

Epidemiological aspects of ocular superglue injuries

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Abstract

- **AIM:** To report the frequency, associated risk factors and characteristics of cases referred to Farabi Eye Hospital with ocular superglue injuries.

- **METHODS:** In a descriptive cross-sectional study conducted between December 2012 and February 2013, patients with ocular superglue injuries were evaluated. Age, sex, educational level, location, time, mechanism, type, site and time of eye injury were gathered through interview using a customized questionnaire. All participants had given consent to undergo thorough eye examination.

- **RESULTS:** Over the course of three months, 105 patients with ocular superglue injuries enrolled in the study, including 56 (53.3%) men and 49 (46.7%) women with the mean age of 24.7 ± 11.6 (range, 2 to 53)y. The right eye, left eye and both eyes were involved in 52%, 42% and 6% of the patients, respectively. Most of injuries had occurred at home (72.4%) and at night (55%). More than half of patients (52.4%) did not take any primary aids following the ocular injury. Patient carelessness (78.1%), childhood curiosity and lack of parental supervision (11.4%), storing superglue in inappropriate places and inadvertently using superglue as eye drops due to poor vision (2.9%), inadequate awareness of superglue applications [used to stick on artificial nails (3.8%), artificial eyelashes (1.9%) and broken tooth (1%)] and being assaulted with glue (1%) were common risk factors.

- **CONCLUSION:** The frequency of ocular superglue injuries in patients referred to Farabi Eye Hospital is relatively high. This finding underlines the importance of public education and awareness about superglue injuries to the eye and taking protective measures and safety strategies in order to prevent these injures.

- **KEYWORDS:** eye injuries; superglue; risk factors

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INTRODUCTION

Eye is one of the most delicate organs of human body and eyesight is an important sense, which has an enormous role in data collecting from environment so eye protection and caring is crucial and vital [1]. Ocular emergency injuries has imposed a noticeable amount of referring to ophthalmology emergency departments [2]. Chemical eye injuries are one of these significant eye emergencies that constituted 2.3% of ocular injuries in the United States[3].

Superglue (instant glue), cyanoacrylate glue, is one of the most powerful adhesive bonding for materials such as metal, wood, paper, glass, ceramics and plastics and has a high resistance to heating, humidity and most solvents like alcohol, oil and gasoline [4]. High adhesive ability, easy availability and being inexpensive makes superglue a popular choice for domestic use for repairing broken items as well as its applications in industry, art, student assignments and cosmetic application of nail tips[5-6].

Superglue is toxic so wearing gloves, glasses and mask while using is strongly recommended [6]. Despite of numerous cautions about it, still a lot of people refer to ophthalmology emergency department due to ocular superglue injuries. They usually experience severe pain and anxiety of blindness[7].

According to previous studies, 90% of these injuries are preventable and 45% of them happen in usual places like home, school or work area, so it is essential for everyone to have basic information about eye injuries in order to be able to take the best action to deal with an urgent ocular accident and preserve the vision [4]. Most of childhood ocular injuries can be prevented by parents' supervision [8] and by keeping dangerous chemical substances out of their reach. Reddy [6] showed in his study that accidental administration of superglue to the eye is possible because of similar packaging, poor eyesight or child's curiosity.

There are a limited number of studies about superglue injuries, and most of existing literature consists of case reports[4-9]. Accident prevention, educating and consulting are

Table 1 Risk factors of ocular superglue injuries in patients referred to Farabi eye Hospital in Tehran, 2012

Etiology	n	%
Patient carelessness	82	78.1
Childhood curiosity and lack of parental supervision	12	11.4
Storing superglue in inappropriate places and inadvertent use of superglue as eye drops due to poor vision	3	2.9
Inadequate awareness of superglue applications		
Being used to stick artificial nails	4	3.8
Using for sticking artificial eyelashes	2	1.9
Being used to stick broken tooth	1	1
Assault with glue	1	1
Total	105	100

important roles of health care team in the community^[10-12]. This study helps all care providers to recognize ocular superglue injuries' risk factors and take a big step toward ocular injuries prevention through consulting and community education.

This study aimed to assess the prevalence of ocular superglue injuries and its related risk factors in patients who referred to Emergency Department of Farabi Hospital in 2013.

SUBJECTS AND METHODS

This descriptive cross-sectional study was conducted in Emergency Department of Farabi Hospital in 2013 during 3mo (between December 2012 and February 2013). This ophthalmology hospital is a major eye injury center and considered as a main referral center in Iran, so it could produce reliable information about this field. The study sample includes all patients with ocular superglue injury presenting to the Emergency Department of Farabi Hospital during this 3mo. Data collection was done using a checklist and eye observation and examination. The checklist was prepared based on "The Birmingham Eye Trauma Terminology" system (BETT) and the USEIR model^[12-13] and the following data was gathered through interview: sex, age, job, education, mechanism of injury, reason for using superglue, injury place, past eye medical history, type of eye injury, which eye was injured, injury to other part of the body, information about intervention prior to the admission to the hospital and questions about parents supervision and job in the case of pediatric patients. The face and concept validity of checklist were assessed. Cronbach's alpha coefficient was 0.73. Also the checklist was reviewed by 10 ophthalmology nursing professional members of nursing and midwifery faculty of Tehran University of Medical Sciences and their comments were applied. The data were entered into SPSS version 22 and descriptive statistics (frequency and mean) was performed. Research outlines were approved by the ethics committee of Tehran University of Medical Sciences. All subjects gave their informed consent prior to participating in the study.

RESULTS

During 3mo from December 2012 to February 2013, 105

patients with ocular superglue injuries referred to Emergency Department of Farabi Ophthalmology Hospital. Patients' mean age was 24.7±11.6y. Their age interval ranged between 2 and 53y. Fifty three percent of patients were male and the rest were female. Based on their education levels participants were categorized into illiterate (12.5%), elementary school (11.5%), middle school (16%), high school (40%) and university (20%) groups. Fifty-two percent of patients had right ocular injury, 42% had left ocular injury and 6% had injury in both eyes. Injuries occurred in the morning (15%), evening (30%) and at night (55%). Conjunctivae, cornea and eyelid injuries were seen in 67%, 60% and 52.5% of patients, respectively. Also in 6.7% of patients, inflammation and rash were seen on other parts of the body like neck, hands and chest. Most common injury settings were at home, work and school area, accounting for 72.4%, 24.8% and 2.9% of the cases, respectively. More than half of patients (52.4%) did not take any primary aids following the ocular injury, before referring to the hospital.

Most prevalent risk factors were careless opening and working with superglues (78.1%) and child's curiosity without parents' supervision (11.4%) (Table 1). None of patients were hospitalized.

DISCUSSION

Several case studies have been done about superglue injuries in ears, eyes and mouth^[14]. Superglue ocular injuries are real urgent chemical injuries; it is necessary for health care providers to know the proper primary care and management of it^[2].

Superglue ocular injures cause dermatitis, loss of eyelashes, ankyloblepharon (an abnormal fusion of the upper and lower eyelid margins), severe eye pain, conjunctival epithelial abrasion, corneal abrasion, and punctuate epithelial keratopathy and chemical keratitis^[9]. After the accident, the eyes will be so painful and sensitive thus referring to the first emergency department is strongly recommended^[5]. Health care providers use normal saline for irrigation of eyes in hospitals^[5,15]. Sometimes physicians prescribe soft lens dressing for corneal abrasion healing, eye dryness prevention

and pain reduction ^[9] and antibiotics, cycloplegics, artificial tear eye drops, vitamin C and corticosteroid tablets ^[3,16]. Trimming eyelashes is not always mandatory ^[6]. Terman's ^[14] study proposes using an analgesic, sodium chloride 0.3% solution and daily follow-ups instead of cutting eyelashes.

McLean ^[5] in an one year cross-sectional study yielded that the majority of patients were injured during uncapping the glues while it suddenly splashed to their eyes (7 people), it might be because of the air inside the tube that causes it, which was corroborated by some of the patients who referred to Farabi Hospital in this study. According to McLean's study, second group consisted of children under 6 years old who lived unsupervised at home and the ocular injury occurred while they were playing with superglue (4 cases). Leaving children alone and unsupervised at home, with dangerous at their reach, is a concerning issue that invites more attention and public awareness should be promoted about it ^[17]. In McLean's study a small amount of patients had injured themselves by mistaking superglue with eye drops (2 people) although one person had been injured through assault^[5].

Mistaking superglue for eye drops has been widely studied and packaging superglue into dropper bottles resembling eye drops, due to similar appearance of both bottles or due to similar appearance of the superglue tube to the eye ointment tube have been identified ^[5,7,10,18]. It seems that superglue companies should provide some new standards about shape, size and color of superglue tubes and also emphasizing the instruction in each country's native language will be helpful to prevent this kind of injuries in the future.

Another important issue is general public's unawareness of proper applications for superglue. Superglue is toxic and should not be touched; still, some people use superglue for sticking false nails or eyelashes. These findings emphasize the necessity of families' education about superglue applications, instructions, hazards and disadvantages.

Causes of ocular injuries as reported by other studies ^[19] included misidentification by people with poor eyesight who were prescribed topical eye medications, careless patients who confused the glue for over-the-counter eye drops, childhood curiosity resulting in accidental splashing of glue into the eyes while playing with the glue containers and deliberate forcible squirting of glue into eyes during assault. These findings are in a line with this study.

In the management of ocular superglue injuries two principles should be considered: reversing chemically-induced tarsorrhaphy ^[20] and staining the ocular surface with fluorescein to assess the severity of damage ^[4,21-22]. Immediate irrigation of the eye, as is done in chemical burns, helps in reducing the bulk of superglue and severity of subsequent ocular damage.

Separation of the lid margins is done by gentle force in the

emergency room in adults but children may need general anesthesia in the operating room. For removing the superglue form lid margin acetone swab can be used but the physician should be aware of chemical burn of the conjunctiva and the cornea. Glue on the cornea and conjunctiva can be removed with a forceps.

Corneal abrasion should be treated with topical antibiotics, mydriatics/cycloplegics, patching and therapeutic contact lenses.

In this study all patients suffered injury as the result of an accident. Some patients sustained their injury while opening the glue container. To prevent injury in children younger than six years old, superglue containers need to be stored away from young children. However, in the event of an infant finding a superglue bottle, a child-proof cap would prevent injury. Many medicine bottles are now made child-proof by employing caps which only open when pushed down and twisted or when arrows on the top and on the bottle are correctly aligned. Such child-proofing would also reduce the likelihood of adults inadvertently pouring superglue into their eyes rather than their prescribed eye drops, as they would have to scrutinize the bottle much more carefully in order to remove the top and would thus realize they had picked up the wrong bottle.

This is the first study reporting the frequency, characteristics and risk factors of ocular superglue injuries in patients referred to Farabi Eye Hospital in Tehran.

The main conclusion to be drawn from this survey is that the frequency of these injuries is relatively high and more than half of patients did not take any primary aids following the eye injury. Also, this study showed that patient carelessness, childhood curiosity and lack of parental supervision, storing superglue in inappropriate places, inadvertent use of super glue, inadequate awareness of superglue applications and being assaulted with glue were the common causes of ocular superglue injuries. These findings emphasize the importance of family education and improving levels of public awareness. Also, It is recommended that health care teams should keep their knowledge updated to have better understanding of eye accidental injuries, risk factors and caring for it. It provides better education in society for eye injuries prevention, protection and improvement especially targeting high-risk groups. Health education and safety strategies, which have traditionally targeted the workplace, sports, and other high-risk activities, should also target high-risk activities at home.

This study has some limitations because of using a cross-sectional design, choosing a single hospital and short period of time. Further research in this field would be helpful, if performed in different hospitals and over a long term period. Finally, according to our findings, some safety recommendations are suggested to reduce the risk of ocular

superglue injuries: 1) implementing changes in the package of superglues' bottles; 2) making products in different odors to alert the users; 3) warnings in bold print or vertical ribs on the bottles; 4) finding a safe place for keeping superglues; 5) more supervision and attention on the side of parents; 6) keeping eye drops and superglues in different places; 7) using protective tools (e.g. gloves, mask and glasses) and good ventilation in room while working; 8) taking caution while working with superglues; 9) taking primary actions when the ocular injury happens; not to open eyes with force, washing eyes gently with warm and clean water and removing glues with a applicator slowly and referring to an emergency department; 10) if it damages skin integrity, using soap and warm water and acetone swabs solvents; 11) for the treatment of ocular lesions, it is recommended to cut eyelashes stuck together and use topical prophylactic antibiotics with or without cycloplegics for conservative management.

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REFERENCES

- 1 Mowatt L. Epidemiology of pediatric ocular trauma admissions. *Surv Ophthalmol* 2014;59(4):480.
- 2 Pokhrel PK, Loftus SA. Ocular emergencies. *Am Fam Physician* 2007;76(6):829-836.
- 3 Haring RS, Canner JK, Haider AH, Schneider EB. Ocular injury in the United States: emergency department visits from 2006-2011. *Injury* 2016; 47(1):104-108.
- 4 Yusuf IH, Patel CK. A sticky sight: cyanoacrylate 'superglue' injuries of the eye. *BMJ Case Rep* 2010;2010.
- 5 McLean CJ. Ocular superglue injury. *Accid Emerg Med* 1997;14(1): 40-41.
- 6 Reddy SC. Superglue injuries of the eye. *Int J Ophthalmol* 2012;5(5): 634-637.
- 7 Mandal A, Imran D, Erdmann MW. Inadvertent application of superglue as eye ointment. *Ir Med J* 2003;96(10):310-311.
- 8 Cao H, Li L, Zhang M, Li H. Epidemiology of pediatric ocular trauma in the Chaoshan Region, China, 2001-2010. *PLoS One* 2013;8(4):e60844.
- 9 Spector J, Fernandez WG. Chemical, thermal and biological ocular exposures. *Emerg Med Clin N Am* 2008;26(1):125-136.
- 10 Parkkari M, Latvala T, Ropo A. Handling test of eye drop dispenser-comparison of unit-dose pipettes with conventional eye drop bottles. *J Ocul Pharmacol Ther* 2010;26(3):273-276.
- 11 American Society of Ophthalmic Registered Nurses. Quick as a wink. Tips for administering ophthalmic topical medications. *Insight* 2009;34(4): 13.
- 12 Wong DT, Hillier RJ. Serious ocular trauma: prevention is key. *Can J Ophthalmol* 2012;47(4):329.
- 13 Kuhn F, Morris R, Witherspoon CD, Mester V. Birmingham Eye Trauma Terminology system (BETT). *J Fr Ophthalmol* 2004;27(2):206-210.
- 14 Terman SM. Treatment of ocular super glue instillation. *J Trauma* 2009; 66(5):70-71.
- 15 Desai SP, Teggihalli BC, Bholra R. Superglue mistaken for eye drops. *Arch Dis Child* 2005;90(11):1193.
- 16 Good AM, McCabe SE. Superglue accidents and the eye-causes and prevention. *Br J Ophthalmol* 1994;78(10):802.
- 17 Chakraborti C, Giri D, Choudhury KP, Mondal M, Datta J. Paediatric ocular trauma in a tertiary eye care center in Eastern India. *Indian J Public Health* 2014;58(4):278-280.
- 18 Thompson CG, Kumar N, Billson FA, Martin F. The aetiology of perforating ocular injuries in children. *Br J Ophthalmol* 2002;86(8): 920-922
- 19 Mansouri MR, Mirshahi A, Hosseini M. Domestic ocular injuries: a case series. *Eur J Ophthalmol* 2007;17(4):654-659.
- 20 Margo CE, Trobe JD. Tarsorrhaphy from accidental instillation of cyanoacrylate adhesive in the eye. *JAMA* 1982;247(5):660-661.
- 21 Øgard C, Kjaerbo H, Sørensen TL. Inadvertent instillation of superglue in both eyes should not be treated conservatively. *Ugeskr Laeger* 2010;172(41):2846-2847.
- 22 Lammersdorf K, Weissbach A, Meyer CH. Glued eyelids by cyanoacrylate glue (superglue). *Klin Monbl Augenheilkd* 2010;227(2): 149-150.