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WORK-RELATED, PENETRATING EYE INJURIES IN RURAL ENVIRONMENTS

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Abstract: Purpose: To establish the aetiology and visual outcome after penetrating eye injures in rural environments. Materials and Methods: The records of 182 patients (184 eyes) with penetrating eye injuries treated in the 1 st Eye Hospital, Lublin, Poland, between 1994 and 2002, were reviewed. Twenty eight of the 184 eyes (15.6%) were work-related agriculture penetrating eye injuries. Distribution by age, sex, season variation, cause of injury, place of entrance wound, visual acuity and late complications were estimated. Results: Of the group of 28 patients, 24 (85.7%) were male and 4 (14.3%) female, with the age range between 11–76 (mean 48.2) years. Most injuries were a result of repair and maintenance work in 35.7%, wood chopping in 25%, machine use in 17.9%, simple instruments use in 10.7%, fall from one level to another in 7.1%, and cow butting with a horn in 3.6%. Eighteen eyes (64%) were blind with visual acuity less than 0.05 at their most recent review. Conclusions: Our study has shown that perforating ocular injuries in rural environment are still a big therapeutic, social and economic problem.

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INTRODUCTION

Penetrating eye injuries are one of the main reasons for severe visual impairment and as a rule require treatment in hospital. In spite of the new microsurgical techniques, the prognosis of penetrating eye injuries in many cases is still quite poor and dependent mostly on the severity of the primary injury.

Definitions. A work-related injury, according to Schelp, is an injury that has occurred at a work place, either as part of the job or on a work-related assignment [12]. A penetrating eye injury, according to Kuhn, is an injury caused by a sharp inflicting agent, when a structure of an eye is cut, but there is only one (entrance) wound. An intraocular foreign body injury is an injury when a retained object is involved. A perforating injury is an injury when there are both an entrance and exit wound exist [5].

MATERIAL AND METHODS

The records of 182 patients (184 eyes) with penetrating eye injuries requiring hospital admission at Tadeusz Krwawicz Chair of Ophthalmology and 1st Eye Hospital, Skubiszewski Medical University of Lublin between 1994 and 2002, were reviewed. All of the patients were operated on as emergency cases on the day of admission to the hospital. After treatment in the hospital, each patient was followed up in the outpatient department.

Twenty eight out of 184 eyes (15.6%) suffered from work-related agriculture penetrating eye injuries. In

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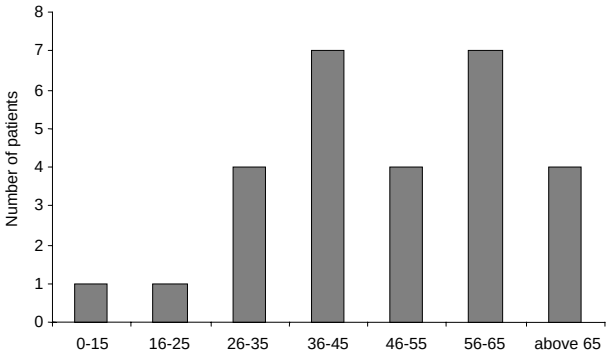

Figure 1. Age distribution.

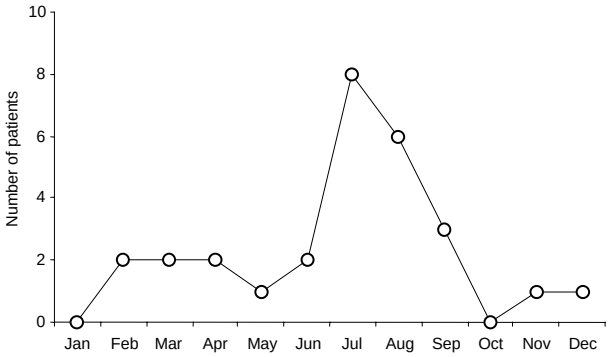

Figure 2. Seasonal distribution of eye injury.

agriculture eye injuries: age, sex, season variation, cause of injury, place of entrance wound, visual acuity after trauma, late complications after trauma and final visual acuity were evaluated.

RESULTS

In the whole series of 182 patients (184 eyes) with penetrating eye injury, the age range from 1–80 (mean 33.8) years. The sex ratio was 145 (80%) males and 37 (20%) females. A final visual acuity of less than 0.1 was achieved in 72 eyes (39.1%).

Twenty eight agriculture workers, 24 (85.7%) male and 4 (14.3%) female, with the age range between 11–76 (mean 48.2) years, were treated. Penetrating eye trauma occurred more frequently in people between 26–65 years of age; however the highest rate was observed in the group between 56–65 years of age. There were 2 children, 11 and 16 years old, in the analysed group. (Fig. 1). Seasonal distribution of penetrating injuries, with the maximum occurring during the summer months, is seen in Figure 2.

Most injuries were a result of repair and maintenance work - 10 (35.7%) includes 8 intraocular metallic foreign bodies entered an eye during hammering, wood chopping - 7 (25%), machine use - 5 (17.9%) (e.g. chaff-cutter, threshing-machine, grinding machine), simple instruments use - 3 (10.7%) (knife, reaping hook), fall from one level to another - 2 (7.1%) and cow butting with a horn - 1 (3.6%) (Tab. 1)

Table 3. Visual acuity after penetrating eye injury.

Visual acuity	below 0.1	0.1–0.3	above 0.3
n (after injury)	18 (64.3%)	4 (14.3%)	6 (21.4%)
n (after treatment)	19 (67.9%)	2 (7.1%)	7 (25.0%)

Corneal wound location was found in 16 eyes (57.1%), scleral in 8 eyes (28.6%) and corneosclaral location in 4 eyes (14.3%). In 8 eyes (28.6%) intraocular foreign body was found. All of them were removed from the eye either during the primary eye repair, using an electromagnet, or during subsequent surgery procedures. During the follow up period, most cases developed late post-traumatic complications (Tab. 2) treated with additional surgical procedures: vitrectomy - 8 patients (28.6%), encircling scleral buckling - 1 patient (3.6%), cataract surgery - 7 (25%).

The initial visual acuity (measured after admission to the hospital) was below 0.1 in 18 patients, from 0.1 to 0.3 in 4 patients, and above 0.3 in 6 patients. Final visual acuity (at the end of treatment process) was below 0.1 in 18 patients, from 0.1 to 0.3 in 3 patients and above 0.3 in 7 patients (Tab. 3). Final visual acuity improved in 7 cases (25%), did not change before and after treatment in 14 cases (50%) and decreased in 4 cases (14.3%). Three eyes due to severe trauma and no light perception were enucleated.

Table 1. Cause of penetrating eye injury.

External cause of injury	Repair and maintenance work	Wood chopping	Machine use	Simple instruments use	Falling	Cow horn
n	10	7	5	3	2	1
%	35.7	25	17.9	10.7	7.1	3.6

Table 2. Posttraumatic complications.

Complication	Cataract	Vitreoretinal proliferations	Retinal detachment	Endophthalmitis	Atrophia bulbi
n	10	1	8	1	2
%	35.7	3.6	28.6	3.6	7.1

DISCUSSION

Today, work accidents are still frequent events despite efforts made for primary prevention, and the eye is a high-risk organ for work accidents. Although it represents only 0.27% of the total body area and 4% of the facial area, ocular trauma is very frequent [1]. According to the studies by Luccheta and co-workers, the eyes are in third place, after hands and feet, among the most frequently involved anatomical regions [6].

In our study, 15.6% of all treated penetrating eye injuries were work-related penetrating eye injuries due to work in agriculture. Similar values were found by others authors [3, 11]. The mean age of patients with eye injuries due to agriculture was higher (48.2 years) than in all cases (33.8 years). About 18% of the of the agricultural workers with the eye injuries were over the age of 65 years, whereas in other occupational groups only 8% of cases were above this age. There were 2 children, 11 and 16 years old, who had helped adults in threshing and grinding (circular saw). The ratio of male to female was 7:1 in our study, which is similar to that by others authors [9, 10].The most frequent injuries were a result of repair and maintenance work - 10 (35.7%) and includes 8 intraocular metallic foreign bodies entered an eye during hammering. This kind of injury was typical for younger workers. The second frequent cause of an injury was a flying piece of wood at chopping, which occurred in 7 (25%) cases, more typical for older people. In our region, a lot of farmyards, specially occupied by older people, use wood as a source of fuel, to heat the houses and prepare meals. Also, quite a big number of blunt, not perforating, trauma of the eye occurred during wood chopping, were treated in our hospital (not included to this study). Blunt trauma can also lead to severe complications, such as: haemorrhage inside the eye, lens luxation into the vitreous, glaucoma or retinal detachment. Fourteen (50%) out of 28 injuries took place in the summer months, July and August, the typical harvest time in Poland, and most of them occurred in connection with harvesting.

In spite of the high qualify surgical service after eye trauma and second surgical procedures during follow up, the final functional outcome are not satisfactory. Eighteen (64%) out of 28 patients had final visual acuity less than 0.05 (WHO definition of blindness, 1979), includes 3 cases where the eye was enucleated, and 2 children. This means that those people, according Polish law, are no longer allowed to work with moving machinery (like tractors, threshing-machine, grinding machine, circular saw) or to work on a high level, which are common in agriculture. The rate of monocular blindness among rural population was higher, compared to 40% among all penetrating injures treated in our hospital between 1994–2002. Saari and Aine (Finland), who analysed in their group all kinds of eye injuries in agriculture (superficial, blunt and penetrating), found the blindness rate as being equal 21.9%. The difference in the rates is implied from the fact that penetrating injuries are the most devastating injuries of the eye. Although no separate series of penetrating injuries of the eye in rural environments exist in the literature, the rate of blindness among different occupational groups after penetrating eye injuries in literature varied from 31–62% [2, 4, 7, 8, 10].

In our study, we were not able to count the risk of penetrating injury in rural workers compared to the other groups. Saari and Aine have shown that in agriculture the incidence of eye injuries during paid work was about four times as high as in industry. They have explained this by the fact that in the course of a day an agricultural worker undertakes different tasks with a great range of possible eye hazards, so that measures to protect the eyes cannot readily be applied. On the other hand, in industry the prevention of the eye injuries is more controlled [11]. Cruciani and co-workers (Italy) have shown, that the risk of eye injury is slightly higher in agriculture as compared to industry/craftsmanship (RR=1.63), but the risk of permanent consequences is 3 times higher in agriculture (RR=3.36) [1].

In conclusion, our study has shown that perforating ocular injuries in rural environment are still a big therapeutic, social and economic problem. High risk of injury and pure final functional outcome in the group of rural environment are due to the fact that agriculture is still a family business, sometimes even three generations, and preventive measures are often absent or insufficient.

Conclusions. Our study has shown that perforating ocular injuries in rural environment are still a big therapeutic, social and economic problem.

REFERENCES

1. Cruciani F, Lucchetta F, Regine F, Salandri AG, Abdolrahimzadeh B, Balacco Gabrieli C: Work-related accidents of ophthalmologic interest in Italy during 1986-1991. *Ophthalmologica* 1997, **211**, 251-255.

2. Esmaeli B, Elner SG, Schork MA, Elner VM: Visual outcome and ocular survival after penetrating ocular trauma. A clinicopathologic study. *Ophthalmology* 1995, **102(3)**, 393-400.

3. Forsius H, Nikupaavo A: On accidental injuries to the eyes in Finland. *Ann Occup Hyg* 1964, **7**, 373-384.

4. Fuller DG, Hutton WL: Prediction of postoperative vision in eyes with severe trauma. *Retina* 1990, **10(Suppl. 1)**, 20-34.

5. Kuhn F, Morris R: The terminology of Eye Injuries. *Ophthalmologica* 2001, **215**, 138-143.

6. Luccheta F, Cruciani F: Considerazioni epidemilogiche sugli infortuni oculari registrati dall'INAIL nel periodo 1975-1982. *Clin Ocul Pato Ocul* 1986, **3**, 179-185.

7. Mackiewicz J, Machowicz-Matejko E, Salaga-Pylak M, Piecyk-Sidor M, Zagorski Z: Penetrating eye injuries - longitudinal observation. **In:** *Proceedings of the XXVI Symposium Retinologicum, Poznań, 4-6 April 2003*. Poznań 2003.

8. Mulvihill A, Eustace P: The pattern of perforating eye injuries in Ireland. *Ir J Med Sci* 2000, **169**, 47-49.

9. Niiranen M: Perforating eye injuries. *Acta Ophthalmol (Copenh)* 1978, **Suppl. 135**, 1-87.

10. Punnonen Eeva: Epidemological and social aspects of perforating eye injuries. *Acta Ophthalmol* 1989, **67**, 492-498.

11. Saari KM, Aine E: Eye injuries in agriculture. *Acta Ophthalmol* 1984, **Suppl. 161**, 42-51.

12. Schelp L: The occurrence of farm-environmental injuries in a Swedish municipality. *Accid Anal and Prev* 1992, **24(2)**, 161-166.