Ocular bungee cord trauma: clinical characteristics and treatment outcomes

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Background: The use of the bungee cord is still common in our society, resulting in ocular trauma related to its use, that is often times very complicated. Literature regarding this form of trauma is scarce, mostly case reports; therefore a more detailed study of bungee cord ocular trauma is beneficial.
Objectives: To describe clinical features and treatment outcomes of ocular trauma associated with bungee cord injuries.
Methods: Prospective case series. One hundred cases of bungee cord-associated ocular trauma who underwent in-patient and out-patient treatment at Cosmetic – Neuro-Ophthalmology Department, Ho Chi Minh City Eye hospital from March 2018 to December 2018 were enrolled in this study. Baseline visual acuity and intraocular pressure, anterior segment, posterior segment and periorbital injuries and surgical intervention were recorded. Follow-up period was 6 months for all the patients.
Results: Fourty-four% of patients had hand movement and light perception visual acuity. The most common anterior, posterior and periorbital injuries were hyphema (79%), vitreous hemorrhage (40%) and eyelid edema/ecchymosis (61%). Fifty-one percent underwent surgical intervention, with the most common surgery being corneal-scleral reconstruction (30%). Forty-five percent had visual acuity improved after treatment, while 30% of patients remained counting finger to no light perception.
Conclusion: Bungee cord may cause a varied spectrum of injuries, with low baseline visual acuity and poor prognosis. A modification in the design of these cords, as well as appropriate printed warnings to the users regarding the potential for severe ocular trauma and preventive strategy, is therefore necessary.
Conflicts of interest: The authors report no conflicts of interest.
Keywords: bungee cord, ocular trauma, clinical characteristics, treatment outcomes.
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Introduction

Ocular trauma resulting from bungee cords, elastic cords with metallic J-shape hooks at both ends (Figure 1), have become increasingly prevalent. With low price and ease of acquisition, bungee cords

are usually used in occupational and recreational events. When recoiled, the elastic cord generates an immense power which enables the metallic hook to injure the eye. The design of the cord enables it to cause both open and closed globe injuries when one of the hooks are not appropriately secured or when the hook is straightened by the force of the loads secured.

A few studies regarding this type of trauma have been carried out[1-9], mostly being case series with participants of less than 30; the largest study had 67 participants[1]. In those studies, the authors agreed that most patients were male, and that a considerable number of patients required surgery. Furthermore, these cords should be modified with a warning paper about the risk of ocular trauma paired with it.

Figure 1: The design of a bungee cord

Due to the increasing number of patients and few studies about this subject, we conducted this study to describe clinical manifestations and treatment outcomes of bungee cord associated ocular trauma, as well as to support previous authors in the calling for a structure modification of this cord.

Materials and methods

This study, a prospective case series, was carried out in Ho Chi Minh City Eye Hospital from March 2018 to December 2018. Participants were all patients whose eyes were injured by a bungee cord with 2 J-shaped hooks, treated in outpatient unit or hospitalized in the cosmetic – neuro-ophthalmology department of the hospital in the above period of time. Patients who had previous history of vision-affected eye diseases, did not complete 6-month follow up or did not agree to participate were excluded from this study.

For data collection, we recorded patients age, sex, occupation , setting of trauma event, duration until admission to hospital, baseline visual acuity (VA) – classified based on visual acuity grading of WHO - and intraocular pressure (IOP), periocular, anterior segment and posterior segment manifestations, operations performed, hospitalized duration. We also recorded VA and IOP of all the patients until 6-month follow-up.

Results

From March 2018 to December 2018, 100 patients with bungee cord ocular trauma were studied. Etiological characteristics of the patients were summarized in Table 1. In this study, most of the patients were male, either workers or farmers of working age. Most patients (71%) suffered the trauma when securing the cord, with the main reason being the cord was let cord slip (85%). Ninety-seven percent had not used protective glasses, and most patients (84%) were admitted to hospital immediately after the trauma.

Baseline VA, IOP and clinical manifestations of the patients were summarized in Table 2. Most patients (61%) had baseline VA being counting fingers (CF), hand-movement (HM) or light perception (LP), 7% had no light perception (NLP); 53% of patients had baseline VA outside of normal limits. The most common periorbital injury was eyelid edema and/or ecchymosis (61%). Three most common anterior segment injuries were hyphema (79%), angle recession (51%) and lens dislocation (40%).Thirty-three percent had corneal-scleral laceration, in whom 30/33 cases had penetrating lacerations. The most common posterior segment injury was

vitreous hemorrhage (40%), following by commotio retinae (28%) and retinal hemorrhage (23%).

Table 1: Etiological characteristics of the patients

Etiological characteristics	N (%)
Age	
<18	1 (1)
18-60	96 (96)
>60	3 (3)
Gender	
Male	79 (79)
Female	21 (21)
Location	
Ho Chi Minh City	19 (19)
Others	81 (81)
Career	
Students	1 (1)
Worker	83 (83)
Housework	5 (5)
In-office work	7 (7)
Retired	4 (4)
Initiating incident	
Cord securing	71 (71)
Cord release	29 (29)
Cause	
Cord slipping	85 (85)
Cord broken	9 (9)
Others	6 (6)
Secured glasses equipment	
With	3 (3)
Without	97 (97)
Duration until admission	
Immediately	84 (84)
1-3 days	12 (12)
>3 days	4 (4)

Treatment characteristics were summarized in Table 3. Every patient needed medical treatment and 51% needed to undergo surgery, with the most common procedure being corneal-scleral reconstruction (30%). Seventy-two percent of patients needed to be hospitalized, most of them (59%) were hospitalized for 4-7 days.

Table 2: Baseline VA, IOP and clinical manifestations of patients

Clinical characteristics	N (%)
VA	
≥14/20	5 (5)
8/20-12/20	9 (9)
2/20-6/20	18 (18)
CF	17 (17)
HM-LP	44 (44)
NLP	7 (7)
IOP	
High (≥21 mmHg)	15 (15)
Normal (17-20 mmHg)	47 (47)
Low (≤16 mmHg)	38 (38)
Periocular injury	
Lid edema/ecchymosis	61 (61)
Lid laceration	11 (11)
Conjunctival laceration	22 (22)
Medial rectus muscle tear	1 (1)
Anterior segment injury	
Corneal abrasion	8 (8)
Hyphema	79 (79)
Angle recession	51 (51)
Iris sphincter tear	13 (13)
Lens dislocation	40 (40)
Corneal-scleral laceration	33 (33)
Posterior segment injury	
Commotion retinae	28 (28)
Vitreous hemorrhage	40 (40)
Retinal hemorrhage	23 (23)
Retinal tear	2 (2)

Patients VA and IOP in follow up examinations were summarized in Figure 2A and Figure 2B. At 6-month follow up, 45% of patients had improved VA; however, thirty percent remained CF to NLP. Twenty-one percent of patients had high IOP at 6-month follow up, all patients responded well with IOP-lowering drugs.

Table 3: Treatment characteristics of the patients

Treatment	N (%)
Surgical intervention	
Lid repair	2 (2)
Conjuntival reconstruction	7 (7)
Corneal-scleral reconstruction	30 (30)
Anterior chamber blood removal	15 (15)
Lensectomy	9 (9)
Vitrectomy	7 (7)
Muscle reconstruction	1 (1)
Hospitalized duration	
0 day	28 (28)
1-3 days	9 (9)
4-7 days	59 (59)
>7 days	4 (4)

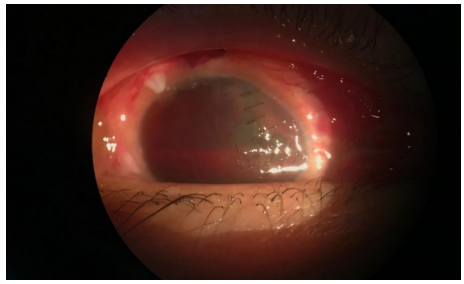


Figure 3: A bungee cord ocular trauma patient with penetrating corneal laceration (reconstructed), hyphema and vitreous hemorrhage (B-scan ultrasound)

Discussion

Similar to previous authors, our study demonstrated that bungee cord use could cause severe ocular trauma (Figure 3). Seventy-two percent of patients being hospitalized, 51% undergoing surgery and CF to NLP visual acuity accounted for two-thirds of patients at baseline and one-third of patients at 6-month follow up, confirmed the danger of trauma by this cord. Although blunt trauma accounted for most cases, 30% of patients suffered penetrating injuries with severe reduction of visual acuity. Most patients were male (79%) and of working age (96%), many of them may be the main working individual in family. Bungee cord associated ocular trauma may cause these patients irreversible vision loss, which is a considerable impact for the families and society. Barely any of the patients were aware of the dangers of working with bungee cords when only 3% used protective plastic glasses while securing their belongings. On the other hand, all the

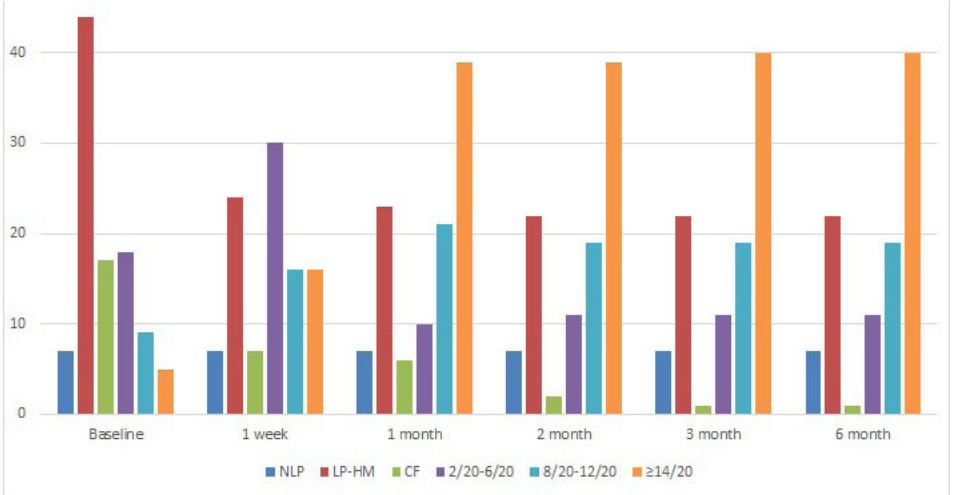
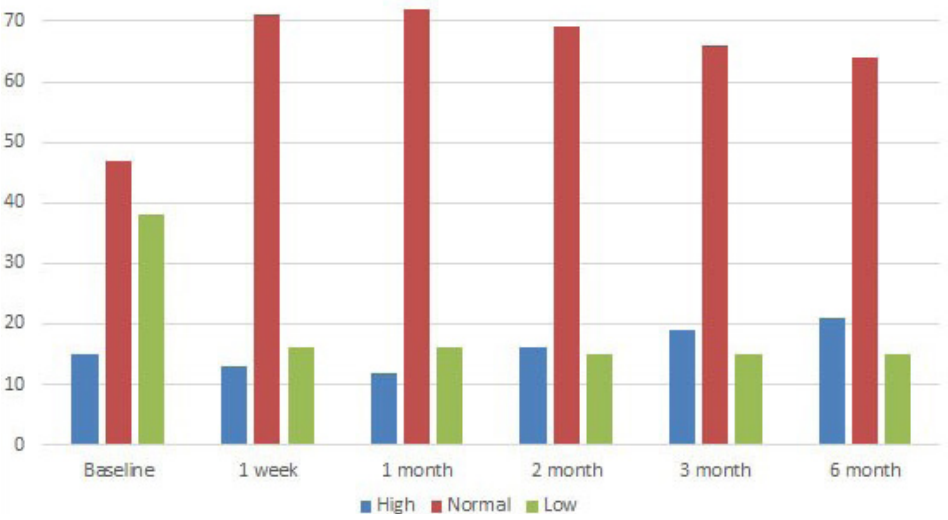


Figure 2A: Patients VA at follow-up examinations

Figure 2B: Patients IOP at follow-up examinations



patients used protective glasses admitted to hospital with penetrating corneal – scleral laceration. Our study group considered if the broken pieces of the glasses caused even more severe damage to the eye.

To the best of our knowledge, this is the largest series regarding bungee cord ocular trauma up to now. Most studies, including our own, found that the majority of patients were males in working age[1-3]. Hyphema was the most common anterior segment finding. One study[3], along with ours, found that vitreous hemorrhage was the most common posterior segment finding, along with other findings such as retinal tears[5,8] and commotio retinae[1]. This difference may be the result of difficulty in examining the posterior segment in vitreous hemorrhage patients of whom the the authors used B-scan ultrasonography to look for other signs. The percentage of patients who required surgery varied from study to study[1-3]. This difference possibly comes from the decision ofwhether or not to perform surgery to remove anterior segment blood, which depends on the knowledge, experience and skill of the surgeons.

The trade and use of bungee cords is not an illegal act; moreover, the price of bungee cords is affordable and it is easy to access. Therefore, the only solution to prevent the damage of bungee cord to users is to modify its structure. As recorded above, 79% of trauma cases happened when the patients were securing the cord, and 85% of cases were because the cord slipped from its secured location. Therefore, most of trauma cases could be prevented if the S-shaped hook is modified into an O-shape with a gate flip (Figure 4). This modified structure would prevent the hook from being released unless the flip was depressed, therefore prevent most users from ocular trauma. From our

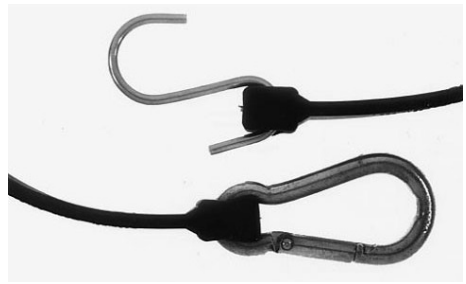


Figure 4: An example of a modified bungee cord, with S-shape hook replaced by a gate flip

study results, it is unlikely that bungee cord users are willing to use protective glasses; therefore it is reasonable that making bungee cords safer is the responsibility of the manufacturers.

Conclusion

Being the largest case series to date regarding bungee cord-associated injury, this study demonstrates that this tool may cause a varied spectrum of injuries. Among those injuries, many are serious and complicated, with low presenting visual acuity and bad prognosis. A modification in the design of these cords, as well as an appropriate printed warnings to users regarding the potential for severe ocular trauma and preventive strategy, is therefore necessary.

Acknowledgements

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References

1.Aldave AJ, Gertner GS, Davis GH, Regillo CD, Jeffers JB. Bungee cord-associated ocular trauma. Ophthalmology. 2001;108(4):788–92.

2.Brouzas D, Charakidas A, Papagiannakopoulos D, Koukoulomatis P. Elastic cord-induced ocular injuries. Injury. 2003;34(5):323–6.

3.Cooney MJ, Pieramici DJ. Eye injuries caused by bungee cords. Ophthalmology. 1997;104(10):1644–7.

4.Chaudhry NA, Flynn HW Jr, Palmberg PF. Elastic cord-induced cyclodialysis cleft and hypotony maculopathy. Ophthalmic Surg Lasers. 1999;30(8):678–80.

5.Chorich LJ 3rd, Davidorf FH, Chambers RB, Weber PA. Bungee cord-associated ocular injuries. Am J Ophthalmol. 1998;125(2):270–2.

6.Gray RH, Menage MJ, Cook SD, Harcourt J. Eye injuries caused by elasticated straps. Br Med J (Clin Res Ed). 1988;296(6629):1097–8.

7.Hollander DA, Aldave AJ. Ocular bungee cord injuries. Curr Opin Ophthalmol. 2002;13(3):167–70.

8.Litoff D, Catalano RA. Ocular injuries caused by elastic cords. Arch Ophthalmol. 1991;109(11):1490–1.

9.Nichols CJ, Boldt HC, Mieler WF, Han DP, Olsen K. Ocular injuries caused by elastic cords. Arch Ophthalmol. 1991;109(3):371–2.