OPHTHALMIC EMERGENCIES

• 40-45% injuries
• 40 - 45% inflammation
• 10 - 20% miscellaneous (eg. reduced vision, visual disturbances, contact lens problems)

Vernon SA  JRSM 1983
INJURIES:
MAJORITY TRIVIAL
OCULAR TRAUMA - WORLD WIDE

- 19 million unilateral visual loss, commonest cause of unilateral visual loss
- 2.3 million bilaterally visually impaired
- 1.6 million bilaterally blind from eye injuries

Negrel AD. Ophthal Epid 1998
OCULAR TRAUMA – THE DEVELOPING WORLD

Represents 5% of all blindness –

- Particular ‘at risk’ occupations
- Lack of safety measures
- Eye health facilities inappropriate (traditional medicines)
- Socio-economic background (poor education/housing)
- Sympathetic ophthalmia
OCULAR TRAUMA - WORLD WIDE

• 2.5 million Americans suffer an eye injury annually
  – 3rd commonest ophthalmic cause for admission

• 0.5 million blinding eye injuries occur globally each year  
  *Nat Soc Prev Blindness*

• Cumulative lifetime prevalence 20%
  *Wong Ophthalmol 2000*
FINANCIAL COSTS

• 175 - 200 million US dollars spent annually on eye injuries in the USA. 
  This excludes indirect costs of days of work lost

• 155 million Australian dollars/year for Australia
  Includes lost work years and medical costs

Tielsch Ophthalmol 1990
OCULAR TRAUMA – ‘THE NEGLECTED DISORDER’*

A lack of -

• Well developed surveillance systems
• Population based studies

Need for –

• Epidemiological work
• Reference to defined populations

*Parver Arch Ophthalmol 1986
“Serious ocular injury” -
“Necessitating admission to hospital under the care of a Consultant Ophthalmologist for observation or treatment”

- Population-based (Scotland)
- Prospective
- Observational (what happens in real life situation)
- Bespoke clinical data collection: 1992 and 2009
- Standardised methodology & definitions
- Temporal trends
Scotland - all patients admitted with ocular trauma over a full year

- 415 patients admitted
  - 8.14 / 100,000 one year cumulative incidence for hospital admission
- 21 < 6/60 (10%)
  - 0.41 / 100,000 blind

Desai P, MacEwen C et al 1996 BJO
Extrapolated to UK -
- 4688 patients admitted
- 236 blinded in injured eye

Up to 15% of all ophthalmic hospital admissions

10% of these will lose useful vision in the affected eye

Cumulative incidence 8.14 / 100,000 (hospital admission)

0.41 / 100,000 blind

Desai P, MacEwen C et al 1996 BJO
Scotland

- Repeat study 17 years later (via BOSU)
- Stable population numbers
- Differences identifiable
- Identify trends in ocular injury

Morris D, Desai P, MacEwen C et al 2013 EYE
OCULAR TRAUMA – UK SCOTS 2 (2009)

- **Numbers admitted**
  - 102 patients admitted in one year (2009)
  - 415 patients admitted in one year (1992)

- **Incidence of serious eye injury has fallen x4**
  - 1.96 / 100,000 required hospital admission annually (2009)
  - 8.14 / 100,000 required hospital admission annually (1992)

**Incidence Ratio 1992 : 2009 = 3.88 (95% C.I. 3.12 to 4.83)**

*Morris D Desai P, MacEwen C et al 2013 EYE*
WHO? AGE & GENDER

- **Over 80% Male**
  - v. 50% A&E attendances

- **42-44% admissions in the 15 to 34yrs age group**
  - Of these 90% male

- **Females older than males**
  - Difference in mean age 20.26 yrs (95%CI: 9.32 -31.19; $p=0.004$).
AGE & GENDER

• **Single large peak for young males**

  Schein OD Ophthalmology 1988
  Katz J Arch Ophthalmol 1993
  Morris D Eye 2013

• **Children in developing world**

PAEDIATRIC EYE INJURIES (US) 1997 - 2006

Moren Cross J et al J AAPOS 2008
WHAT?
TYPE OF INJURY (%)
CHANGE IN TRAUMA TYPE

- Blunt trauma reduced from 56% (1992) to 41%
  - 226 (1992) to 42 (2009)

- Penetrating injury increased from 23% (1992) to 37%
  - 93 (1992) to 23 (2009)
HOW?
MECHANISM OF INJURY

% 45

Machinery / Tools
Firearm
Assault
Chemical Injury
Fall
Vehicle Accident
Other

1992
2009


WHERE?
PLACE OF INJURY

![Bar Chart for Place of Injury]
Commonest site of severe injuries was the home (31.9%) 1991 (30.6%) 2009
0 - 4 age group (73%)
>65 age group (60%)
Female : male - 2:1
>50% resulted in loss of vision

Desai, MacEwen et al BJO 1996
Morris, Desai, MacEwen EYE 2013
WORK/OCCUPATIONAL INJURIES

Severe ocular trauma - UK
1910 – 70%
1992 - 23%
2009 – 20%

Garrow BJO 1923
Desai et al BJO 1996
Morris EYE 2013
**OCCUPATIONAL INJURIES**

*Tip of the iceberg?*

- Non compliance (employer or employee) with legislation is a significant risk factor for ocular trauma
- 70% of eye injuries attending eye casualty occupational (0.4% of those hospitalised)

*Remain an important cause of minor injuries*

MacEwen BJO 1989
SPORTS EYE INJURIES

• Admitted to Hospital - 1987
  – all eye injuries 2.3%
  – sports eye injuries 27%

  MacEwen BJO 1987

• 1992 – 16.7%
• 2009 – 8.2%
SPORTS

Blunt trauma
Commonly poor outcome
Young men
Declining

MacEwen BJO 1987
SPORTING EYE INJURY PREVENTION

- Education
- Eye protection
- Rule changes
- Safe practice

KEEP YOUR SIGHT
90 percent of eye injuries can be prevented with protective eyewear

Protective Eyewear Should:
- Be appropriate for the sport
- Have polycarbonate lenses
- Be properly fitted by an eye care professional

Sports Eye Safety
For more information or to find an Eye M.D., visit www.aao.org
ASSAULT

• *Increasingly important cause of trauma*
  - 21% - 1992
  - 31% - 2009
INTOXICATION AND INJURY

No Female had evidence of intoxication on presentation with injury
SCOTS - OUTCOMES

- Blinding outcome
  - 0.46 / 100,000 blind (2009)
  - 0.41 / 100,000 blind (1992)

Morris D Desai P, MacEwen C et al 2013 EYE
OUTCOME OF SERIOUS EYE INJURIES

1 year Cumulative Incidence of Blinding Outcome Attributable to Ocular Injury -
1992: 0.41 per 100,000 resident population
2009: 0.46 per 100,000 resident population

<table>
<thead>
<tr>
<th>Age and Sex Standardised Morbidity Ratios (SMR) : Comparing 1992 and 2009 with respect to risk of blinding and poor visual outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed Cases 1992</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Blinding Outcome (VA worse than 6/60)</td>
</tr>
<tr>
<td>Poor Visual Outcome (VA worse than 6/12)</td>
</tr>
</tbody>
</table>

* Expected number of cases if the 2009 age and gender specific incidence figures applied
BLINDING OUTCOME OF SERIOUS EYE INJURIES

**Associations** –

- **Person** - Males x5 risk
- **Place** - Home
- **Mechanism** - Falls and assault
- **Type** - Penetrating (no IOFB)
CVI England and Wales: Cause of blindness “trauma injuries and accidents” - all ages

- 1999-2000: 0.26% (n=36/13,788) of all certifications
- 2007-2008: 0.09% (n=7/8,173) of all certifications

But –
- Few injuries are bilateral - 1 to 6% (SCOTS)
- Trauma represents “silent” morbidity

Bunce C et al.  Eye 2008
Bunce C et al.  Eye 2010
• Broadly Representative –

• Scottish Population Characteristics over time period:
  ▪ Gender - 52% female
  ▪ Ageing shift in line with that of UK

• Response: 100% and 77%

•Completeness of Ascertainment:
  ▪ SMR data
  ▪ Admissions under other Specialty Consultants

➢ trends
➢ outcomes
➢ (minimum) estimates
OBSERVED TRENDS

• **Incidence**
  – Decrease in incidence of serious ocular trauma and blinding outcome
  – Reflects changing practice / service organisation for admission and clinical management

• **Aetiology**
  – Falls, Assault and the Home remain important
  – Corporate v personal “health & safety”

• **Gender**
  – Males remain at greater risk (x9)
  – When females injured – older, in the home and due to falls
  – Patterns of trauma exist – largely driven by relative “exposures” i.e. daily activities that may be risk factors for injury, but also duration of exposure to these risk factors

• **Context**
  – Reflects societal trends lifestyle choices; & consistent with wider A&E and trauma
CONCLUSIONS

• An important cause of visual morbidity
• Tends to blind eyes rather than individuals
• Aetiology and outcomes not static
Table 2. Types of injury, by age and by gender, in 102 patients admitted to hospital for ocular trauma – Scotland 2009.

<table>
<thead>
<tr>
<th></th>
<th>Type of Injury, n (row %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blunt</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>5-15</td>
<td>6 (50.0)</td>
</tr>
<tr>
<td>16-24</td>
<td>3 (21.4)</td>
</tr>
<tr>
<td>25-64</td>
<td>26 (41.9)</td>
</tr>
<tr>
<td>≥ 65</td>
<td>7 (53.8)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td></td>
</tr>
<tr>
<td>ALL</td>
<td>42 (41.2)</td>
</tr>
</tbody>
</table>

Comparing ‘Type of injury’ distribution between males and females: Fisher’s exact p = 0.216
Table 3. Place of injury, by age and by gender, in patients admitted to hospital for ocular trauma – Scotland 2009.

<table>
<thead>
<tr>
<th>Place of Injury, n (row %)</th>
<th>Work</th>
<th>Home</th>
<th>School</th>
<th>Street</th>
<th>Public building</th>
<th>Sport * facility</th>
<th>Other</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>0 (0.0)</td>
<td>1 (100)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1</td>
</tr>
<tr>
<td>5-15</td>
<td>0 (0.0)</td>
<td>5 (41.7)</td>
<td>1 (8.3)</td>
<td>2 (16.7)</td>
<td>0 (0.0)</td>
<td>2 (16.7)</td>
<td>2 (16.7)</td>
<td>12</td>
</tr>
<tr>
<td>16-24</td>
<td>1 (7.7)</td>
<td>3 (23.1)</td>
<td>0 (0.0)</td>
<td>4 (30.8)</td>
<td>4 (30.8)</td>
<td>0 (0.0)</td>
<td>1 (7.7)</td>
<td>13</td>
</tr>
<tr>
<td>25-64</td>
<td>19 (31.7)</td>
<td>15 (25.0)</td>
<td>0 (0.0)</td>
<td>11 (18.3)</td>
<td>6 (10.0)</td>
<td>5 (8.3)</td>
<td>4 (6.7)</td>
<td>60</td>
</tr>
<tr>
<td>≥ 65</td>
<td>0</td>
<td>6 (50.0)</td>
<td>0 (0.0)</td>
<td>4 (33.3)</td>
<td>0 (0.0)</td>
<td>1 (8.3)</td>
<td>1 (8.3)</td>
<td>12</td>
</tr>
<tr>
<td><strong>Gender:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>0 (0.0)</td>
<td>9 (64.3)</td>
<td>0 (0.0)</td>
<td>2 (14.3)</td>
<td>0 (0.0)</td>
<td>3 (21.4)</td>
<td>0 (0.0)</td>
<td>14</td>
</tr>
<tr>
<td>Males</td>
<td>20 (23.8)</td>
<td>21 (25.0)</td>
<td>1 (1.2)</td>
<td>19 (22.6)</td>
<td>10 (11.9)</td>
<td>5 (6.0)</td>
<td>8 (9.5)</td>
<td>84</td>
</tr>
<tr>
<td><strong>ALL ©</strong></td>
<td>20 (20.4)</td>
<td>30 (30.6)</td>
<td>1 (1.0)</td>
<td>21 (21.4)</td>
<td>10 (10.2)</td>
<td>8 (8.2)</td>
<td>8 (8.2)</td>
<td>98</td>
</tr>
</tbody>
</table>

Comparing ‘place of injury’ distribution between males and females: Fisher’s exact p = 0.008
* sport or leisure facility
© 4 patients with unknown place of injury (1 female and 3 males) excluded from the table.
Table 4. Activity at Injury, by age and by gender, in patients admitted to hospital for ocular trauma – Scotland 2009.

<table>
<thead>
<tr>
<th></th>
<th>Paid employment</th>
<th>DIY</th>
<th>School</th>
<th>Leisure</th>
<th>Other</th>
<th>ALL</th>
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</thead>
<tbody>
<tr>
<td><strong>Age:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0- 4</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (100.0)</td>
<td>0 (0.0)</td>
<td>1</td>
</tr>
<tr>
<td>5-15</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (18.2)</td>
<td>9 (81.8)</td>
<td>0 (0.0)</td>
<td>11</td>
</tr>
<tr>
<td>16-24</td>
<td>1 (9.1)</td>
<td>1 (9.1)</td>
<td>0 (0.0)</td>
<td>9 (81.8)</td>
<td>0 (0.0)</td>
<td>11</td>
</tr>
<tr>
<td>25-64</td>
<td>20 (35.1)</td>
<td>4 (7.0)</td>
<td>4 (7.0)</td>
<td>24 (42.1)</td>
<td>5 (8.8)</td>
<td>57</td>
</tr>
<tr>
<td>≥ 65</td>
<td>1 (9.1)</td>
<td>1 (9.1)</td>
<td>0 (0.0)</td>
<td>8 (72.7)</td>
<td>1 (9.1)</td>
<td>11</td>
</tr>
<tr>
<td><strong>Gender:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (15.4)</td>
<td>9 (69.2)</td>
<td>2 (15.4)</td>
<td>13</td>
</tr>
<tr>
<td>Males</td>
<td>22 (28.2)</td>
<td>6 (7.7)</td>
<td>4 (5.1)</td>
<td>42 (53.8)</td>
<td>4 (5.1)</td>
<td>78</td>
</tr>
<tr>
<td><strong>ALL °</strong></td>
<td>22 (24.2)</td>
<td>6 (6.6)</td>
<td>6 (6.6)</td>
<td>51 (56.0)</td>
<td>6 (6.6)</td>
<td>91</td>
</tr>
</tbody>
</table>

Comparing 'Activity at Injury' distribution between males and females: Fisher's exact p = 0.029

° 11 patients with unknown 'Activity' (9 males and 2 females) excluded from this analysis.
Table 5. Mechanism of injury, by age and by gender, in patients admitted to hospital for ocular trauma – Scotland 2009.

<table>
<thead>
<tr>
<th>Age</th>
<th>Hammering</th>
<th>Machinery/Tools</th>
<th>Firearm</th>
<th>Assault</th>
<th>Chemical Injury</th>
<th>Fall</th>
<th>Vehicle Accident</th>
<th>Shuttlecock/Racket</th>
<th>Other</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (100)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1</td>
</tr>
<tr>
<td>5-15</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (9.1)</td>
<td>1 (9.1)</td>
<td>0 (0.0)</td>
<td>1 (9.1)</td>
<td>0 (0.0)</td>
<td>1 (9.1)</td>
<td>7 (63.6)</td>
<td>11</td>
</tr>
<tr>
<td>16-24</td>
<td>0 (0.0)</td>
<td>3 (21.4)</td>
<td>0 (0.0)</td>
<td>8 (57.1)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (7.1)</td>
<td>0 (0.0)</td>
<td>2 (14.3)</td>
<td>14</td>
</tr>
<tr>
<td>25-64</td>
<td>4 (6.6)</td>
<td>13 (21.3)</td>
<td>1 (1.6)</td>
<td>20 (32.8)</td>
<td>3 (4.9)</td>
<td>4 (6.6)</td>
<td>3 (4.9)</td>
<td>3 (4.9)</td>
<td>10 (16.4)</td>
<td>61</td>
</tr>
<tr>
<td>≥ 65</td>
<td>0 (0.0)</td>
<td>1 (8.3)</td>
<td>0 (0.0)</td>
<td>2 (16.7)</td>
<td>0 (0.0)</td>
<td>6 (50.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (25.0)</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Hammering</th>
<th>Machinery/Tools</th>
<th>Firearm</th>
<th>Assault</th>
<th>Chemical Injury</th>
<th>Fall</th>
<th>Vehicle Accident</th>
<th>Shuttlecock/Racket</th>
<th>Other</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (13.3)</td>
<td>0 (0.0)</td>
<td>6 (40.0)</td>
<td>0 (0.0)</td>
<td>3 (20.0)</td>
<td>4 (26.7)</td>
<td>15</td>
</tr>
<tr>
<td>Males</td>
<td>4 (4.8)</td>
<td>17 (20.2)</td>
<td>2 (2.4)</td>
<td>29 (34.5)</td>
<td>3 (3.6)</td>
<td>6 (7.1)</td>
<td>4 (4.8)</td>
<td>1 (1.2)</td>
<td>18 (21.4)</td>
<td>84</td>
</tr>
<tr>
<td>ALL *</td>
<td>4 (4.0)</td>
<td>17 (17.2)</td>
<td>2 (2.0)</td>
<td>31 (31.3)</td>
<td>3 (3.0)</td>
<td>12 (12.1)</td>
<td>4 (4.0)</td>
<td>4 (4.0)</td>
<td>22 (22.2)</td>
<td>99</td>
</tr>
</tbody>
</table>

Comparing 'Mechanism of injury' distribution between males and females: Fisher's exact p = 0.001

* 3 patients with unknown mechanism of injury were excluded.
Figure 6. Frequency distribution of place of injury in 1991 and in 2009.

- Work: 20.4% (1991), 23.3% (2009)
- Home: 30.6% (1991), 31.9% (2009)
- School: 1.0% (1991), 4.1% (2009)
- Street: 9.6% (1991), 21.4% (2009)
- Sport/Leisure: 8.2% (1991), 16.7% (2009)
- Other: 14.4% (1991), 13.4% (2009)

Legend:
- Red bar: year 2009
- Blue bar: year 1991
Figure 5. Frequency of eye injury types in 1991 and in 2009.
Figure 7. Frequency distribution of eye injury mechanism in 1991 and in 2009

- Firearm: 2.0% (1991), 1.4% (2009)
- Assault: 31.3% (2009) (highlighted)
- Chemical injury: 3.0% (1991), 4.1% (2009)
- Fall: 8.2% (1991), 12.1% (2009)
- Vehicle accident: 4.0% (1991), 3.4% (2009)
- Other: 26.3% (1991), 38.8% (2009)

Legend:
- Red: year 2009
- Light blue: year 1991
PREVENTION

• Key to the problem
• >90% of serious eye injuries preventable

Vinger Ophthalmol 1981
SCOTS

- 13% aware of the risk of injury
- Protective eyewear available for < 50%
- Protective eyewear worn by < 20%
- Ocular trauma is largely preventable