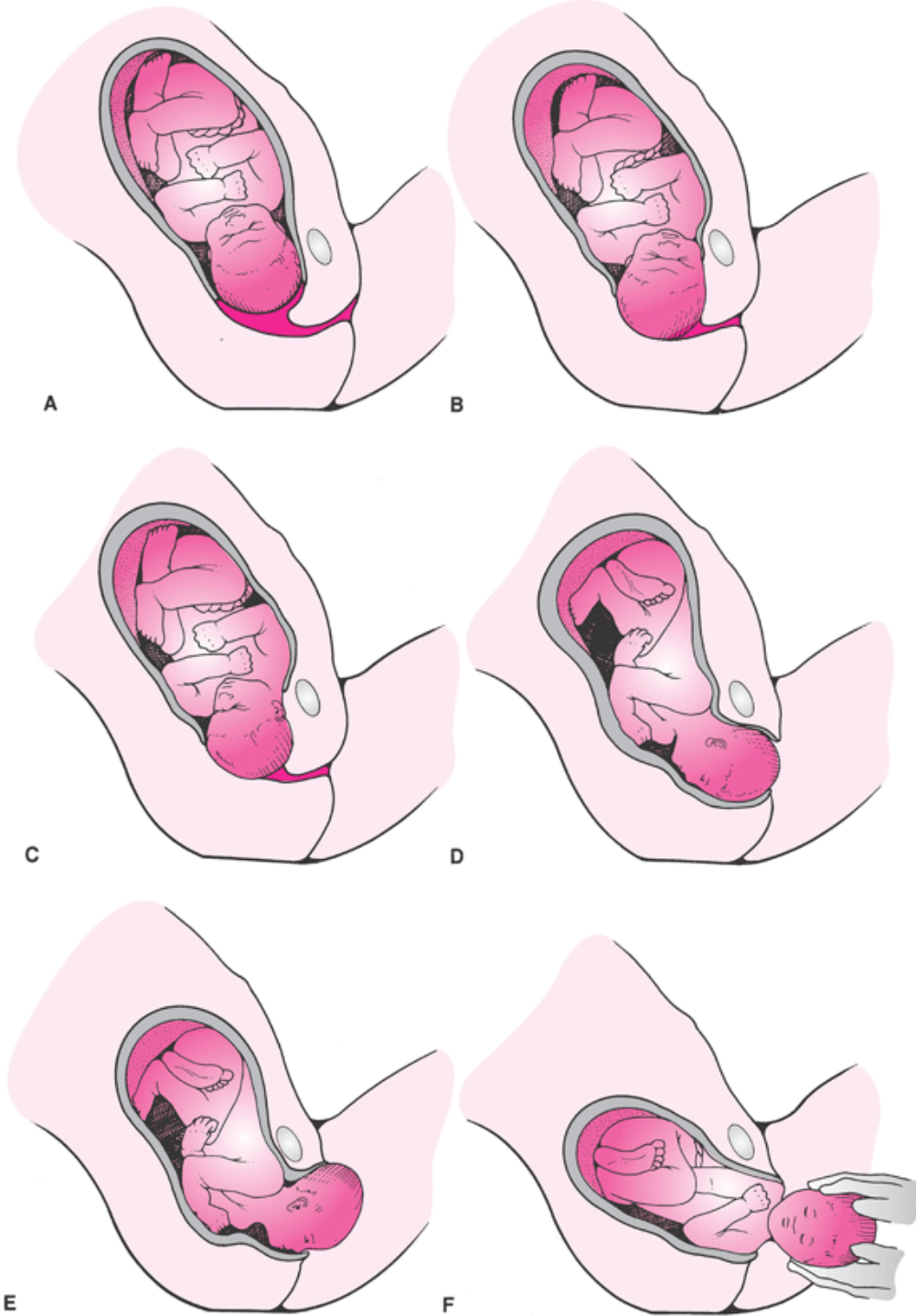
# Treatment

- The ***hip*** should be reduced within the 1st 6 weeks if the dislocation is recognized.

- The earlier the diagnosis is made, the easier and safer the treatment will be

Pavlik harness→95% resolution by 6 weeks from newborn period

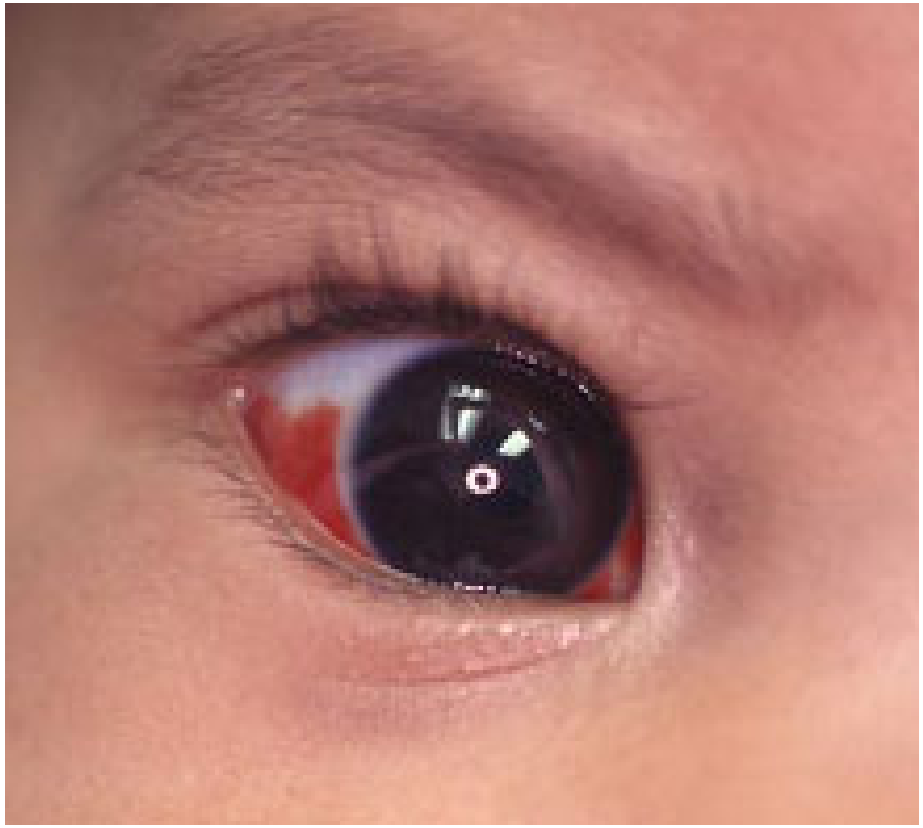
# Club Foot vs Positional Talipes

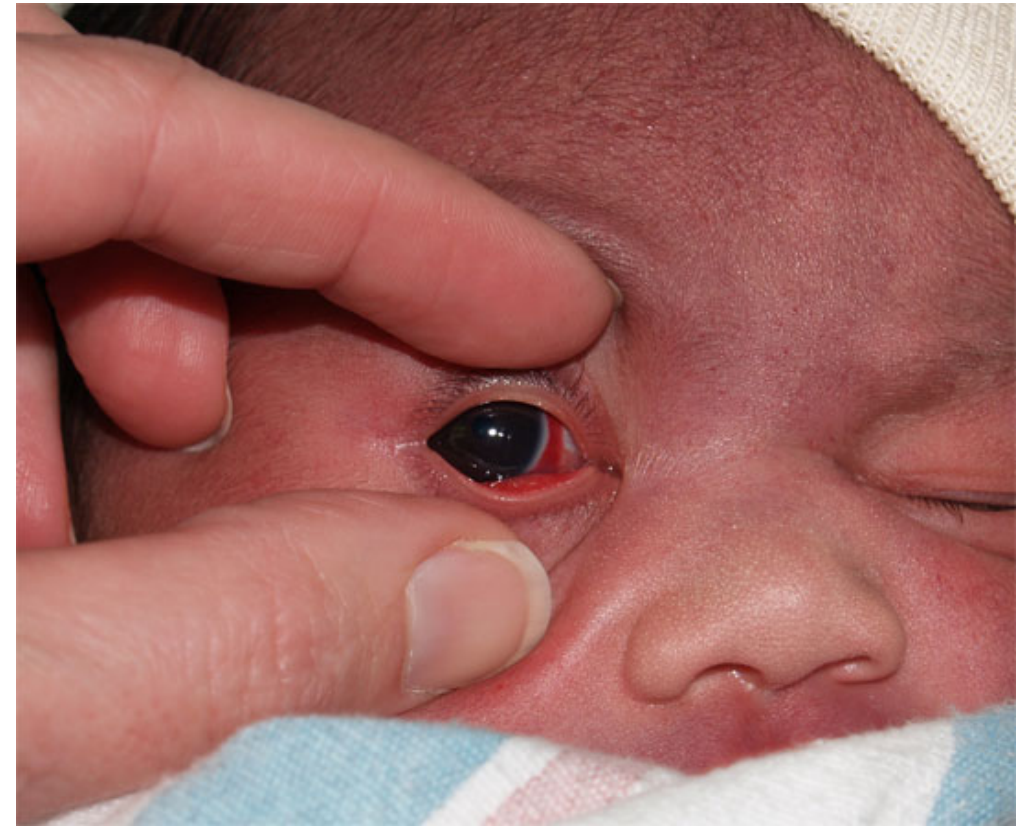

A
B
C
D
E
F

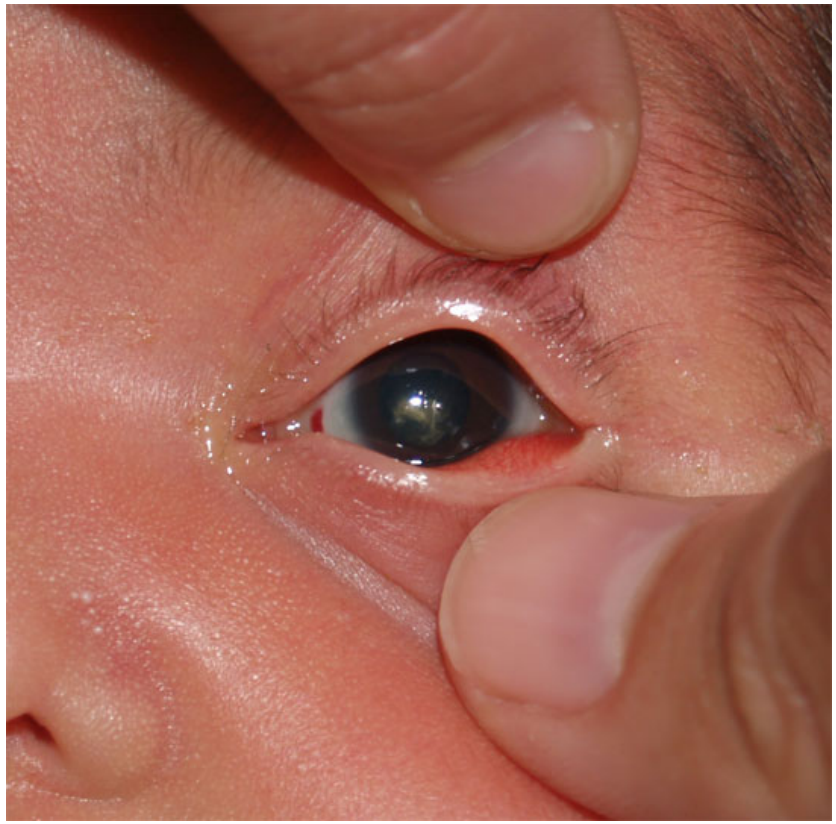

kidz first
Children's Hospital & Community Health
Tamariki Ma

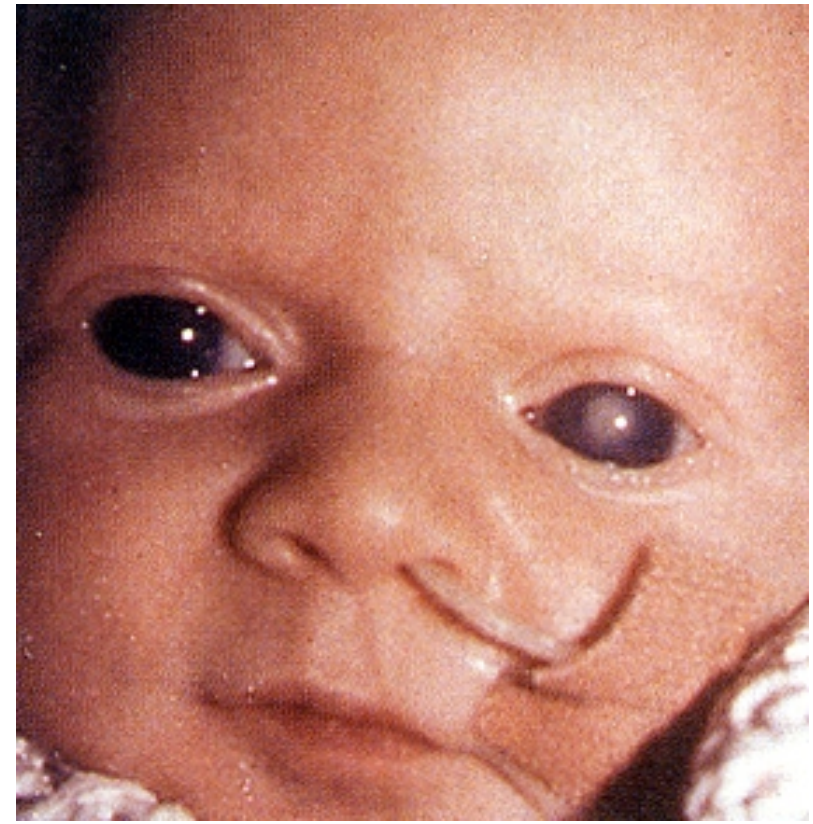
# Eye Examination

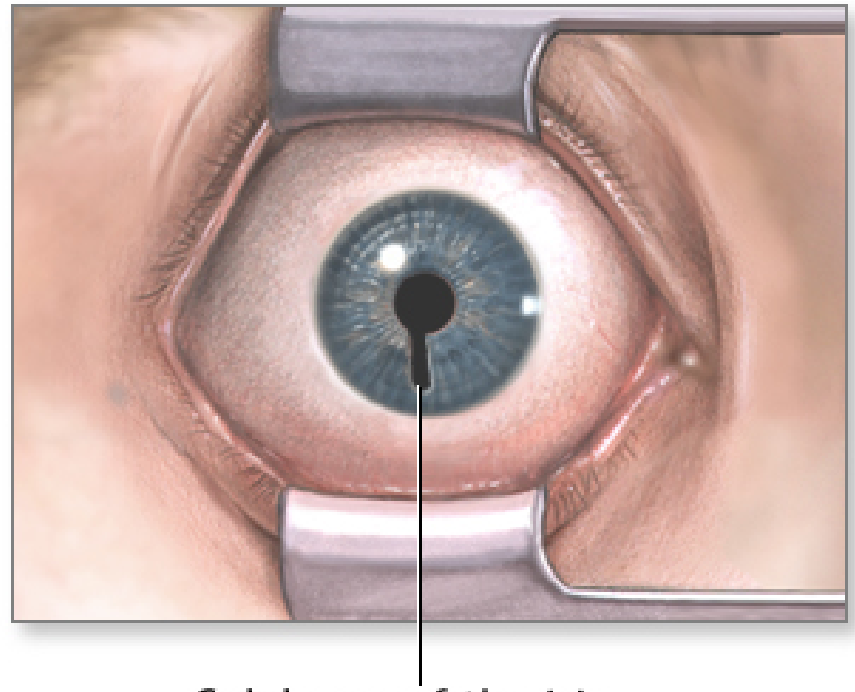
- Are the eye(s) present!
- Are they the same size?
- Pupil reaction (present at Term)
- Red reflex





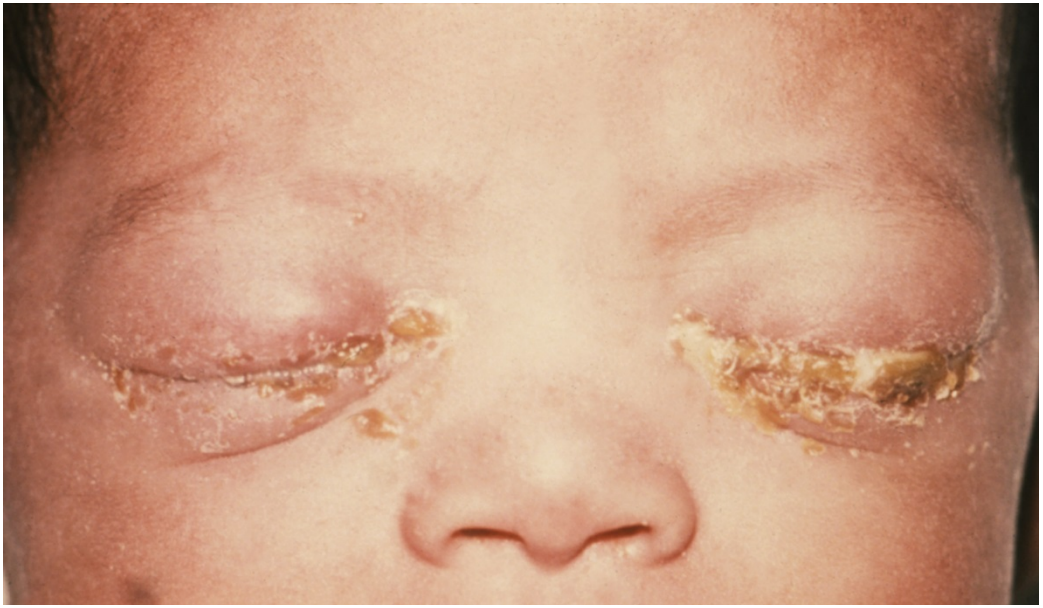






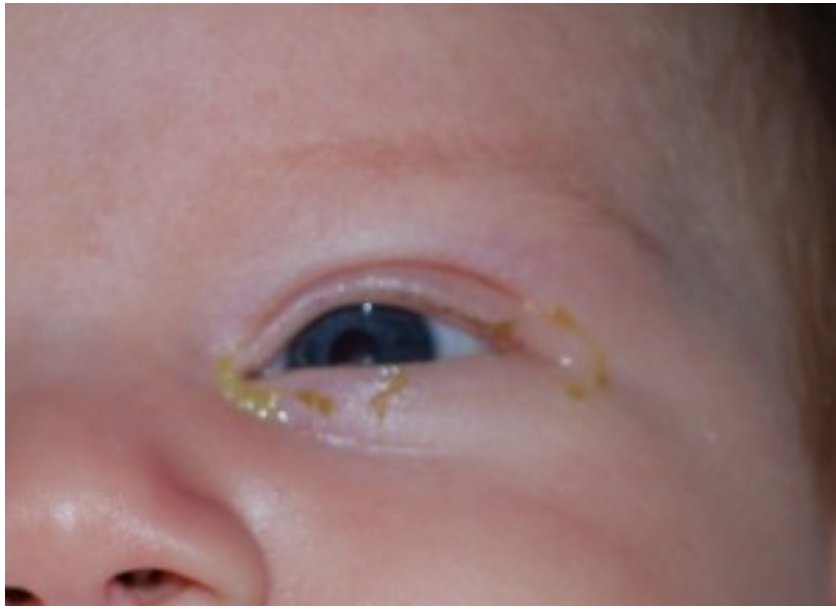
# Eye discharge

Red Eye



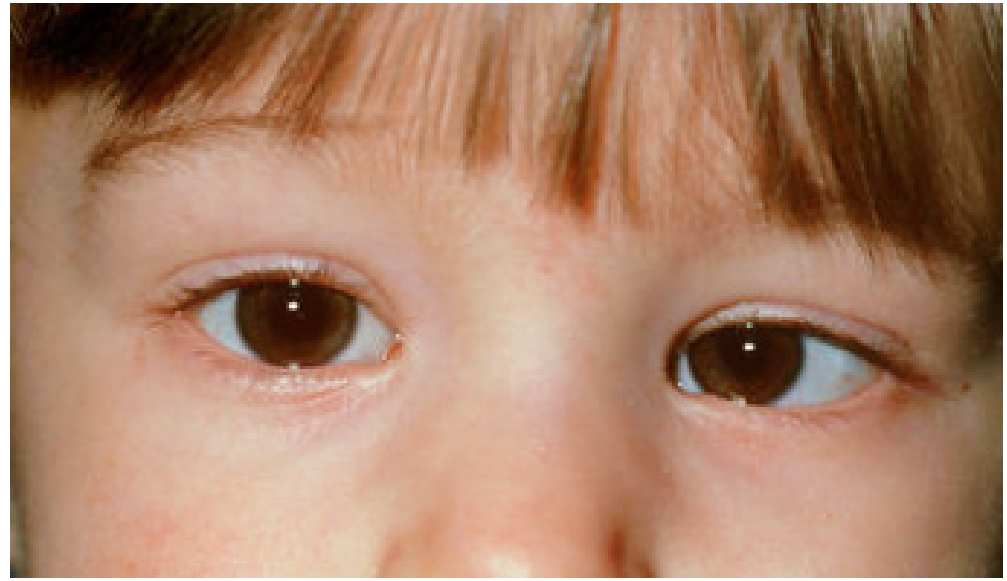
Neisseria gonorrhoeae

White Eye



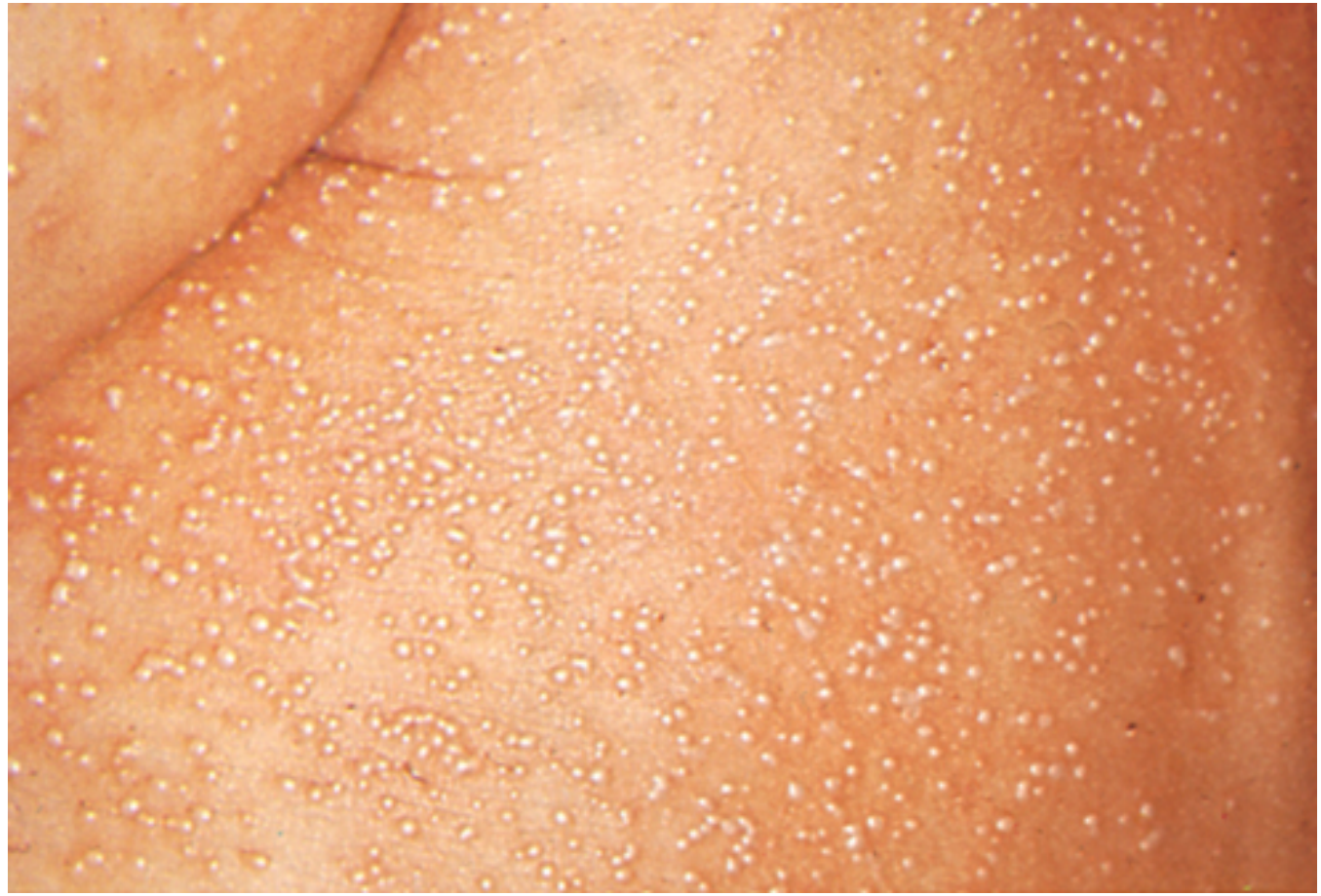
Nasolacrimal duct obst.
6% newborns
Conservative management
Massage: 80% fixed 1 month
May get infected

# Squint



After 3 months of age needs referral

# What is this rash?



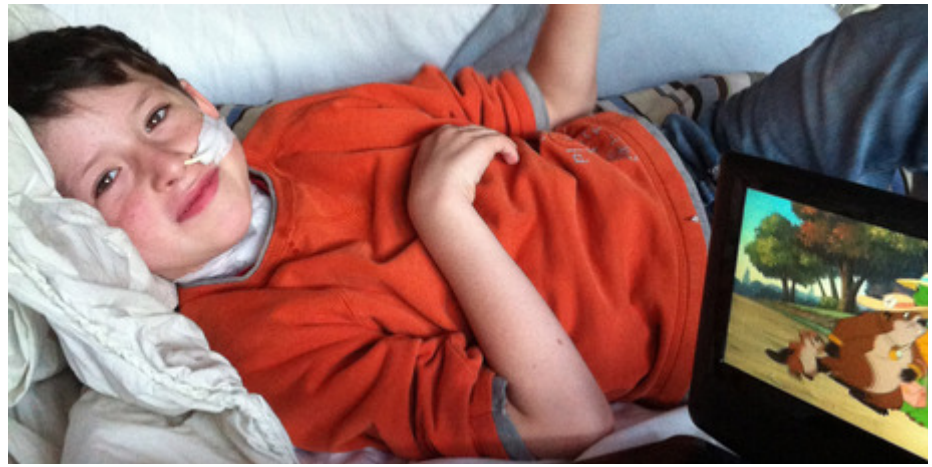
# Immunisations

The New Zealand Herald

Saturday Jan 19, 2013

# Son's ordeal was our fault, say parents

## Father says decision to refuse tetanus shot made without facts



The New Zealand Herald

Monday Feb 25, 2013

# Whooping cough epidemic spreads

# Immunisation Schedule: 6 weeks

- DTaP
- IPV
- Hib
- HepB
- PCV 13
- *$RV_5$

* = Live attenuated

(*BCG)

# Hepatitis BsAg +ve

- HBsAg+ve / HBeAg+ve: Perinatal transmission 70-90%
- HBsAg+ve / HBeAg-ve: Perinatal transmission 5-20%
- Chronic infection develops in 90% of those who acquire perinatal transmission

# Vaccine Efficicacy

- Up to 90% reduction in vertical transmission
- 75% reduction in hepatocellular carcinoma in vaccinated population (Italy, Gambia, Asia)
- At birth:
  - » Immunoglobulin as close as possible to birth but can be given up to 10 days
  - » HB vax as close as possible to birth up to 12 hours

# Neonatal Sepsis

# Infections in the first month

1. Congenital infection sustained in utero
2. Acquired during birth
3. Acquired in nursery (breast milk)
4. From household

# Fever ≥ 38º C if < 6 weeks

- High risk group
- Majority viral **BUT** bacterial infection probability = 15%
- Rapid progression
- Full septic workup prudent
- UTI common and serious (catheter / bladder stab)

# Measuring a Temperature

- Rectal the gold standard < 2 years
  - » trend now for 6 months cut off for rectal
  - » electronic OK
- > 38ºC  Rectal = fever
- Axillary and tympanic (tympanic better than axilla)
  - » Both under record fever
  - » For tympanic; EAM often too small in babies
- Provides at best approximation of core temp esp > 39ºC

# Treating Fever

- Paracetamol: 60mg/kg/day < 3 months (10mg/kg/dose)
- Standard dose: lower core temp by about 1$^{o}$ C
- Aim to get child comfortable; not abolish fever
- Avoid brufen (gastritis, renal, Reyes)

# Recent Research

- Over 200,000 children from 73 centres in 31 countries included in analysis

- Paracetamol for fever in 1st yr of life – ?associated with:
  - 46% increased risk of asthma (severe asthma ↑ increased 22-38%)
  - 48% increased risk of rhinoconjunctivitis
  - 35% increased risk eczema

Beasley, Clayton, Crane et al ( 2008)

  - Recent work debunks: Not strong enough evidence to change practice

Lowe AJ et al, BMJ 2010

# Clinical Signs

- Respiratory rate: 40 – 60 asleep! (periodic respirations)
- Temperature instability
- HR 90 – 160 asleep!
- MAP = Gestation

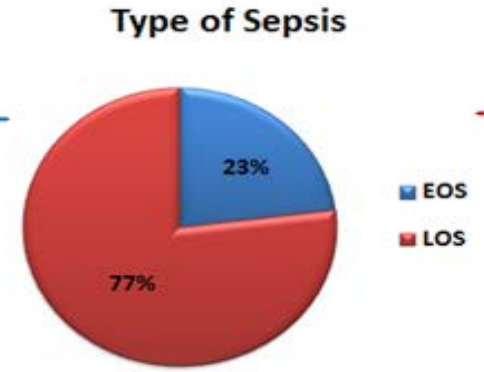
# Listen to the (experienced) mother

- “off his feeds”
- “sleeping more than usual”
- “fussy”
- “just not right”

# Group B streptococcus (agalactiae)

- G
- E
- T
- Listeria

# Causes of Neonatal Sepsis - UK



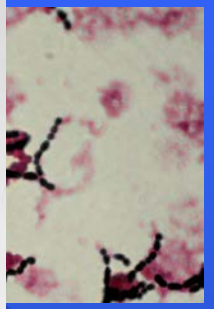

EOS

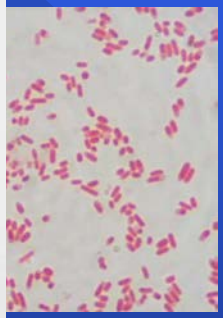
| Pathogen | Number | Percentage |
|---|---|---|
| GBS | 225 | 43% |
| *E. coli* | 95 | 18% |
| Other *Streptococci* | 66 | 13% |
| *Micrococcus* sp. | 23 | 4% |
| *Enterococcus* sp. | 19 | 4% |

LOS/HAI

| Pathogen | Number | Percentage |
|---|---|---|
| *Enterococcus sp.* | 264 | 15% |
| *E. coli* | 246 | 14% |
| *S. aureus* | 242 | 14% |
| *Klebsiella sp.* | 172 | 10% |
| *Candida sp.* | 158 | 9% |

Unpublished data from the neonIN neonatal infection surveillance network.





| Characteristic | Early Onset | Late Onset | V. Late Onset |
|---|---|---|---|
| Onset | < 7 days of age (usually first 48 hrs) | 7 to 30 days | 30 days+ |
| Gestation | 25% <37 weeks | Often full term | Usually <30 weeks |
| Risk factors | Maternal intrapartum complications common | Often none | Prematurity |
| Source of organism | Maternal genital tract | Maternal genital tract, nosocomial, or community | Nosocomial, community |
| Usual clinical presentation | Nonspecific signs or respiratory distress | Focal or nonspecific signs | Focal or nonspecific signs |
| Case-fatality ratio | 10%–20% | 5%–10% | <5% |

# GBS

- How does GBS get to infant during labour and delivery?
- Why are newborns (esp prems) so susceptible?
- How does it evade host defences?
- How does bacteraemia and meningitis occur?

# Neonatal Immunology

- Maternal T cell function ↓ during pregnancy ?tolerance
- Specific GBS capsular polysccharide associated with bad disease
- Transplacental immunity via passive transfer of IgG
  (IgG t½ 20 days; less if prem +/- sick)
- higher the concentration to this polysccharide the more protection
- Majority passive therefore ∝ maternal concentrations
  (start @ 8/40 / majority in last weeks)

# Group B Streptococcus (agalactiae)

- Very good at binding to vaginal wall cells
- May induce ROM and prem delivery
- Penetrates intact membranes / loves amniotic fluid especially if contains meconium
- Deficiencies in neonatal neutrophil response (phagocytes)

# Group B Streptococcus (agalactiae)

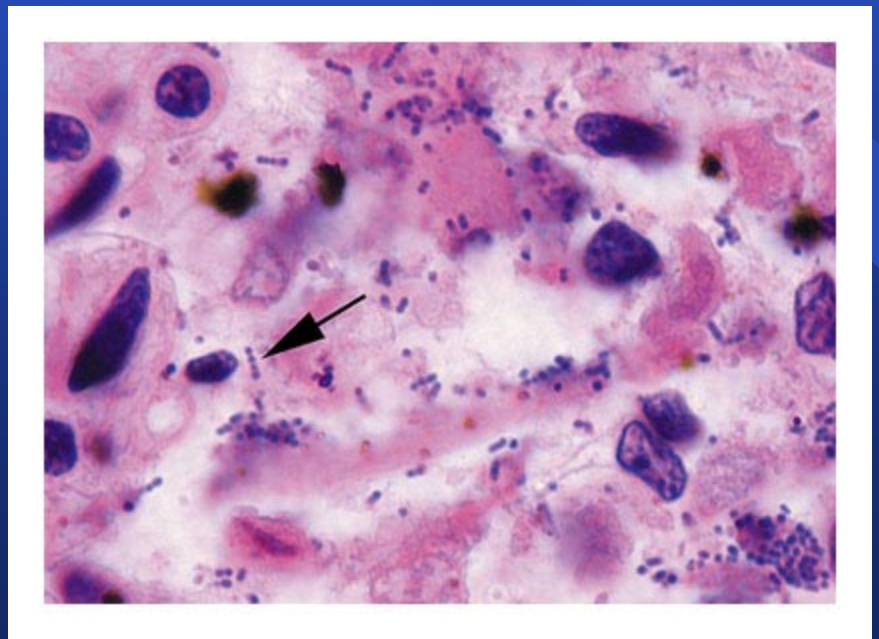
- 15 – 40% women colonised (comes and goes)
- Historically occurred in 1 – 4/200 colonised women
- Much lower with intrapartum antibiotics

# Group B Streptococcus (agalactiae)

- Early onset (75%) (0 – 6 days) Mean = 18 hours
- 0.7 – 3.7/1000 livebirths (with antibiotics)
- Late onset (7 – 89 days)
- 0.5 – 1.8/1000 uninfluenced by peripartum antibiotics
- Total (early-late) case fatality 8%

# Early onset

- 80% pneumonia therefore clinical signs respiratory
- Meningitis unusual but more common in late onset



# Neonatal Meningitis

- Group B streptococci (*Streptococcus agalactiae*)
- *Escherichia coli* (and other gram-negative enteric bacilli)
- *Listeria monocytogenes*
- Enterococci

# Neonatal Meningitis

- Especially preterm babies immunocompromised
- Blood-brain barrier immature
- GBS & Listeria meningitis usually after the first week
- Mortality / Morbidity highest in newborn

| *Clinical sign of GBS Bacteraemia* | *Percentage of infants with sign* |
|---|---|
| Hyperthermia | 51 |
| Hypothermia | 15 |
| Lethargy | 25 |
| Irritability | 16 |
| Respiratory distress | 33 |
| Apnea | 22 |
| Cyanosis | 24 |
| Jaundice | 35 |
| Hepatomegaly | 33 |
| Anorexia | 28 |
| Vomiting | 25 |
| Abdominal distention | 17 |

# Maternal intrapartum treatment (early onset)

- Previous GBS infected child
- GBS bacteruria
- Preterm labour and imminent birth
- Fever > 38$^{o}$C
- PROM > 18 hours OR
- Positive maternal screening 35-37/40 current pregnancy