

Eye Injuries in Summer Olympic Sports - A Mini Review

Abstract

Eye sports injuries, despite lower incidence, possess great impact in athlete's performance and might shutdown athletes from the competition. This article aims to review eye injuries published in indexed literature related to sports that will be presented at the Summer Olympics Games-Rio 2016.

Methods: A critical literature review of articles was performed. Study analysis was conducted using online databases-Pubmed and BVS-selecting case reports, series of cases and reviews related to eye injuries in sports of which were only selected information's about the sports practiced on Olympic Summer Games-Rio 2016 with no language restriction, published in a twenty years period (1996-2016). Other sports that were not in the list of the Olympic Summer Games-Rio 2016 as the modalities practiced only in Winter Olympic Games were excluded from the study. The keywords used were 'athletic eye injuries', 'open globe trauma in sports', 'ocular trauma', 'ophthalmologic injuries', 'eye trauma', 'trauma in Olympic games' and 'eye injuries'.

Results: USA and England published most of the articles. Corneal abrasion/ulcer and conjunctival hemorrhage were the most frequent injuries reported. Boxing was responsible for the most devastating ocular trauma cases.

Conclusion: The review of indexed literature showed about 970 eyes with sports-related ocular traumas varying from mild to severe in accordance with the 39 sports practiced on the Olympic Summer Games in 2016. Ophthalmologist should be aware of most dangerous sports and type of lesion caused to better inform patients.

Keywords: Athletic eye injuries; Open globe trauma in sports; Ocular trauma; Ophthalmologic injuries; Eye trauma; Trauma in olympic games; Eye injuries

Mini Review

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Abbreviations: Bad: Badminton; Bas: Basketball; Box: Boxing; Cyc: Cycling; Gol: Golf; Hoc: Hockey; Rug: Rugby; Soc: Soccer; Swi: Swimming; Ten: Tennis; Vol: Volleyball; Wat: Water polo

Introduction

In this year, Brazil will host one of the biggest sports events worldwide: Summer Olympics-Rio 2016 in which will be played 39 modalities (Athletics, badminton, basketball, boxing, canoeing slalom, speed boating, cycling BMX, road cycling, track cycling, cycling mountain biking, fencing, football, gymnastics, trampoline gymnastics, rhythmic gymnastics, golf, handball, equestrianism, field hockey, judo, weightlifting, Olympic fight, aquatic marathons, synchronized swimming, swimming, modern pentathlon, water polo, rowing, rugby, taekwondo, ornamental jumps, archery, shooting sport, triathlon, tennis, table tennis, sailing, volleyball and beach volleyball) and among them 18 have reports of eye trauma in indexed literature [1].

Eye sports injuries, despite lower incidence, possess great impact in athlete's performance and might shutdown athletes from the competition [2-5]. During Beijing Summer Olympic Games in 2008, 135 athletes suffered eye injuries, representing approximately 4% of all injuries reports [1,6]. According to the International Federation of Sports Medicine (FIMS) modalities are classified in low, high and very high risk to eye injuries [7,8]. The "low risk" sports are those that do not involve infighting, blunt throwing balls and discs or use bats and very accelerate strokes

such as athletics, swimming, gymnastics and rowing. Floorball, tennis, squash, badminton, handball, baseball, basketball, volleyball and football (soccer) are considered "high risk" owing to their total or partial ratio with blunt throwing balls, use of bats or aggressive contact. Finally, the "very high" risk sports are: boxing and karate [7]. This article aims to review eye injuries related to sports that will be presented at the Summer Olympics Games-Rio 2016.

Methods

A critical literature review of articles was performed. Study analysis was conducted using online databases-Pubmed and BVS-selecting case reports, series of cases and reviews related to eye injuries in sports of which were only selected information's about the sports practiced on Olympic Summer Games-Rio 2016, with no language restriction, published in a twenty years period (1996-2016). Other sports that were not in the list of the Olympic Summer Games-Rio 2016 as modalities practiced only in Winter Olympic Games were excluded from the study. The keywords used were 'athletic eye injuries', 'open globe trauma in sports', 'ocular trauma', 'ophthalmologic injuries', 'eye trauma', 'trauma in Olympic games' and 'eye injuries'.

Results

The number of patients with eye injuries associated to sports that were practiced on Rio Olympic Summer Games in different

countries was analyzed. USA and England published 7 and 5 reviews, respectively. Canada, China and Turkey published 2 articles each, followed by Brazil, Finland, France, Italy, Israel, Japan, Korea and Scotland with only 1 each. There were studies from 1976-2016; however, the majority was performed between 2000-2009.

There are few reports mentioning eye injuries during Olympic Games. The biggest one is about the Olympics with the venue being Beijing in 2008 in which athletes population represented almost 15% of all the medical encounters with 5,7% of eye injuries diagnosis. From what concerns London Olympic Games, there were no reports about eye injuries on the literature [6]. In terms of sports modalities, four articles were found considering swimming, gymnastics and cycling, denominated low risk sports [2,8-11]. Twenty three articles mentioned injuries related to high risk sports as floorball (hockey), badminton, handball, basketball, golf, rugby, volleyball, water polo and soccer [2,5,6,8-28]. Considering “very high-risk” sports category, four articles had registers about boxing among which one described an isolated eyelid traumatic laceration related to karate [29-34].

Figure 1 shows the main causes of eye injuries according to sports modalities. In sports using ball like soccer, badminton, floorball, tennis, golf, volleyball and water polo most injuries

were caused by the ball or shuttlecock (51,1% of all eye injuries). However, basketball and rugby had injuries predominantly caused by body contact due to extreme contact between the competitors. Body contact is also present in swimming and boxing, representing 32,08% of sport-related ocular traumas and in a lesser extent, in sports such as soccer and floorball. In cycling, the only cause notified was the handlebars or brakes [33] and in the case of tennis, the ball was a 100% responsible for the injuries. Finally, sports equipment such as bats and rackets motivated 8,16% of lesions and falls were responsible for just 0,12% of all.

Table 1 shows the quantity of eye injuries in accordance with each sport, totalizing 970 in all of them. Basketball was responsible for 58 of the injuries, with cases of eyelid lacerations (30) and black eye (17), but also corneal abrasion and rupture with 7 and 3, respectively and one case of optic nerve avulsion. Badminton has 51 lesions of which 13 were hyphema and 7 contusions followed by traumatic uveitis (4), corneal abrasion (3) and glaucoma (3) besides angle resection (2), vitreous hemorrhage (2), choroidal rupture (1), conjunctival congestion, corneoscleral perforation (1), corneal stromal edema (1), macular edema (1), optic atrophy (1), periorbital injury (3), retinal detachment (1), retinal tears (1), subluxation of lens (1), traumatic cataract (1), upper lid edema (1) and uveal prolapse (1).

Table 1: Type of eye injury according to each sports modality.

Injury/ Sport	BAD	BAS	BOX	CYC	GOL	HOC	RUG	SOC	SWI	TEM	VOL	WAT	Total
Angle Resection	2												2
Black Eye		17											17
Choroidal Rupture	1				4			1					6
Commotio Retinae					5			5					10
Conjunctival Congestion	2												2
Conjunctival Haemorrhage			147				8	7	3	1			166
Contusion	7					44				12			63
Corpusculated			5										5
Corneal Abrasion	3	7			1	2		44	4	2			63
Corneal Acheration										1			1
Corneal Rupture		3											3
Corneal scleral Perforation	1												1
Corneal stromal Edema	1												1
Corneal ulcer			205										205
Difuse Blunt Trauma							2	7					9
Diploplia											1		1

Eye lid laceration		30		1									31
Glaucoma	3												3
Hyphema	13				15	1	1	15		1			46
Lid Trauma										1			1
Macular Edema	1												1
Micro cystoid degeneration			51										51
Optic Atrophy	1												1
Optic disc swelling			64										64
Optic nerve avulsion		1											1
Orbital Haemorrhage				1									1
Orbital Trauma						1							1
Orbital wall fractures					1								1
Partial Or Total Lens Dislocation			69										69
Peri orbital Injury	3				1	1	1	19		1			26
Pigment Scar and Atrophic Retinal Hole			1										1
Retinal Detachment	1		8					2				1	12
Retinal Edema			38				2	10		1			51
Retinal tears	1		1					2					4
Scleral Rupture							1						1
Subluxation of Lens	1				5								6
Superior Orbital Roof fracture				1									1
Tear Detachment					1			2					3
Traumatic Cataract	2									1			3
Traumatic Macular Holes								4					4
Traumatic Optic Neuropathy					1								1
Traumatic Uveitis	4						3	11					18
Upper Lid Edema	1							1					2
Uveal Prolapse	1									1			2
Vitreous Haemorrhage	2							1					3
Vitreitis			6										6
Total Of Injuries	51	58	595	3	34	49	18	131	7	22	1	1	970

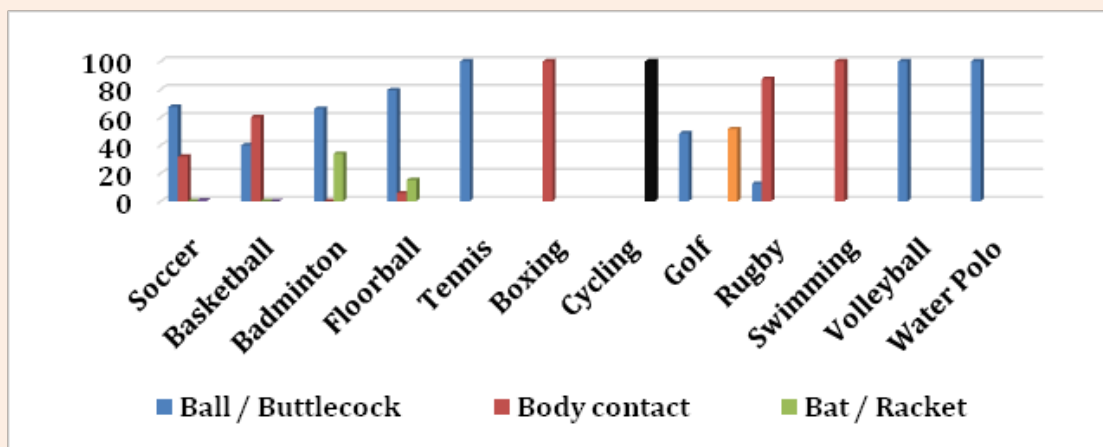


Figure 1: Causes of ocular trauma related to each modality.

Considering boxing whose body impact was responsible for the largest number of injuries, studies has shown reports of corneal ulcer, conjunctival hemorrhage or laceration, lens dislocation, optic disc swelling and microcystoid degeneration as the most common represented. With a total of 595 injuries, studies has shown, in a lesser proportion, cases of retinal detachment (8), vitritis (6), corpusculated (5), pigment scar and atrophic retina hole (1) and retinal tears (1). Golf injuries had notifications in 34 eyes, being hyphema the most prevalent (15), followed by commotio retinae (5), lens subluxation (5), choroidal rupture (4) besides one case each of corneal abrasion, orbital wall fractures, periorbital injury, tear detachment and traumatic optic neuropathy. Besides that hockey/floorball resulted in contusions (44), corneal abrasion (2), hyphema (1), orbital trauma (1) and periorbital injury (1), resulting in 49 injuries. Football was the second leading cause of eye sport related trauma, responsible for 131 injuries. The majority resulted in corneal abrasion (44), periorbital injury (19), hyphema (15) and retinal edema (10). However, other types are included as conjunctival hemorrhage (7), diffuse blunt trauma (7), commotio retinae (5), traumatic macular hole (4), and retinal (2) and tear detachment (2), retinal tears (2), choroidal rupture (1), upper lid edema (1) and vitreous hemorrhage (1).

Discussion and Conclusion

In accordance with this review taking in account those articles based on the 39 sports practiced in Summer Olympic Games-Rio 2016, the most incident sports related to eye injuries are boxing and soccer. The higher incidence of soccer is due to the fact that this sport is the most practiced in the world, and not because of the dangerousness [5]. On the other hand, boxing has also an elevated prevalence of ocular trauma even with all changes that happened in this sport all over the years as the gloves material variation, their increase in weight and the fights shorter duration. In this way, it has a possible association with stroke's violence [19].

Corneal ulcer/abrasion and Conjunctival hemorrhage/laceration accounted are four of the most common eye injuries reported, counting with a totality of 371 injury cases of all 970 injuries, comprising approximately 38% of ocular traumas. Meanwhile, corneal ulcer was founded in a hundred percent

of the cases of boxing trauma, requiring a higher attention for this pathology in this modality. Conjunctival hemorrhage and laceration are focus in sports as rugby, soccer, swimming, tennis and boxing. High-risk sports (tennis, badminton and floorball/hockey) should stick their concerns about contusions. In turn, corneal abrasion should be more worrisome in cases of badminton, basketball, floorball, golf, soccer, swimming and tennis. Optic disc swelling and lens dislocation were related in it's entirely with boxing and golf.

The emphasis on needs of using mandated protective eyewear (MPE) is due to the fact that in several studies the predominance of the injuries was in the group without proper protection [3,10,11,13,15]. Ultimately, demonstrated that the use of correct eye protection could reduce or even eliminate unnecessary traumas that are easily preventable [2,5,7,12-15,19,22,24,29]. The majority eye-trauma reports came from USA and England probably because of the great coverage of their data center and patient's information systems although those found in English articles are not specific reports. Taking all in consideration, it cannot be forgotten that people practice sports worldwide, and accidents do not stop to happen. Therefore, this article brings information focused in Olympic modalities helping ophthalmologists to be aware of the most common eye injuries and advertise patients to wear protective eyewear.

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References

1. PG (2016) Guia para Imprensa Jogos Olímpicos Rio 2016. COB 1 (2): 8.
2. Yulish M, Reshef N, Lerner A, Pikkell J (2013) Sport-Related Eye Injury in Northern Israel. *Isr Med Assoc J* 15(12): 763-765.
3. Desai P, Morris DS, Minassian DC, MacEwen CJ (2015) Trends in serious ocular trauma in Scotland. *Eye (Lond)* 29(5): 611-618.
4. Barroso GC, Thielell ES (2011) Lesão muscular nos atletas. *RBO* 46: 354-358.

5. Kriz PK, Comstock RD, Zurakowski D, Almquist JL, Collins CL, et al. (2012) Effectiveness of Protective Eyewear in Reducing Eye Injuries Among High School Field Hockey Players. *Pediatrics* 130(6): 1069-1075.
6. Zhang JJ, Wang LD, Chen Z, Ma J, Dai JP (2011) Medical care delivery at the Beijing 2008 Olympic Games. *WJEM* 2 (4): 267-271.
7. (1997) Lesões e proteção oculares nos esportes. *Rev Bras Med Esporte* 3(2): 36-38.
8. Leivo T, Haavisto AK, Sahraravand A (2015) Sports-related eye injuries: *Acta* 93(3): 224-231.
9. Netto AA, Mateus Astolfi, Rodrigues IK, Roberta Neumaier, Aguiar UJ (2003-2004) Acidentes oculares nas atividades esportivas. *Arquivos Catarinenses de Medicina*.
10. Mac Ewen CJ (1987) Sport associated eye injury: A casualty department survey. *Br J Ophthalmol* 71(9): 701-705.
11. Khandelwal R, Majumdar MR, Gupta A (2012) An unusual mechanism of ocular trauma in badminton players: Two incidental cases. *BMJ Case* : 10.1136/bcr-2012-006363.
12. Jones NP (1987) Eye injuries in sport: An increasing problem. *Br J Sports Med* 21(4): 168-170.
13. Gregory PT (1986) Sussex Eye Hospital sports injuries. *Br J Ophthalmol* 70(10): 748-750.
14. Moinul P, Dodd MM, Murphy PH (2015) Modified tennis ball- ball induced ocular trauma. *Can J Ophthalmol* 50(2): e30-e31.
15. Kelly SP (1987) Serious eye injury in badminton players. *Br J Ophthalmol* 71 (10): 746-747.
16. Horn EP, McDonald HR, Johnson RN, Ai E, Williams GA, et al. (2000) Soccer ball-related retinal injuries: A report of 13 cases. *Retina* 20(6): 604-609.
17. Hensley LD, Paup DC (1979) A survey of badminton injuries. *Br J Sports Med* 13(4): 156-160.
18. Borel A, Bonnin N, Porte C, Chiambaretta F, Bacin F (2013) Optic nerve trauma: Case report of partial optic nerve avulsion. *J Fr Ophtalmol* 36(4): 372-377.
19. Sánchez AF, Hernández EM, Guardiola AAB (2006) El Boxeo, es el deporte con mayor frecuencia de trauma ocular? *Rev. Cubana Oftalmol* 19 (2).
20. Qiu HY, Zhang MN, Zhang Y, Jiang CH (2011) The survey of the causes of eye injury of various services in China. *Mil Med* 176(9): 1051-1055.
21. Youn J, Sallis RE, Smith G, Jones K (2008) Ocular injury rates in college sports. *Med Sci Sports Exerc* 40(3): 428-432.
22. Zigelbaum BM, Starkey C, Hersh PS, Donnenfeld ED, Perry HD, et al. (1995) The National Basketball Association Eye Injury Study. *Arch Ophthalmol* 113(6): 749-752.
23. Heimmel MR, Murphy MA (2008) Ocular injuries in basketball and baseball: What are the risks and how can we prevent them? *CSMR* 7(5): 284-288.
24. Park SJ, Park KH, Heo JW, Woo SJ (2014) Visual and anatomic outcomes of golf ball- related ocular injuries. *Eye* 28(3): 312-317.
25. Crane ES, Kolomeyer AM, Kim E, Chu DS (2016) Comprehensive review of golf-related ocular injuries. *Retina* 36 (7): 1237-1243.
26. Song YS, Yokota H, Ito H, Yoshida A (2014) Temporal posttraumatic limited ocular movement with suspected trapdoor fracture. *Clin Ophthalmol* (8): 1535-1538.
27. Gökçe G, Ceylan OM, Erdurman FC, Durukan AH, Sobacı G (2013) Soccer Ball Related Posterior Segment Closed- Globe Injuries in Outdoor Amateur Players. *Ulus Travma Acil Cerrahi Derg* 19(3): 219-222.
28. Kent JS, Eidsness RB, Colleaux KM, Romanchuk KG (2007) Indoor soccer- related eye injuries: Should eye protection be mandatory? *Can J Ophthalmol* 42(4): 605-608.
29. Bianco M, Vaiano AS, Colella F, Coccimiglio F, Moscetti M, et al. (2005) Ocular complications of boxing. *Br J Sports Med* 39(2): 70-74.
30. Hazar M, Beyleroglu M, Subasi M, Or M (2002) Ophthalmological finding in elite amateur Turkish boxers. *Br J Sports Med* 36(6): 428-430.
31. Maguire JI, Benson WE (1986) Retinal Injury and Detachment in boxers. *JAMA* 255(18): 2451-2453.
32. Corrales G, Curreri A (2009) Eye trauma in boxing. *Clin Sports Med* 28(4): 591- 607.
33. Carrillo-Arroyo I, Gordo-Molina IT, Menca-Gutiérrez E, Gutiérrez-Díaz E, Sarmiento-Torres B (2012) Isolated tarso-conjunctival superior eyelid traumatic laceration. *Int Ophtalmol* 32(4): 337-339.
34. Ng JD, Payner TD, Holck DE, Martin RT, Nunery WT (2004) Orbital trauma caused by bicycle and brakes. *Ophthal Plast Reconstr Surg* 20(1): 60-63.