Visual loss from retinopathy of prematurity: first global estimates

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Overview

- ROP - the condition, risk factors and control
- ROP as a cause of visual loss
- Earlier estimates
- New global estimates

Retinal vascularisation during development

Peripheral retinal hypoxia drives the new blood vessel growth

Classification of ROP

- Site (zones and clock hours)
- Severity (Stages)
- Signs of BRB breakdown ("plus disease")
- Scarring

Classification of ROP - by zone (site)
Classification of ROP - by zone (site)

Classification of ROP - by stage (severity)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Demarcation line</td>
</tr>
<tr>
<td>II</td>
<td>Ridge</td>
</tr>
<tr>
<td>III</td>
<td>Fibrovascular ridge</td>
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<tr>
<td>Iva,b</td>
<td>Subtotal retinal detachment</td>
</tr>
<tr>
<td>Va,b</td>
<td>Total retinal detachment</td>
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</tbody>
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Stage 1 demarcation line

Stage II ROP

Stage III ROP

Stage 4 – subtotal retinal detachment
Stage V - inoperable retinal detachment

End stage eye blind from ROP

Cicatricial ROP with dragging of the retinal vasculature

Natural history of ROP

- Starts 4-7 weeks after birth
- Progresses / regresses over following few weeks
- Treatment indications:
  - earlier: constellation of signs indicating 50% risk of progression to retinal detachment (CRYO-ROP trial*)
  - current: constellation of signs indicating 15% risk of progression to retinal detachment (ET-ROP trial*)

  *provided data on visual outcomes after treatment, or no treatment (CRYO-ROP)

Confluent laser to peripheral avascular retina

Disease regresses with treatment

Before treatment

4 weeks after treatment
Characteristics of babies with “severe” ROP in UK, USA and Canada

Characteristics of babies with “severe” ROP in low/middle income countries

Risk factors for ROP
Prematurity, prematurity, prematurity!
But also:
- no antenatal steroids
- inadequately controlled oxygen
- sepsis etc
- poor early weight gain

Inadequate health systems:
- inadequate equipment
- poor staff numbers; training; motivation
- weak management information systems
- poor leadership
- inadequate governance

Prevention of blindness from ROP
Primary prevention:
- prevent preterm birth
- antenatal steroids
- gentle newborn care/no 100% oxygen in first “golden hour”
- good health systems with excellent neonatal care

Secondary prevention:
- examination of infants at risk by ophthalmologists in unit
- treat those with advanced disease by laser
- BUT not all countries have high coverage with ROP programs

Tertiary prevention:
- sight cannot be restored once lost

ROP – the condition
- Well classified disease and natural history known
- Risk factors largely known
- Non-invasive examination
- Effective treatment
- Early treatment gives better results
- Ideal for a screening and treatment programme
Visual loss from ROP

Causes of visual loss – individual level:
• Retinal detachment (inoperable)
• Scarring and distortion of the retina

Rates of visual loss – population level:
• Rates of preterm birth
• Survival of preterm infants - access to neonatal care
• Level of neonatal care – exposure to risk factors
• Coverage with ROP programs
• Quality of treatment

ROP as a cause of blindness

Proportion of blindness due to ROP, by World Bank region


Proportion of blindness due to ROP, by infant mortality rates (2000)
ROP blindness – likely risk using IMR as a proxy (2000)

Methods used to estimate the incidence of blindness and visual impairment from ROP

Potential outcomes

Countries grouped by neonatal mortality rate

- Level 1: NMR <5/1000
- Level 2: NMR 5 to <15/1000
- Level 3: NMR ≥15/1000

Used as a proxy for access to neonatal care and survival if data limited

Parameters required and methods for estimation (2000-2010)
Parameters required and methods for estimation (2000 to 2010)

Review of available data, meta-analyses, other data and assumptions to estimate:

In 3 country groupings using NMR:
- Step 1: Number of preterm births
- Step 2: Survival rate amongst infants receiving neonatal care
- Step 3: Incidence of any ROP; risk of progression to stage requiring treatment; proportion treated

For all countries:
- Risk of visual loss amongst those treated and not treated

Results

Step 1: preterm births (<36 weeks) 14,900,000
Step 2: surviving neonatal care 848,300
Step 3: any ROP in survivors 184,700
  ROP needing treatment 53,800
  number treated 22,700
Blind (treated and untreated) 20,000
Visual impairment * 12,300
TOTAL blind/VI 32,300/year

Regional incidence

Annual incidence, by region
Summary

- Annual incidence of visual loss higher than anticipated
- Reflects increasing provision of neonatal care with increased survival, particularly in Asia
- More needs to be done to improve neonatal care and access to screening and treatment for severe ROP
- More data are needed to refine assumptions and provide more precise estimates at each step...856 datasets used in this analysis......