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Eye injuries in Northern Ireland two years after seat belt legislation

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SUMMARY Two hundred and forty-six patients with ocular perforation were treated at the Royal Victoria Hospital, Belfast, between 1 February 1981 and 31 January 1985. Road traffic accidents were responsible for 63 injuries, all of which affected front seat occupants, and 45 occurred before implementation of the seat belt law on 1 February 1983. Following legislation there was a 60% reduction in ocular injuries, which confirms the protective effect on front seat occupants of wearing a seat belt.

Road traffic accidents are a common cause of perforating eye injury with resulting visual loss and cosmetic disability. Johnston[1] strongly recommended the compulsory use of seat belts to protect car occupants from injury, and evidence from other countries[2] shows a significant decrease in eye injuries after introduction of seat belt legislation.

The compulsory use of seat belts by front seat occupants of cars was introduced to Great Britain and Northern Ireland on 1 February 1983, and Rutherford *et al.* reported a significant reduction in fatalities and injuries from car accidents during the first year after legislation.

We set up a retrospective study which examined the pattern of penetrating eye injuries in Northern Ireland during the two years immediately before and after seat belt wearing became compulsory.

Materials and methods

The Department of Ophthalmology at the Royal Victoria Hospital, Belfast, is the regional ophthalmic centre for a population of about 1·25 million. We examined the hospital records of all cases of penetrating eye injuries which were treated at the Royal Victoria Hospital from 1 February 1981 to 31 January 1985. Where injury resulted from a road traffic accident, details of the injury, the patient's age and sex, seat belt compliance, position in the vehicle, and visual recovery were recorded.

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Results

Two hundred and forty-six patients with ocular perforation were treated at the Royal Victoria Hospital between 1 February 1981 and 31 January 1985 (Table 1). A total of 63 injuries were caused by car accidents during the survey, and, of these, 45 cases occurred before and 18 after seat belt legislation, which is a fall of 60% ($p<0·001$, χ^2 11·57, df=1).

Eight patients (Table 2) sustained injury while wearing a seat belt, and of this group one had a defective belt and another described injury by flying glass when his vehicle was stationary.

Table 1 *Distribution of eye injury by cause and year of injury*

Cause	*1981–3*		*1983–5*	
	No.	*%*	*No.*	*%*
Road traffic accident	45	33.6	18	16
Others	89	66·4	94	84
Total	134	100	112	100

Table 2 *Seat belt status of injured patients*

	1981–3		*1983–5*	
	No.	*%*	*No.*	*%*
Seat belt	1	2·2	7	38·8
No seat belt	44	97·8	11	61·2
Total	45	100	18	100

All 63 patients were front seat occupants (Table 3), with no significant difference in the number of front seat passengers and drivers injured. There were no injuries to back seat passengers during the study.

66% of injuries affected patients aged 17-29 years (Table 4), and this age range showed a 73% reduction in ocular perforations sustained after legislation.

Table 5 shows that a greater proportion of patients retained vision of 6/6 in the injured eye in the pre-seat belt period. During the prelegislation period a greater proportion of patients were rendered totally blind in the injured eye by the accident, and the enucleation rate was greater. A total of six bilateral perforations were treated during the survey, and of these only one occurred after the legislation. Males were more susceptible than were females to injury (Table 6).

Table 3 *Position of injured person in vehicle*

	1981–3		*1983–5*	
	No.	*%*	*No.*	*%*
Driver	23	51	10	55·5
Front seat passenger	22	49	8	44·5
Total	45	100	18	100

Table 4 *Distribution of injured patients according to age*

Age when injured (years)	*1981–3*		*1983–5*	
	No.	*%*	*No.*	*%*
0–16	2	4·4	3	16·6
17–29	33	73·3	9	50·0
30+	10	22·3	6	33·4
Total	45	100	18	100

Table 5 *Distribution of eye injuries by final visual acuity*

Acuity	*1981–3*		*1983–5*	
	No.	*%*	*No.*	*%*
6/6	15	30·6%	4	21·0%
6/9–6/12	13	26·5%	4	21·0%
6/18–6/36	5	10·2%	5	26·3%
6/60 or worse	4	8·1%	4	21·0%
No perception of light	12	24·5%	2	10·5%
Total	49*	100·0%	19	100·0%
Enucleation	8	16·0%	1	5·0%

*One patient lost to follow-up.

Table 6 *Distribution of injured patients by sex*

	1981–3		*1983–5*	
	No.	*%*	*No.*	*%*
Male	30	66·6	13	72·2
Female	15	33·4	5	27·8
Total	45	100	18	100

Discussion

Road traffic accidents are a major cause of visual loss in the young adult population, and Canavan *et al.*[4] found that they caused 30·2% of perforating eye injuries in Northern Ireland from 1967 to 1976. The ocular injury caused by a road traffic accident is usually associated with multiple facial lacerations and may be bilateral. The mechanism of injury comprises impact of the victim's head against a shattered windscreen and perforation caused by flying glass.

Seat belt wearing by front seat occupants of vehicles became compulsory in Northern Ireland on 1 February 1983, and compliance was estimated at 92% during the first year of legislation compared with 25% during 1982.[3] The Royal Victoria Hospital is responsible for the treatment of almost all perforating eye injuries which occur in Northern Ireland. The records of all these injuries were examined during the two years before and after introduction of seat belt legislation. Our survey shows a 60% reduction in perforating eye injuries following legislation, which corresponds with observations in Wessex, England, by Hall *et al.*,[5] who reported a 73% reduction in the immediate postlegislation year, and Vernon and Yorston,[6] who found a 58% reduction during comparable six-month periods before and after compulsory seat belt use. A multicentre report by Rutherford *et al.*[3] showed a decrease by 83·3% of perforating wounds to the eye in the year after legislation. The significant drop in ocular perforations which followed seat belt legislation in Northern Ireland is not explained by a reduction in road traffic accidents, which increased from 5249 in 1981 to 5978 in 1984.[7]

It is clear that the risk of serious ocular injury by windscreen impact is greatly reduced by seat belt use. However, seat belts do not protect against injury by flying glass. Blake *et al.*[8] emphasised the danger of flying windscreen glass as a cause of ocular perforation, and reported[9] that in spite of compulsory seat belt legislation eye injuries in the Republic of Ireland continued to occur at a high rate of 99 injuries in 5182 accidents during 1981. We found an average of nine eye injuries in 5701 accidents following seat belt legislation, and, of these, 39% were injured while wearing seat belts. Our observations support the view of MacKay[10] that eye injuries to car occupants could be further reduced if laminated instead of toughened windscreens were used in addition to seat belt use.

Of those injured before and after legislation the expected level of visual recovery is largely unchanged. Indeed, in the prelegislation period 57% of our patients regained visual acuity of 6/12 or better compared with 42% postlegislation. These figures compare with those of Blake[8] and Canavan *et al.*,[4] who both reported that 44% of their patients regained 6/12 or better. There was a dramatic decline in the enucleation rate before and after legislation. During 1981–3 eight injured eyes (16%) were excised and in 1983–5 one enucleation (5%) was necessary. This compares favourably with enucleation rates of 22·9% by Blake *et al.*[8] and 20·2% by Canavan *et al.*[4] We observed a decline in bilateral ocular perforations during the postlegislation period, which probably reflects the direct effect of legislation in reducing the total number of eye injuries and the protective effect of seat belt use against windscreen impact.

The seat belt legislation introduction to Northern Ireland on 1 February 1983 has effected a remarkable decline in the number of serious eye injuries caused by road traffic accidents. Injuries continue to occur which we believe are due to the non-use of belts, faulty belts, and injury caused by flying glass from toughened windscreens. These injuries may be further reduced by compulsory fitting of laminated windscreens in all newly registered motor vehicles and rigorous enforcement of the seat belt legislation.

References

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