Visual Outcome of Severely Traumatized Eyes with No Light Perception

Işık Hissi Olmayan, Ciddi Bir Şekilde Travmatik Gözlerde Görme Sonuçları

Mehul SHAH[1], Shreya SHAH[2], Agrawal RUPESH[3], Patel KASHYAP[2], Oo Hnin HNİN[4]

ABSTRACT

Objective: Severe ocular trauma presenting with no light perception (NPL) typically has dismal prognosis, and suggests little success for further therapeutic intervention. The objective of our study was to analyse the characteristics and visual outcomes of severely-injured eyes presenting with NPL at a tertiary referral eye care centre in India.

Methods: A retrospective cohort study was performed for all the patients with open globe injuries between January 2003 to December 2009. Medical records of patients with NPL were analysed. Patient demographics, risk factors for NPL, anatomical and visual outcome for the injured eyes was studied.

Results: Out of 4721 patients with ocular injuries, 285 patients (6.0%) with mean age of 38 ± 20.5 years had NPL visual acuity at presentation. 242 patients (84.9%) from this group did not have any surgery due to severe structural damage or extremely poor prognosis while 22 patients (7.7%) underwent non vision-salvaging surgeries. The remaining 21 patients (7.4%) had vision-salvaging surgeries. 3 (14.3%) out of 21 patients had improved vision with visual acuity of perception of light (PL), 6/36 and 6/12 compared to 2 (0.8%) out of 264 patients receiving non vision-salvaging treatment. Patients with posterior segment injuries and higher number of tissue injuries per person are less likely to be considered for vision-salvaging surgeries.

Conclusion: Patients with severe ocular injury presenting with NPL can potentially gain improved vision with prompt intervention, hinting that case selection and vision-salvaging surgeries could have a role in treatment and enucleation or evisceration surgeries could be minimised.

Key Words: No perception of light, ocular trauma, BETTS, severely traumatized eyes.

ÖZ

Amaç: Işık hissi olmayan (NPL) (no light perception) ciddi oküler travma tipik olarak kötü pragnaj gösterir ve daha ileri tedavi edici girişimlerde başarı şansı çok düşüktür. Çalışmamızın amacı, Hindistan'da 3. Derecede refere bir göz merkezinde, NPL sergileyen ciddi bir şekilde travmatize olmuş gözlerin özelliklerini ve görme sonuçlarını incelemektir.

Metod: Ocak 2003 ve Aralık 2009 yılları arasında açık göz yaralanması geçirmiş tüm hastalıkları içine alan retrospektif bir çalışma yapılmıştır. NPL sergileyen hastaların medikal kayıtları değerlendirilmiştir. Hasta demogofik olarak , NPL için risk faktörleri , yaralanmış gözlerde anatomik ve görsel beklentiler çalışılmıştır.

Sonuçlar: oküler yaralanma geçirmiş 4721 hastadan 285 i (%6) ortalama yaş (38-20,5)Görme keskinliğinde NPL gösteriyordu. Bu hasta grubunun 242 si (%84.9) ciddi yapısal tahribata veya aşırı derecede düşük prognoz bağlı olarak ameliyat edilmemişti.22 hasta (%7.7) non vision kurtarma ameliyatı geçirmişti. Geriye kalan 21 hasta ise (%7.4) görmeyi kurtarma ameliyatı geçirmişti. Görmenin korunması ameliyatı geçirmiş 264 hastadan 2 si ile karşılaştırıldığında, (%0.8) 21 hastadan 3ünde görme ışık hissi ,6/36 ve 6/12 seviyesinde gelişme gösterdi. Orta segment yaralanmaları ve hastada doku yaralanma sayısının fazla olduğu durumlarda görmenin korunma ameliyatlarının daha az düşünülmesi gerektiği görüldü.

Tartışma:NPL sergileyen, ciddi oküler yaralanması olan hastalar anında müdahale ile görmede önemli artış kazandılar. Vaka seçimi ve görmeyi kurtarma ameliyatlarının tedavide rolü önemlidir.böylece eviscerasyon ameliyatları minimalize olur.

Anahtar Kelimeler : Işık hissi, BETTS; ciddi göz yaralanmaları.

1- Prof. Dr., Drashti Netralaya, Retina, Dahod, Hindistan

2- Uz. Dr., Drashti Netralaya, Retina, Dahod, Hindistan

3- Uz. Dr., National Healthcare Group Eye Institute, Tan Tock Seng Hospital, Retina, Singapore, Singapur

4- Uz. Dr., Yong Loo Lin School of Medicine, National University of Singapore, Retina, Singapore, Singapur

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Yazışma Adresi / Correspondence Adress:
Mehul SHAH
Drashti Netralaya, Chakalia Road. Dahod-389151 Gujarat, INDIA

Phone: +91 267 364 5364
E-mail: omtrustdahod@gmail.com

INTRODUCTION:

Trauma is a major cause of monocular blindness in the developed world. World Health Organisation (WHO) approximated an annual incidence of some 55 million eye injuries limiting activities longer than one day. 1.6 million people suffered from blindness from ocular injury, an additional 2.3 million people experienced bilateral low vision and about 19 million people had unilateral blindness or low vision from injuries.[1] Few studies have addressed the issue of ocular trauma in rural areas.[2] The etiology of ocular injury is likely to differ between urban and rural areas and thus is worth investigating the profile of ocular injury in rural areas.[3-5] The management and prevention of ocular injuries require a comprehensive knowledge of causative factors. Often, children are the victims of ocular trauma; the prognosis is usually poor and could lead to blindness and loss of productive years.[4]

Severely traumatic eye injuries often carry a dismal prognosis. The introduction of the Birmingham Eye Trauma Terminology System (BETTS), has led to standardization of ocular trauma definitions,[6] making it possible to compare visual outcomes following traumatic cataract surgery and to understand the determinants in predicting the outcomes. Though there are studies on visual outcomes of traumatic cataracts,[7, 8] most of them are of small sample size or case studies in nature.

The presenting visual acuity frequently holds bearing on the final visual outcome of severely traumatised eyes. With the presenting vision of no perception of light (NLP), recovery to vision better than NLP is not hopeful. It is currently recommended in United States to perform primary closure of an open globe and subsequently reassess the vision to evaluate the need for vitrectomy. If the vision is not likely to recover, enucleation should be considered within the first 1 to 2 weeks to minimize the complication of sympathetic ophthalmia.[9] Our earlier work has discovered that in open globe injuries presenting with NLP, one third of eyes regained ambulatory vision or better after surgical repair of injury.[10] We also reviewed that primary enucleation in consideration of resultant sympathetic ophthalmia in severely traumatised eyes presenting with NLP is a controversial approach. Therein, we advocated the management of such cases with globe salvaging surgery instead.[11] Thus, the objectives of this study were (1) to identify the high risk characteristics of patients with severely traumatized eyes presenting with no light perception, (2) to explore the visual outcome in patients who had vision-salvaging surgeries post-injury and (3) to evaluate any differences in characteristics between patients who underwent vision-salvaging surgeries and those who received no surgery or underwent enucleation.

METHODOLOGY

Data collection

The medical records of patients with ocular trauma in either eye between January 2003 and December 2009 in a tertiary eye centre in India were obtained and reviewed retrospectively with consent from the hospital and participants. Patients with serious bodily injuries were excluded from the study. The following parameters were collected in a specific pretested format designed by the International Society of Ocular Trauma for both initial presentation and follow-up: basic demographics, past ocular history, circumstances of injury (mechanism, activity engaged, object of injury), time elapsed between injury and presentation, type of injury sustained, presenting visual acuity (NLP as verified by 2 separate observers in dark room setting), ocular trauma score, treatment and surgery conferred and final visual outcome.

Types of injury sustained were classified into open globe or closed globe injury according to the Birmingham Eye Trauma Terminology System (BETTS).[6] Open globe injuries (full- thickness wound of the eyewall) were further categorized into laceration and rupture groups. Lacerations of the eyeball were subcategorized as perforating, penetrating injuries and injuries involving an intraocular foreign body. Closed globe injuries (no full- thickness wound of eyewall) were divided into lamellar lacerations and contusions. Visual prognosis was gauged using the Ocular Trauma Score (OTS).[12]

All patients underwent a standardized physical examination. The anterior segment was examined using a slit lamp. For a partially opaque lens, a posterior segment examination was performed with an indirect ophthalmoscope and a +20D lens. When the optical medium was not clear, a B-scan was performed to evaluate the posterior segment.

Surgical management

The surgical technique was selected according to the tissues affected (anterior or posterior segment). Open globe injuries were managed with wound repair and additional vitreoretinal surgeries to attain anatomical success. Closed globe injuries were also managed for anterior and posterior segment injuries. Intraocular pressure was controlled medically and surgically in all cases. In patients undergoing corneal wound repair, the traumatic cataract was managed using a second procedure. Recurrent inflammation was more prominent in patients who had undergone previous surgery for trauma.[11,13] When the ocular medium appeared hazy due to inflammation of the anterior vitreous, a capsulectomy and vitrectomy were performed via an anterior/pars plana route. In children younger than 2 years of age, both lensectomy and vitrectomy via the pars plana route were performed. The operated patients were re-examined after 24 hours, 3 days, and 1, 2,

and 6 weeks post-operatively to enable refractive correction. Follow-up checkups were scheduled on post-op day 3, weekly for 6 weeks, monthly for 3 months, and then every 3 months for 1 year. All children were subsequently seen by a paediatric ophthalmologist and qualified pediatric orthoptist for supportive amblyopia therapy.

Medical management

All patients without infection were treated with topical and systemic corticosteroids and cycloplegics. The duration of medical treatment depended on the degree of inflammation in the anterior and posterior segments of the operated eye.

Follow-up

For all patients, visual acuity was tested according to age using the American Academy of Ophthalmology (AAO) guidelines at every follow-up examination. The anterior segment was examined with a slit lamp, and the posterior segment was examined with an indirect ophthalmoscope. Post-treatment visual outcome was predicted from the Ocular Trauma Score (OTS)[12] by calculating the raw score and the final score based on the presenting vision and condition. This prediction was compared with the actual visual outcome using a statistical analysis.

Data analysis

Data collected for the study was entered respectively into initial and follow-up forms designed by the International Society of Ocular Trauma and exported into a Microsoft Excel spreadsheet. Data were audited periodically to ensure complete data collection. Statistics were descriptive and analysed qualitatively. When the difference in percentage between statistical groups is >5%, it will be highlighted in the results.

RESULTS

Baseline Demographics

Out of 4721 patients with ocular injuries, 285 (6.0%) patients with average age of 38 ± 20.5 years had NLP visual acuity at presentation. 67 patients (23.5%) of the patients were paediatric patients (age ≤ 18). Patients were divided into two groups: vision salvaging (VS) group and non-vision-salvaging (NVS) group. VS group consists of 21 patients (7.4%) who underwent vision-salvaging surgeries. NVS group has 264 patients (92.6%) consisting of 242 patients (84.9%) did not undergo surgery and 22 patients (7.7%) underwent non vision-salvaging (i.e cosmetic) surgeries.

Table 1 shows the baseline demographics of the two groups. In both groups, patients were predominantly male, of similar age profile (mainly younger than age 60) and of poor socioeconomic background. VS group has relatively higher number of paediatrics patients (28.6%) with 19% of patients in 0-10 years age group, compared to 23.1% of pediatric patients in NVS group.

They also have similar median number of days (4 days) between the onset and reporting of ocular injury. Excluding the unspecified causes, the circumstances surrounding the injury showed similar trends as well. The top three activities causing injury in VS group were occupational injuries (23.8%), housework (e.g cooking) (14.3%) and playing (14.3%), while those in NVS group were playing (28.4%), housework (22.3%) and occupational injuries (18.9%). Notably, nearly 10% of VS group suffered from injuries from cattle care compared to 2.7% of NVS group. There was a small proportion of injury from travel (4.9%) in NVS group. Additionally, objects inflicting injury were similar in nature for both groups of patients – sharp objects (e.g glass, needle, wood, thorn) were the most traumatic followed by blunt objects (e.g ball, finger, hand, stone). Of note, NVS group had a sizable number of patients coming from labour job (15.5%), while none of the patients from VS group had labour job.

Severity of Ocular Injury

Table 2 describes the parameters indicating the severity of injury. All patients in VS group had unilateral ocular injury while NVS had 257 patients (97.3%) with unilateral injury and 7 patients (2.7%) with bilateral injury. Both groups had similar mean raw ocular trauma score (OTS) – 59.9 for VS group and 58.5 for NVS group and the final OTS score does not appear to differ much between the two groups. With respect to the distribution of open and closed globe injuries, VS group had higher proportion of patients with retained IOFB (14.3%) and closed globe contusion injury (38.1%) compared to 0% IOFB and 27.8% contusion injuries in NVS group. Meanwhile, NVS group had a significantly higher proportion of closed globe injuries with lamellar laceration (18.9%) compared to VS group (11.1%). NVS group also had a fraction of patient experiencing perforating open globe injuries (3.4%) and other uncategorised orbital injuries (4.9%) while VS group had none.

NVS group appears to have a higher number of tissue injuries per person as well (57.2% of patients with 3 tissue injuries) compared to VS group (47.6%). Most commonly, anterior segment tissues were traumatised (cornea, anterior chamber and iris being the top three) but NVS group has more posterior segment injuries to structures such as retina, vitreous and optic nerve with a higher percentage of phthisical eyes (31.1%). Table 2 describes a more detailed breakdown of posterior segment injuries and pupillary reactions on ocular examination at initial presentation. Generally NVS group had more extensive injuries than VS group.

Table 1. *Baseline demographics and mechanism of injury*

	Vision Salvaging (VS)	Non-Vision Salvaging (NVS)	Total
Number of patients (n)	21 (7.4%)	264 (92.6%)	285
Gender (n)			
Male (n)	18 (85.7%)	200 (75.8%)	218
Female (n)	3 (14.3%)	64 (24.2%)	67
Age (years)			
Mean (±SD)	38 (±22.1)	38 (±20.4)	38 (±20.5)
Median	40	40	40
Age (n)			
Paediatrics (age ≤18)	6 (28.6%)	61 (23.1%)	67 (23.5%)
Age Distribution (n)			
0 to 10	4 (19.0%)	33 (12.5%)	37
11 to 20	3 (14.3%)	31 (11.7%)	34
21 to 30	1 (4.8%)	38 (14.4%)	39
31 to 40	4 (19.0%)	42 (15.9%)	46
41 to 50	1 (4.8%)	36 (13.6%)	37
51 to 60	5 (23.8%)	50 (18.9%)	52
61 to 70	3 (14.3%)	29 (11.0%)	32
71 to 80	0	4 (1.5%)	4
81 to 90	0	1 (0.4%)	1
Socioeconomic class (n)			
Poor	18 (85.7%)	223 (84.5%)	241
Middle	3 (14.3%)	34 (12.9%)	37
Rich	0	7 (2.7%)	7
No. of days between injury and reporting (days)			
Mean (±SD)	311 (±621.4)	841 (±2158.9)	802 (±2088.7)
Median (range)	4 (0-2557)	4 (0-14610)	4 (0-14610)
Activity during injury (n)			
Cattle Care	2 (9.5%)	7 (2.7%)	9
Fall	0	5 (1.9%)	5
Fighting	0	3 (1.1%)	3
House work	3 (14.3%)	59 (22.3%)	62
Farm work (occupational)	0	3 (1.1%)	3
Other occupational work	5 (23.8%)	50 (18.9%)	55
Other	6 (28.6%)	35 (13.3%)	41
Walking	1 (4.8%)	6 (2.3%)	7
Playing	3 (14.3%)	75 (28.4%)	78
Sleeping	0	1 (0.4%)	1
Travelling	0	13 (4.9%)	13
Vehicle accidents	1 (4.8%)	7 (2.7%)	8
Labour-job (n)			
Yes	0	41 (15.5%)	41
No	21 (100%)	223 (84.5%)	244
Object of injury (n)			
Blunt object	5 (23.8%)	42 (15.9%)	47
Sharp object	8 (38.1%)	80 (30.3%)	88
Chemical	1 (4.8%)	4 (1.5%)	5
Cattle horn/tail	2 (9.5%)	11 (4.2%)	13
Dust	0	1 (0.4%)	1
Fall	0	1 (0.4%)	1
Foreign body/fire crackers/iron particle	0	16 (6.0%)	16
Insect			
Vehicle accidents			
Unknown			
Other	0	1 (0.4%)	1
	0	4 (1.5%)	4
	4 (19.0%)	83 (31.4%)	87
	1 (4.8%)	21 (8.0%)	22

Table 2. *Severity of injury*

	Vision Salvaging	Non-Vision Salvaging (No surgery + Cosmetic Surgery)	Total
Eye Involved (n)			
Unilateral	21 (100%)	257 (97.3%)	278
Bilateral	0	7 (2.7%)	7
Ocular Trauma Score			
Mean Raw Score	59.9	58.5	58.6
Final Score			
1	1 (4.8%)	22 (8.3%)	23 (8.1%)
2	18 (85.7%)	231 (87.5%)	249 (94.3%)
3	2 (9.5%)	7 (2.7%)	9 (3.2%)
4	0	4 (1.5%)	4 (1.4%)
Open globe (n)	9 (42.9%)	127 (48.1%)	136
• Globe rupture	3 (14.3%)	42 (15.9%)	
• IOFB	3 (14.3%)	0	
• Penetrating	6 (28.6%)	76 (28.8%)	
• Perforating	0	9 (3.4%)	132
Closed globe (n)	9 (42.9%)	123 (46.6%)	
• Contusion	8 (38.1%)	73 (27.8%)	
• Lamellar laceration	1 (4.8%)	50 (18.9%)	16
Not OG/CG (n)	0	13 (4.9%)	
• Adnexal injury	0	7 (2.7%)	
• Orbital fracture	0	5 (1.9%)	
• Orbital cellulitis	0	1 (0.4%)	1
Mixed OG& CG (n)	0	1 (0.4%)	
Number of tissue injured per person (n)			
1	9 (42.9%)	93 (35.2%)	102
2	2 (9.5%)	20 (7.6%)	22
3	10 (47.6%)	151 (57.2%)	161
Tissue involved (may have more than 1 tissue involvement per person) (n)			
Lid	0	9	9
Conjunctiva	2	48	50
Cornea	14	208	222
Sclera	0	2	2
Anterior chamber	9	134	143
Lens	9	38	47
Iris	9	119	128
Pupil	0	5	5
Retina	0	4	4
Vitreous	0	2	2
Optic Nerve	0	9	9
Orbital Adnexal injury (n)			
None	18 (85.7%)	167 (63.2%)	185
Lid	0	8 (3.0%)	8
Orbital	0	6 (2.3%)	6
Lacrimal apparatus	0	0	0
Extraocular muscles	0	0	0
Pthysical eye	3 (14.3%)	82 (31.1%)	85
Endophthalmitis	0	1 (0.4%)	1
Examination finding (may have more than 1 finding per person) (n)	Examination finding (may have more than 1 finding per person)	Examination finding (may have more than 1 finding per person)	
Pupil			
• Fixed	0	1	
• Irregular	1	44	
• Mild dilation	0	1	
• No view	0	1	
• Non-reactive	0	2	
Vitreous			
• Haze	0	4	
• Vitreous haemorrhage	0	1	
Optic Nerve			
• Atrophy	0	9	
• Avulsion	0	3	
Retina			
• Macular atrophy	0	1	
• Retinal detachment	0	7	

Treatment and Complications

Tables 3 and 4 describe the surgical treatment conferred to the patients and the complications. Both groups had similar past ocular surgical history. A large proportion of patients in VS group (71.4%) experienced traumatic cataracts, compared to 20.1% in NVS group. Thus, the majority in VS group received cataract surgeries (57.1%) as primary surgeries. Other forms of primary surgeries offered were glaucoma

Table 3. *Surgical treatment and o utcome*

	Vision Salvaging	Non-Vision Salvaging (No surgery + Cosmetic Surgery)	Total
Number of patients (n)	21 (7.4%)	264 (92.6%)	285
Past ocular surgery (n)			
Yes	0	6 (2.3%)	6
• Lid repair		1	1
• Evesceration		3	3
• Sics + iol		2	2
No	21(100%)	258 (97.8%)	279
Type of first surgery received			
Vision Salvaging (n)			
Glaucoma	1 (4.8%)		
Cataract	12 (57.1%)		
Vitreoretinal	1 (4.8%)		
Corneoscleral wound repair	4 (19.0%)		
Foreign body removal	3 (14.3%)		
Cosmetic (n)		22	
Ball implant		16 (72.7%)	
Cyclocryopexy		1 (4.5%)	
Lid repair		1 (4.5%)	
Orbit gunderson flap		1 (4.5%)	
Skin grafting		1 (4.5%)	
Cornea tattoo		1 (4.5%)	
Unknown		1 (4.5%)	
Type of second surgery received			
Vision salvaging			
Cataract	3 (14.3%)		
Cosmetic			
Lid repair		4	
Final visual outcome Number of patients with final vision >NPL (n)	3 (14.3%)	2 (0.8%)	5 (1.8%)

Table 4. *Post-injury complications*

	Vision Salvaging	Non-Vision Salvaging (No surgery + Cosmetic Surgery)	Total
Traumatic cataract formation post-injury (n)			
Yes			
• Total cataract	15 (71.4%)	53 (20.1%)	68
• Ectopic lens	6	24	30
• Membranous cataract	4	6	10
• Phacodonesis	1	3	4
• Rosette cataract	0	1	1
• Soft cataract	0	2	2
• Unspecified	0	2	2
No	4	16	20
	6 (28.6%)	211 (79.9%)	217
Infection (n)			
Yes	1 (4.8%)	16 (6.0%)	17
No	20 (95.2%)	248 (93.9%)	268
Steroids post-injury (n)			
Yes	11 (52.4%)	83 (31.4%)	94
No	10 (47.6%)	181 (68.6%)	191

surgery (4.8%), vitreoretinal surgery (4.8%), corneoscleral wound repair (19.0%) and foreign body removal (14.3%). 14.3% of patients had to undergo secondary cataract surgeries after the primary repair.

Out of 264 patients in NVS group, 22 patients (8.3%) opted for cosmetic surgeries. Most commonly, orbital ball implant surgery was done (72.7%). Other procedures included orbit gunderson flap (4.5%), cornea tattoo (4.5%), skin grafting (4.5%), lid repair (4.5%), cyclocryopexy (4.5%) and unspecified (4.5%).

In terms of complications, the infection rates were apparently comparable between the two groups but steroid usage was higher in VS group (52.4%) compared to NVS group (31.4%).

Final Visual Outcome

Among 21 patients in VS group, 3 patients (14.3%) had visual improvement from presenting vision of NLP to perception of light, 6/36 and 6/12, while in NVS group, 2 patients (0.8%) experienced visual improvement to 3/60 and 6/6 (Table 3). The characteristics of patients experiencing improved vision were elaborated in Table 5. All 5 patients were male, had only unilateral ocular injury and had non-labour job. The extent of tissue involvement varies but is generally superficial to iris. No eyes suffered from infection.

Among VS group, 1 patient (aged 35) had a sharp object wound with a wooden stick and suffered from open globe penetrating injury reported 15 days after the injury. It affected 3 ocular tissues (cornea, anterior chamber and iris) and resulted in OTS 60. He had no additional injury. He was offered a cataract surgery as he had traumatic cataract. He did not receive any steroids. His final vision improved to 6/36. Another patient (aged 40) also had a sharp object injury with a wooden stick but suffered from closed globe contusion injury reported 252 days later. The only tissue involved was lens and his OTS was 70. He also experienced traumatic cataract for which he underwent cataract surgery. No steroids were given as treatment and his final vision improved to 6/12. The last patient (aged 55) had a blunt object injury with a stone for which he had closed globe contusion injury to the lens reported 183 days later. His OTS was 60. He received anterior vitrectomy and cataract surgery. His final vision was perception of light.

Among NVS group, 1 patient aged 30 had injury with fire crackers, resulting in lid burn. No other injuries were sustained. He was managed conservatively with steroids and his final vision improved to 6/6. The other patient had a closed globe contusion injury to lens with an unspecified object. Though he also developed traumatic cataract, he did not undergo any surgery or steroids. His final vision was 3/60.

DISCUSSION

Out of 285 ocular trauma cases with presenting vision of NLP in our study, 5 patients (1.8%) regained vision better than NLP at the end of clinical course. 3 (14.3%) out of 21

Table 5. *Characteristics and comparision of patients who experienced visual improvement*

	VS 1	VS 2	VS 3	NVS 1	NVS 2
Age	35	40	55	30	40
Gender	Male	Male	Male	Male	Male
Unilateral/ Bilateral	Unilateral	Unilateral	Unilateral	Unilateral	Unilateral
Days between injury and reporting	15	252	183	731	1461
Nature of work	Occupational	Other	Housework	Occupational	Occupational
Labour job	No	No	No	No	No
Object of injury	Wooden stick	Wooden stick	Blunt stone	Fire crackers	Other
Type of BETTS injury	OG penetrating	CG contusion	CG contusion	Unclassified (lid burn)	CG contusion
Ocular trauma score	60	70	60	60	60
Number of tissues involved	3 (cornea, AC, iris)	1 (lens)	1 (lens)	1(lid)	1 (lens)
Traumatic cataract	Yes	Yes	Yes	No	Yes
Additional injury (retained FB/orbital adnexal injury)	No	No	No	No	No
Previous ocular history	No	No	No	No	Cataract
Surgery received	Cataract	Cataract	Anterior vitrectomy & Cataract	No	No
Infection	No	No	No	No	No
Steroids	No	No	Yes	Yes	No
Final vision	6/36	6/12	PLPR	6/6	3/60

patients receiving vision-salvaging surgeries experienced visual improvement to light perception, 6/36 and 6/12, compared to 2 patients (0.8%) in non-vision-salvaging group. Remarkedly, both groups share similar ocular trauma score (mean raw ocular trauma score (OTS) – 59.9 for VS group and 58.5 for NVS group). Ocular Trauma Score (OTS) aids in predicting the visual prognosis and has 97.4% sensitivity to predict visual survival, 90.9% sensitivity to predict minimal-to-severe visual loss and 100% specificity to predict no vision.[12] Hence, for similar OTS scores, more patients experienced visual improvement in VS group, suggesting that vision salvaging surgeries could play a beneficial role.

Existing studies on visual outcomes after ocular trauma and vision salvaging surgeries are limited and variable in outcomes. Han[14] reported similar visual outcome in 4 patients (16%) out of 25 patients presenting with NLP after open globe injury and underwent vitreoretinal surgery, though the regains were up to hand motion in 3 patients and light perception in 1 patient. In our earlier retrospective case analysis of open globe injuries, 9 eyes out of 27 eyes (33.3%) with presenting vision of NLP had visual improvements to light perception/hand movement in 2 (7.4%) eyes, 1/200 to 19/200 in 3 eyes (11.1%) and 20/50-20/200 in 4 eyes (14.8%). In this study, our results appear to be less optimistic in comparison. Likewise, Haideri et al.[15] reported visual regain better than NLP in 16 patients (88.9%) out of 18 patients presenting with NLP, with visual acuity 20/200 or better in 6 eyes (33.4%) post-surgery (deep vitrectomy or other suitable procedures for 1-3 times). The visual outcome in their study was impressive and could be attributed to short time from presentation to surgical intervention (3 to 14 days) outcome, especially as the timing of presentation is also important as in pediatric patients to prevent amblyopia from media opacity. Late presenting injuries may have more inflammation disc and macular changes may further lead to difficult decision about perception.[16] However, our study seems to suggest that the time elapsed between injury and initial reporting was not a limiting factor, as patients whose vision recovered reported late.

Risk factors for ocular trauma

In general, patients in our study were predominantly male, of younger age profile (age <60) with poor socio-economic background. Leading causes or circumstances of injury were occupational, housework and play and the objects of injury were most commonly sharp objects followed by blunt objects. These factors are also well-known predisposing factors associated with ocular trauma.[17-19] Although another common risk factor is paediatric age group, only 23.5% of our patients were 18 years or younger.

Characteristics of patients under non vision-salvaging group

In our study, patients in NVS were not offered any vision-salvaging procedures based on the primary ophthalmologist's discretion. Hence, we would like to analyse the factors influencing the surgeon's initial decision to offer a conservative approach with or without cosmetic surgery. NVS patients share some traits that were different from patients in VS group – NVS patients are more likely to come from manual jobs (15.5% vs 0%), sustain more perforating open globe injuries (7.1% vs 0%), more closed globe injuries with lamellar laceration (40.7% vs 11.1%), present with more tissue injuries per person (57.2% patients with 3 tissue injuries vs 47.6%), had more posterior segment injuries and present with more phthisical eyes (31.1% vs 14.3%). In our earlier study, similar characteristics were found to be associated with poor postoperative outcome were presence of RAPD, wound extending into zone III and associated vitreoretinal trauma.[10] This could explain the surgeon's decision for a conservative treatment instead.

Characteristics of patients in vision-salvaging group

We also explored the types of patients could undergo primary surgical repair instead of enucleation. In our study, VS group had more pediatric patients, patients with retained IOFB and closed globe contusion injuries, higher usage of steroids and more traumatic cataracts. Other studies such as Feng K et al reported visual recovery in case of NLP cases and found prognostic factors like ciliary body damage, closed funnel retinal detachment and choroidal damage.[20] In the study by Salehi-Had H et al,.[21] 8 out of 23 patients regained vision ranging from hand motion to 20/70 after secondary vitreoretinal surgery following the primary open globe repair. He described prognostic indicators for successful surgical outcome to be hand motion or better vision prior to vitreoretinal surgery, recovery of vision within 5 days of open globe repair and vitreoretinal intervention within 5 weeks of open-globe injury.

Complications

There is a myriad of complications following ocular trauma such as traumatic uveitis, traumatic glaucoma, corneal abrasion and hyphema. In patients with lens vitreous admixture, this is a potent stimulator for further proliferative vitreoretinopathy and can also result in traction on the retina, hence primary extraction of the lens and vitreous is imperative in such patients.[16] We did not collect an extensive data for specific complications experienced by patients except traumatic cataract. To alleviate the complications, we administered steroids post-injury. A common consequence of ocular trauma is the formation of cataracts.[2] In traumatic cases, damage to surrounding ocular tissues may compromise the visual recovery in eyes after surgery. Untreated cataract or

lens subluxation can result in severe posterior segment complications and impair the vision. Hence, traumatic cataracts usually have poorer visual outcomes than non-traumatic cataracts, especially in children due to subsequent amblyopia and recurrent inflammation. Our study shows that 71.4% of patients who underwent vision salvaging surgeries experienced traumatic cataract. Hence, a secondary cataract surgery is recommended if primary cataract surgery was not performed initially.[22]

Concerns with initial assessment of 'no light perception'

Additionally, we should also note that assessment of light perception is a subjective measure and not dependable in the presence of severe media opacity secondary to dense vitreous haemorrhage, traumatic cataract, dense hyphema and corneal edema.[11, 13] Visual acuity can be profoundly impaired to the extent of no light perception (NLP) in presence of significant media opacity (e.g. corneal edema, hyphema, cataract, and dense vitreous haemorrhage), retinal detachment, associated subretinal or subhyaloid haemorrhage, haemorrhagic choroidals and even psychological factors (e.g. hysteria).[23] Ultrasonography is useful for assessment of posterior segment in the eyes with media opacity and to differentiate between retinal detachment and vitreous haemorrhage, but it is sometimes difficult to differentiate a detached retina from blood clots in the vitreous cavity or membranes.[23] Optic neuritis following trauma may cause dense central scotoma which may falsely interpreted as a NLP case. Medical management with cortical steroids may lead to reduction in central scotoma result in light perception. Traumatic optic neuropathy may also result in no perception light may be because of direct optic nerve injury or injury to vascular supply.[24] Hence, our patients in VS group were treated with steroids (52.4%) more than those in NVS group (31.4%). Other reversible causes of vision loss should be excluded including psychological factors as well.[23, 25] Assessment of light perception even with the bright light of an indirect ophthalmoscope can give false impression of NLP. [16]

Role of vision-salvaging surgery

Even in situations in which enucleation seems inevitable, the ophthalmologist should discuss the possible options with the patient before making a final decision. The most feared complication from ocular trauma is sympathetic ophthalmia which has an incidence rate of 0.2% to 0.5% after ocular injuries and an intraocular surgery can reduce the incidence rate to 0.01%.[26] Even then, primary enucleation for severely traumatized eyes with NLP in view of risk of sympathetic ophthalmia was a controversial approach and a relative indication for enucleation of an injured eye.[23] Most reported cases (65%) occur between 2 weeks to 2 months after injury and is rare during the first 2 weeks after trauma.[23] However the actual rate of post-traumatic sympathetic ophthalmia is not clear, and reported rates vary from 0.28% to 1.9%.[13, 23] The use of modern immunosuppressive has also improved treatment and control of sympathetic ophthalmia. As such primary surgical repair should not be abandoned for the risk of sympathetic ophthalmia in eyes with NLP.

Limitations

There are several limitations to our study. We lack data on the time elapsed between presentation and intervention especially on patients who presented acutely, as the recommended vitreoretinal intervention should be performed between 2 to 14 days to minimise extensive proliferative vitreoretinopathy and subsequent retinal detachment.[9] Number of days elapsed between injury and presentation also shows a huge range in both groups, which could be exacerbated by inaccessible healthcare in rural setting. Many patients were lost to follow-up as well, so we were unable to assess the projected visual outcome long-term. There was no data collected on co-morbidities and some systemic diseases could affect the visual recovery. Regretfully, the number of patients showing visual recovery is too small for statistical analysis of patient characteristics in this study; hence, further research in the future could look into similar topics.

CONCLUSION

The outcomes of this study emphasised that enucleation should not be offered based on the presenting vision solely and vision-salvaging surgeries still have a therapeutic role for ocular trauma patients presenting with no light perception, as 14.3% of patients experienced visual improvement after vision-salvaging surgeries. Decision for enucleation should be deliberated carefully after considering patient factors and conducting thorough ocular examination.

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