Aim: To assess the aetiological factors associated with the occurrence of perforating ocular injuries in children in an urban setting and to assess the visual outcomes of such injuries.

Methods: All cases of perforating ocular injury presenting to a single paediatric hospital (age less than 16 years) over a 17 year period were identified by a medical record search. All new cases of perforating ocular injury identified were included. All information was obtained retrospectively from the medical records.

Results: There were 72 cases identified. The commonest causes of perforating ocular injury were sharp tools (knives/scissors) poked by the child into his/her own eye (17%), or objects thrown at the child (17%). Injuries were most likely to have occurred at home (58%). The age range for injuries was 8 months to 14 years 8 months. Perforating ocular injury was most frequent in the 3–6 year group (32%) followed by the 6–9 year group (25%). Males were more frequently involved than females (48–24). There was no correlation between the laterality of the eye, the time of day of the occurrence, or the day of the week of the occurrence. The final acuity achieved was better or equal to 6/12 in 36% and less than 6/60 in 31%. Injuries occurred more frequently on weekends than on weekdays. There were six enucleations (8%). Follow up was for an average period of 25 months.

Conclusions: Penetrating ocular injury occurs most frequently in the home setting and mostly as the result of the use of sharp tools or by thrown objects. Prevention of penetrating ocular injury requires greater education of children and their carers especially on the potential dangers within the home.

Figure 1 Age and sex at time of perforating ocular injury.
recording in 5%.

and more than 10 mm in 24%.

There were insufficient data for

wound was less than 5 mm in length in 38%, 5–10 mm in 33%,

was involved in 42%.

There was uveal prolapse in 68%. The

Wounds involving the sclera alone accounted for 13%. The lens

involving the cornea only (58%) or were corneoscleral (29%).

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and more than 10 mm in 24%. There were insufficient data for

recording in 5%.

The time of injury occurrence was grouped into 2 hour peri-

ods from 8 am.

There was a trend towards more injuries occur-

ring between 4 and 6 pm with 12 of the 48 cases, where the time

of injury was recorded occurring during this period but this was

not statistically significant. Injury occurrence by month showed

no specific seasonal trend. Saturday was the most frequent day

of injury in boys and girls engaged in unsupervised play.

The high incidence of accidents occurring in the home is

clearly of concern. Obviously, children spend a majority of

time at home and hence accidents are more likely to

occur there. However, they also spend approximately 10–15%

of their time at home and hence accidents are more likely to

occur there. However, they also spend approximately 10–15%

of their waking hours when under the age of 16 in school.

The male preponderance of injuries in this study of exactly

two to one is less than the findings of previous studies of children. The

male predominance of injuries may be a result of males and

females being engaged in different activities with different

degrees of risk of ocular injury. Younger children tend to per-

form more similar activities and this could explain the equal

incidence of injuries in the less than 3 year age group.

Similarly Soylu et al. found that during the early years of life

there is no difference in occurrence of perforating ocular

injury in boys and girls engaged in unsupervised play.

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<table>
<thead>
<tr>
<th>Table 1</th>
<th>Grouped causes of perforating ocular injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause of injury</td>
<td>Number of cases</td>
</tr>
<tr>
<td>Sharp object poke in own eye</td>
<td>12</td>
</tr>
<tr>
<td>Object thrown at patient</td>
<td>12</td>
</tr>
<tr>
<td>Hit with sharp object</td>
<td>9</td>
</tr>
<tr>
<td>Fall onto sharp object</td>
<td>7</td>
</tr>
<tr>
<td>Motor vehicle accident</td>
<td>4</td>
</tr>
<tr>
<td>Plant</td>
<td>3</td>
</tr>
<tr>
<td>Cat scratch</td>
<td>2</td>
</tr>
<tr>
<td>Sling shot</td>
<td>2</td>
</tr>
<tr>
<td>Bicycle accident</td>
<td>2</td>
</tr>
<tr>
<td>Projectile shattering glass, fragment in eye</td>
<td>2</td>
</tr>
<tr>
<td>Snapped plastic hair band</td>
<td>2</td>
</tr>
<tr>
<td>Unknown</td>
<td>2</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Miscellaneous causes of perforating ocular injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observing brother crush marble in vice</td>
<td></td>
</tr>
<tr>
<td>Observing father bending wire with pliers</td>
<td></td>
</tr>
<tr>
<td>Observing brother breaking stick</td>
<td></td>
</tr>
<tr>
<td>Leaned against window which broke</td>
<td></td>
</tr>
<tr>
<td>Wall unit fell onto baby bouncer</td>
<td></td>
</tr>
<tr>
<td>Light bulb exploded at desk</td>
<td></td>
</tr>
<tr>
<td>Lit bullet with cigarette lighter</td>
<td></td>
</tr>
<tr>
<td>Plastic hair band</td>
<td></td>
</tr>
<tr>
<td>Dropped bag containing soft drink bottle which exploded</td>
<td></td>
</tr>
<tr>
<td>Bit glass which broke</td>
<td></td>
</tr>
<tr>
<td>Pulled mirror down onto herself</td>
<td></td>
</tr>
<tr>
<td>Sharp twig into eye after jumping over fence</td>
<td></td>
</tr>
<tr>
<td>Plastic star in eye when playing</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Place of injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place of injury</td>
<td>Number of cases</td>
</tr>
<tr>
<td>Home</td>
<td>42</td>
</tr>
<tr>
<td>Road</td>
<td>3</td>
</tr>
<tr>
<td>Shop</td>
<td>2</td>
</tr>
<tr>
<td>Footpath</td>
<td>2</td>
</tr>
<tr>
<td>Park</td>
<td>2</td>
</tr>
<tr>
<td>School</td>
<td>1</td>
</tr>
<tr>
<td>Caravan park</td>
<td>1</td>
</tr>
<tr>
<td>Unknown</td>
<td>16</td>
</tr>
</tbody>
</table>

year. Of the injuries 25% occurred during school holidays. This

was not statistically significant.

The overall outcome showed 36% attained visual acuities of

6/12 or better. However, 31% had acuities of worse than 6/60 (Fig

2). Final acuity showed a trend, but not statistically significant

variation towards better acuity in cases where the lens was not

involved, there was no uveal prolapse and the wound sizes were

smaller. These features are shown in Figure 3.

Two wounds were self sealing and required no initial

surgery but both patients went on to have a delayed cataract

evacuation, and one developed endophthalmitis. Primary lens

removal was performed in eight cases, secondary removal in 12

cases. Primary enucleation or evisceration was performed in

cases three cases and secondary enucleation or evisceration in

three cases. Owing to the age of the population group the

majority of suture removals were performed under a general
anaesthetic and an examination under a general anaesthetic

of the eye would have been performed at these times. The fur-

ther procedures that were performed are detailed in Table 4.

The following complications were encountered. There was one

case of a suture abscess, which settled with suture removal

and topical antibiotics. There were no cases of sympathetic

ophthalmia. There was one case of fungal endophthalmitis

which occurred in a self sealing perforation with plant mate-

rial. This case developed an intralenticular abscess which

failed to settle with topical antibiotics or antifungals. A vitre-

ous tap grew Aspergillus. It settled with intravitreal antifungals

and lensectomy. There was one case of infective keratitis

which settled with topical antibiotics. Five patients developed

retinal detachments which were repaired.

DISCUSSION

Perforating eye injuries represent a significant cause of visual

loss. Ocular injuries have been estimated to cost the Australian

community $155 million a year with 44% of this cost due to

perforating injuries.7

There are only two large recent studies of the aetiology of

perforating eye injuries in children (Soylu et al, 242 cases7

Moreira et al, 1467), and two smaller studies (Rudd et al, 46

cases6, Alfaro et al, 30 cases6). These studies were carried out in

Turkey, Brazil8 and the United States.7 8 With 72 cases this

study is mid-size and in a different country.

The male preponderance of injuries in this study of exactly

two to one is less than the findings of previous studies of children.

of three to one and six to one.12 15 This difference may

relate to different age profiles for these studies of children. The

male predominance of injuries may be a result of males and

females being engaged in different activities with different

degrees of risk of ocular injury. Younger children tend to per-

form more similar activities and this could explain the equal

incidence of injuries in the less than 3 year age group.

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there is no difference in occurrence of perforating ocular

injury in boys and girls engaged in unsupervised play.

The high incidence of accidents occurring in the home is

clearly of concern. Obviously, children spend a majority of

time at home and hence accidents are more likely to

occur there. However, they also spend approximately 10–15%

of their waking hours when under the age of 16 in school.
Average commencing school age in New South Wales is 5 years and 55% of the children in this study were over this age. Only 1% of injuries occurred at school which suggests there is greater safety in being at school. Also only one of the injuries occurred in childcare. This may suggest that in schools and childcare centres the level of supervision may be greater. Also more careful attention may have been given to the activities conducted and the design of the environment and the availability of dangerous objects.

Although not statistically significant there was a slight predominance of right side injuries. Of the self inflicted injuries 10 involved the right eye and only two the left. These injuries generally occurred while the children were cutting towards themselves. If the children were right handed, which is commoner in the community, right side injuries would be expected to predominate. This may explain the predominance of right sided injuries. If the self inflicted injuries were excluded there would have only been 29 right eye injuries and 31 left eye injuries.

The incidence of injuries from motor vehicle accidents (6%) is similar to other recent studies but lower than in earlier studies. The reduction in perforating ocular injuries from the introduction of compulsory seat belt legislation has been well documented and is an excellent example of preventative public health measures.

In this study 36% of the children achieved 6/12 or better. Comparisons with other studies are complicated by different age profiles and differing injury profiles. Other paediatric studies reported achieving 6/12 or better in 43% (Alfaro et al.), 46% (Moreira et al.), and 51% (Elder). The trend of these studies would seem to show a worse outcome in paediatric studies than for total or adult population studies (Thompson et al., Elder et el., patel et al.). This may reflect the additional problems caused by amblyopia, difficulties in follow up and examining the child, effect of the management, and outcome of paediatric perforating ocular injuries.

As prevention of perforating ocular injuries is clearly the goal it is clear greater attention needs to be directed towards the potential dangers of the home surroundings. Owing to the relatively infrequent incidence of injury in any specific environment eye protection devices are unlikely to be instigated in most of these cases. The majority of injuries occurred in younger children who cannot be fully responsible for their actions; hence, parents and carers need education in preparing the home environment to be safe for children. Adequate supervision and appropriate ocular protection for children must be stressed especially when using sharp tools or scissors or knives. Safer tools such as blunt nosed scissors should be provided and access to sharp or dangerous household utensils should be restricted. Furniture with rounded corners is a more desirable choice for households with children. Plants with thorns are not suitable in gardens with children. Attention should also be directed towards the education of children in the avoidance of potentially dangerous activities. Games involving throwing projectiles should be disallowed. Children playing with pets require supervision and education on how to treat pets. Possible avenues of dissemination of this information would be through schools, medical practices and baby health clinics, and through the media.

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REFERENCES

Table 4 Re-operations

<table>
<thead>
<tr>
<th>Operation</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataract removal</td>
<td>8</td>
</tr>
<tr>
<td>Enucleation</td>
<td>3</td>
</tr>
<tr>
<td>Pupillary membrane division</td>
<td>1</td>
</tr>
<tr>
<td>Vitrectomy, foreign body removal</td>
<td>1</td>
</tr>
<tr>
<td>Esotropia surgery</td>
<td>1</td>
</tr>
<tr>
<td>Retinal detachment repair and lensectomy</td>
<td>4</td>
</tr>
<tr>
<td>Retinal detachment repair alone</td>
<td>1</td>
</tr>
<tr>
<td>Resuturing of laceration</td>
<td>1</td>
</tr>
<tr>
<td>Injection of intravitreal antibiotics/anti-fungals</td>
<td>1</td>
</tr>
<tr>
<td>and lens extraction</td>
<td></td>
</tr>
<tr>
<td>Removal of sutures</td>
<td>34</td>
</tr>
<tr>
<td>Examination under anaesthesia only</td>
<td>27</td>
</tr>
</tbody>
</table>

Figure 3 Acuity outcome correlated with lens involvement, uveal prolapse, and wound size.