

Ocular injuries caused by explosive substance

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Abstract

• **AIM:** To evaluate the incidence and characters of the explosive substance induced ocular injuries.

• **METHODS:** All patients were treated in the Ophthalmology Department ward of Daping Hospital between January 2000 and March 2007 for ocular injuries caused by explosive substance were reviewed. Patients demographics, causes of injury, initial and final visual acuity, medical intervention, and the length of hospitalization time were noted.

• **RESULTS:** Totally 116 eyes of 103 cases were identified. Firecracker caused 71 eyes (61.2%), engineering explosive caused 22 eyes (18.9%), explosion of glass bottles caused 10 eyes (8.6%), and other reasons caused 13 eyes (11.2%). Firecracker induced injuries had the highest incidence rate in February (40.9%). 47.0% patients caused by firecracker needed about 2 weeks therapy in the hospital. Only 11.2% visual acuity were 20/200 or better on presentation and after therapy it was 33.6%.

• **CONCLUSION:** Explosive substance may cause severe eye injuries, appropriate caution and prevention would be helpful to decrease the incidence rate of this kind of ocular injury.

• **KEYWORDS:** ocular injury; explosive substance; visual acuity

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INTRODUCTION

Although the amount of ocular injuries caused by explosive substance was not so large in normal time as it in wartime^[1], it is still a common ailment, especially in China, where the firecracker was widely used for celebration or other important things. However, for China it is still a developing country, the engineering explosive was generally used in many construction work, which also causes a lot of ocular injuries.

And there are many other potential explosive substance could induce eye trauma too. Almost all of the previous studies on this kind of trauma have been only focused on the cases of wartime^[2-5]. The purpose of this study is to evaluate incidence and characters of ocular injuries caused by explosive substance in patients requiring hospitalization in normal time, and emphasized on the need of caution and prevention when working with these dangerous explosive substance or potential explosive substance.

MATERIALS AND METHODS

One hundred sixteen eyes in 103 cases that resulted from explosive substance impact were identified during the 7 years period of this study, representing nearly one fifth (17.5%) of all ocular trauma patients in hospital presenting during this period. All patients treated in the Ophthalmology Department ward of Daping Hospital between January 2000 and March 2007 for ocular injuries caused by explosive substance were reviewed as a retrospective study. The demographics and ophthalmic history, the cause and mechanism of injury, presenting and best-corrected visual acuity, the medical intervention, and the length of hospitalization time of patients were recorded for each case. One-way anova statistics was used.

RESULTS

Eighty-nine of the subjects were males (86.4%) and 14 were females (13.6%). Firecracker caused 71 eyes (61.2%) injury, engineering explosive induced 22 eyes (18.9%), 10 eyes (8.6%) injured by the explosion of glass bottles containing beer, and the others were caused by other explosive substance (11.2%), such as plastic lighter, coal gas bottle, pressure cooker and so on.

The initial visual acuity ranged from 20/40 to no light perception. 88 eyes (88.8%) had 19/200 or worse visual acuity, while 13 eyes (11.2%) had 20/200 or better visual acuity. After medical intervention, 25 eyes (21.6%) were performed enucleation or evisceration because they were severely destroyed and could not be repaired, 39 eyes (33.6%) got 20/200 or better visual acuity, and 52 eyes (44.8%) had 19/200 or worse visual acuity. The details of visual acuity of the patient eyes were shown in Table 1.

When all of the ocular injuries caused by different reasons were analyzed by month (Figure 1), it was evident that the firecracker induced injuries had the highest incidence rate, and highest proportion of it occurred in February (40.9% of all ocular injuries caused by firecracker). This corresponded to the Spring Festival, the important Chinese festival which is around February. Other injuries that were not caused by firecracker did not have notable difference in various months.

Table 1 The presenting and final best-corrected visual acuity

	Enuc- leation	No light Perception		Light Perception/Hand Motion		1/200-19/200		20/200-20/50		≥20/40	
		Initial VA	Final VA	Initial VA	Final VA	Initial VA	Final VA	Initial VA	Final VA	Initial VA	Final VA
		Firecracker	15	13	3	48	21	4	8	6	20
Engineering explosive	5	4	1	16	11	0	1	1	4	1	0
Glass bottles of beer	3	4	0	2	2	1	1	2	2	1	2
Others	2	2	2	8	1	1	1	1	4	0	2
Total	25	23	6	74	35	6	11	10	30	3	9

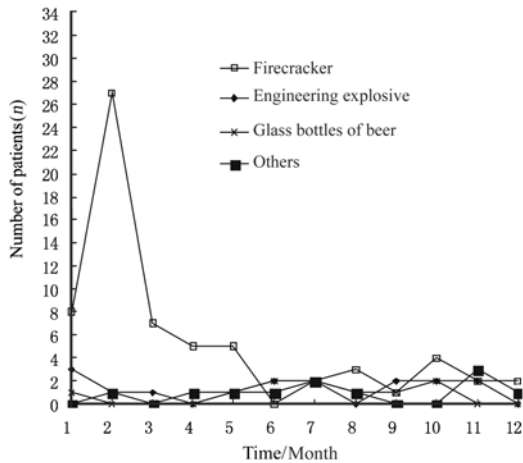


Figure 1 Distribution of ocular injuries, by month and cause.

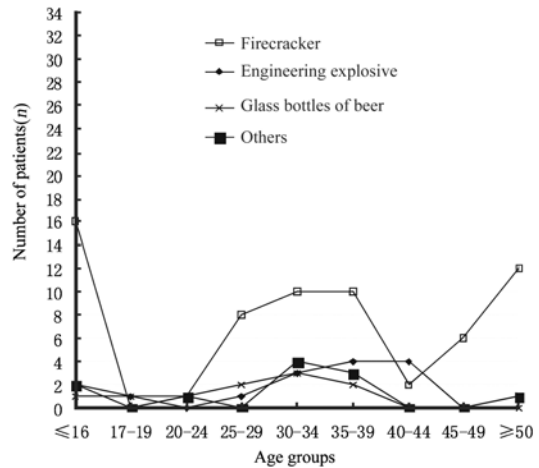


Figure 2 Distribution of ocular injuries, by age and cause.

The ocular trauma rates varied by age (Figure 2), with the highest rates among the young adults personnel, from 20 to 45 years old. Respectively, 48.5% in the firecracker induced injuries, 75.0% in the engineering explosive induced injuries, 80.0% in all of the injuries caused by explosion of glass bottles containing beer, and 72.7% in other explosive substance induced injuries. And in the cases caused by firecracker, the injury rates had the second peak at the years 50 and older than it. Most of the patients (47%) that had trauma induced by firecracker needed about 2 weeks therapy in hospital, the hospitalization time of other patients were not significantly different (Figure 3).

DISCUSSION

Trauma is the leading cause of visual impairment in young adults^[6]. Although the number of it was not enormous like itself in the military in wartime^[1,2,5], occupational accidents, domestic and leisure activities can also cause a significant number of injuries^[7-8]. However, even without land mines and hand grenades, the firecracker, the engineering explosive, the high pressure glass bottles and other explosive substance or potential explosive substance can also bring many explosive induced eye injuries. And most of the time the great strength of explosion would produce severe eyes' trauma. It is very useful to evaluate the incidence and characters of ocular injuries caused by explosive substance or potential explosive substance, so that it can give the caution or even prevention to this kind of severe ocular injuries.

In our study, at first we found that the percentage of male (86.4%) and female (13.6%) was similar to the previous ocular injury studies, even if they focused on other kind of

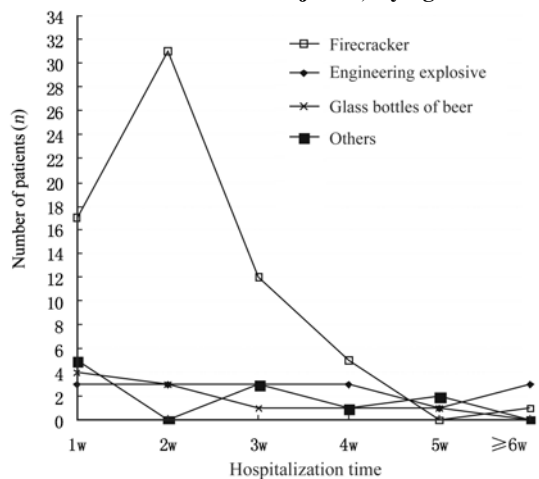


Figure 3 Distribution of ocular injuries, by hospitalization time and cause.

ocular injury etiological factors^[9-10]. So, the male should be ware that his gender is the risk factor to this kind of severe ocular injuries, he should be more careful when working with these dangerous explosive substance or potential explosive substance.

In the firecracker induced ocular injury cases, the biggest percentage of this kind of trauma, we discovered it had significant time relationship. Most of them happened near by February, perhaps because of the Chinese Spring Festival is around this month. 61.2% explosive substance induced ocular injuries are responsible by the firecracker. Although nearly half of the firecracker induced patients (47.0%) could go home after about 2 weeks therapy in the hospital, 21.6% of all eyes might be performed enucleation or evisceration^[11], and only 11.2% of all eyes could have 20/200 or better visual acuity (Table 1). People should be more

careful and get the proper protection as playing with firecracker.

The engineering explosive and high pressure glass bottles of beer are other main reasons for this kind of eye disease, the percentage of them is 18.9% and 8.6% respectively. This maybe result from China is still a developing country, there are many construction work which need engineering explosive, and the quality of some glass bottles filled with high pressure beer could not reach the standard. The fact is that even if it can not be changed by the volunteer, the employer should equip their employees with protection facilities when using engineering explosive. The Low quality glass bottles are used for storing high pressure beer or other matter should be forbidden and paid more attention by the government, and the individuals should also be much careful when dealing with high pressure glass bottles. Hopefully, this study would be helpful to decrease the incidence rate of ocular injuries caused by explosive substance.

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爆炸引起的眼外伤病例特征分析

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摘要

目的:探讨爆炸引起的眼外伤病例特征。

方法:收集大坪医院 2000-01/2007-03 间所有因爆炸引起眼外伤住院患者的病例进行统计学分析。记录患者资料,受伤原因,初始及最终视力,药物治疗及住院时间。

结果:共 103 例 116 眼,其中鞭炮炸伤 71 眼(61.2%),炸药(含雷管)22 眼(18.9%),玻璃瓶爆炸 10 眼(8.6%),其他原因炸伤 13 眼(11.2%)。2 月份鞭炮炸伤是最主要的原因,发病占到 40.9%。47.0%的鞭炮炸伤患者至少需要住院 2wk 治疗。受伤后只有 11.2%的患者视力能够达到 0.1 以上,经过治疗可达 33.6%。

结论:爆炸引起的眼外伤,破坏程度大,虽经积极抢救治疗,预后一般较差。做好保护与预防才能真正降低该病的发病率。

关键词:眼外伤;爆炸物;视力