



Radiological Profiles of Orbital Gunshot Injuries Sustained During the July 2024 Political Unrest and Mass Movement in Bangladesh: Experience at a National Referral Eye Hospital

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Abstract

Background: Gunshot injuries are a form of penetrating trauma that requires prompt imaging assessment for both clinical management and forensic evaluation. The July Revolution in Bangladesh led to a surge in civilian gunshot injuries, including severe orbital trauma. Rifles, handguns, and shotguns were the most commonly used weapons, with shotgun injuries often causing more devastating damage due to the dispersion of pellets. **Objective:** This study investigated the radiological findings, emergency interventions, and surgical outcomes of orbital gunshot injuries treated at the National Institute of Ophthalmology and Hospital, Dhaka, Bangladesh. **Methodology:** This descriptive cross-sectional study was conducted from July 2024 to December 2024. A total of 1,002 patients with gunshot injuries received treatment, among whom 786 required admission and radiological evaluation using X-rays and other imaging modalities. Of these, 612 patients had orbital injuries, including 573 single-eye injuries and 39 bilateral injuries. **Results:** A total of 1,002 patients with gunshot injuries were treated, with 786 requiring admissions. Among the 612 patients with orbital injuries, 573 had single-eye injuries, and 39 had bilateral injuries. Radiological assessments showed that B-scan ultrasonography and X-ray were critical in identifying the injury extent. Surgical interventions included retinal surgery (63.9%) and globe repair (34.9%), with 73.0% of patients preserving their vision post-surgery. **Conclusion:** Early intervention and multidisciplinary care significantly improve surgical outcomes, with a high proportion of patients preserving vision. [*Journal of National Institute of Neurosciences Bangladesh, July 2025;11(2):176-180*]

Keywords: B-scan; gunshot injuries; July revolution; orbital trauma; radiological assessment; retinal surgery

Introduction

Gunshot injuries are a severe form of penetrating trauma that requires prompt medical evaluation and intervention. These injuries are associated with high morbidity and often lead to permanent disability or vision loss when the orbit is involved¹. Orbital gunshot injuries present unique challenges due to the complex anatomy of the eye and surrounding structures. Rapid and accurate imaging is essential for assessing the extent of damage, guiding surgical planning, and determining prognosis². In addition to clinical implications, radiological evaluation of gunshot wounds also holds forensic significance, as it aids in reconstructing injury mechanisms and legal

investigations³.

The July Revolution in Bangladesh led to widespread violence, resulting in a surge of civilian gunshot injuries, including severe ocular trauma. Rifles, handguns, and shotguns were among the most commonly used weapons during this period. While rifles and handguns discharge a single bullet per shot, shotguns release multiple pellets, which disperse upon exiting the barrel. At close range, shotgun injuries can cause devastating damage due to the combined kinetic energy of the pellets, often leading to more extensive soft tissue and bony injuries than single-bullet wounds⁴. The severity of such injuries necessitates a multidisciplinary approach involving

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ophthalmologists, radiologists, and trauma surgeons⁵. Radiological imaging, particularly X-rays and B-scan ultrasonography, plays a critical role in evaluating orbital injuries. X-ray imaging is effective for detecting fractures and metallic foreign bodies⁶, while B-scan ultrasonography provides detailed visualization of intraocular structures in cases where the cornea or anterior segment is opaque⁷. In complex cases, computed tomography (CT) and magnetic resonance imaging (MRI) may be required to assess soft tissue damage and optic nerve involvement⁸.

A prompt and accurate radiological assessment significantly influences the choice of treatment strategies, including emergency surgical interventions. During the study period, a total of 1,002 patients received treatment for gunshot injuries at the National Institute of Ophthalmology and Hospital, Dhaka, Bangladesh, with 786 requiring admission and radiological evaluation. Among them, 573 had single-eye injuries, while 39 patients suffered bilateral injuries, leading to permanent blindness in some cases⁹. Surgical interventions were necessary for 504 patients, including 278 retinal surgeries and two corneal transplants aimed at restoring or preserving vision. This study was aimed to analyze the radiological findings, emergency interventions, and surgical outcomes of orbital gunshot injuries sustained during the July Revolution. By assessing imaging modalities, injury mechanisms, and treatment responses, the study seeks to contribute to the development of standardized management protocols for ocular trauma in conflict and civilian settings.

Methodology

Study Settings and Population: This descriptive cross-sectional study was conducted at the National Institute of Ophthalmology and Hospital, Dhaka, Bangladesh, from July 2024 to December 2024. The study population comprised patients presenting with gunshot injuries during this period. A total of 1,002 patients with gunshot injuries were treated during the study period. Of these, 786 patients required admission and underwent radiological evaluation. Patients with orbital gunshot injuries were identified through comprehensive clinical assessment and confirmed by radiological findings.

Study Procedure: All admitted patients received standardized radiological assessments including X-ray imaging to evaluate bony fractures, presence of foreign bodies, overall anatomical damage and B-scan ultrasonography to assess intraocular structures and retinal and vitreous damage. For complex cases

requiring further evaluation, additional imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI) were utilized when clinically indicated. Surgical management was performed on 504 patients to address acute trauma, including 278 retinal surgeries, 2 corneal transplants and additional procedures as clinically warranted.

Data Collection: Data were systematically collected from multiple sources like patient medical records, radiological reports, surgical outcome documentation and follow-up clinical evaluations.

Statistical Analysis: The collected data were analyzed using Microsoft Office tools (Excel, Word) and descriptive statistical methods. Results were categorized and presented according to injury type and severity, radiological findings, surgical procedures performed and treatment outcomes

Ethical Considerations: The study protocol received ethical clearance from Institutional Review Board National Institute of Ophthalmology and Hospital, Dhaka. Patient confidentiality was maintained throughout the study, with all data anonymized for analysis.

Results

A total of 1,002 patients with gunshot injuries were treated at the National Institute of Ophthalmology and Hospital, Dhaka, Bangladesh, during the study period. Of these, 786 patients required admission, and 612 sustained orbital injuries (61.0% of the total).

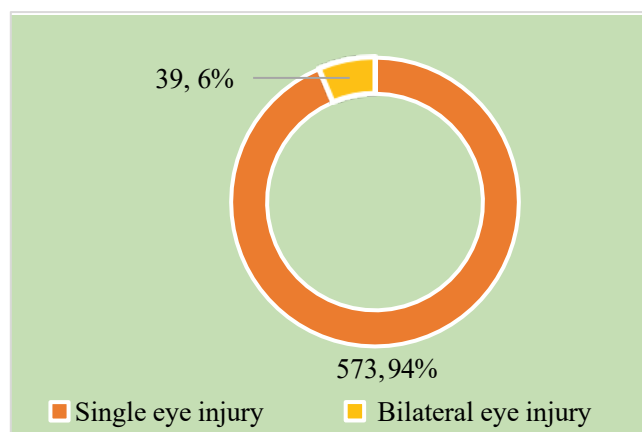


Figure I: Distribution of Orbital Gunshot Injuries by Eye Involvement (n = 612)

Figure I shows that, among the 612 orbital injury cases, 573 had single-eye injuries (93.6%), while 39 patients suffered bilateral eye injuries (6.4%). The radiological evaluation of 612 orbital gunshot injury cases revealed significant differences in imaging findings between

Table 1: Radiological Findings in Patients with Orbital Gunshot Injuries (n = 612)

Modality	Eye injury	
	Bilateral	Single
B-scan positive	28(4.9%)	552(94.5%)
X-ray positive	32(5.6%)	510(87.2%)

bilateral and single-eye injuries (Table 1). B-scan ultrasonography demonstrated positive findings in 94.5% of single-eye injuries (n=552/573), compared to only 4.9% in bilateral cases (n=28/39). Similarly, X-ray positivity was observed in 87.2% of single-eye injuries (n=510/573) versus 5.6% in bilateral injuries (n=32/39). Analysis of injury patterns (Table 2) showed distinct differences between unilateral and bilateral cases. Among single-eye injuries, globe rupture was most prevalent (41.5%, n=238), followed by retinal detachment (21.3%, n=122), vitreous hemorrhage (18.2%, n=104), and optic nerve injury (19.0%, n=109). In contrast, bilateral injuries predominantly presented with retinal detachment (46.2%, n=18) and vitreous hemorrhage (30.8%, n=12), with notably lower rates of globe rupture (5.1%, n=2). Surgical interventions were required in 504 cases (Table 3), with retinal surgery being the most common procedure (63.9%, n=322). Globe repair accounted for 34.9% of surgeries (n=176), while corneal transplantation was relatively rare (1.2%,

Table 2: Breakdown of Injury Types in Single and Bilateral Eye Injury Patients (n= 612)

Injury type	Eye injury	
	Single (n = 573)	Bilateral (n = 39)
Retinal detachment	122(21.3%)	18(46.2%)
Vitreous hemorrhage	104(18.2%)	12(30.8%)
Globe rupture	238(41.5%)	2(5.1%)
Optic nerve injury	109(19.0%)	7(17.9%)

Table 3: Surgical Interventions and Postoperative Outcomes in Orbital Gunshot Injury Patients

Variables	Frequency	Percent
Type of surgery		
Retinal surgery	322	63.9
Corneal transplantation	6	1.2
Globe repair	176	34.9
Outcomes		
Vision preservation	368	73.0
Vision loss (permanent)	136	27.0

n=6). The surgical outcomes (Table 3) demonstrated that 73.0% of patients (n=368) achieved vision preservation postoperatively, while 27.0% (n=136) experienced permanent vision loss despite surgical intervention.

Discussion

Orbital gunshot injuries are a significant cause of ocular trauma in civilian settings, often resulting in severe complications. This study aimed to assess the radiological findings, emergency interventions, and surgical outcomes of orbital gunshot injuries at the National Eye Institute during the July Revolution in Bangladesh. The results underline the crucial role of timely radiological evaluations, emergency interventions, and multidisciplinary approaches in the management of these injuries. The study showed that a substantial number of patients with gunshot injuries sustained orbital trauma. This is consistent with reports from other conflict and civilian settings where penetrating ocular trauma is a common consequence of gunshot wounds¹⁰. Among the injured, the vast majority (93.6%) sustained single-eye injuries, with 6.4% suffering bilateral injuries. The higher proportion of single-eye injuries aligns with previous studies indicating that unilateral ocular trauma is more common in gunshot victims^{11,12}.

Bilateral injuries, however, pose greater challenges due to the risk of permanent blindness, as observed in 6.4% of our sample. Radiological imaging plays an essential role in the evaluation of orbital gunshot injuries, both in determining the extent of damage and in guiding surgical interventions. In our study, B-scan ultrasonography was more frequently positive (94.5%) in single-eye injuries compared to bilateral-eye injuries (4.9%), which indicates the higher severity of single-eye trauma that differs from the findings of another study¹³. The X-ray also revealed significant findings in both groups, with a slightly lower positivity rate for bilateral-eye injuries (5.6%) than single ones (87.2%). This supports the notion that B-scan and X-ray are complementary modalities, with the B-scan more effective in detecting retinal and posterior segment injuries. In contrast, X-ray remains useful for detecting fractures and foreign bodies in the orbit¹⁴. Surgical management of orbital gunshot injuries varies depending on the nature of the damage. In this study, 50.3% of patients required surgical intervention, with retinal surgeries being the most common (63.9%), followed by globe repair (34.9%). This is similar to findings from other studies, where retinal detachment

and vitreous hemorrhage were the leading indications for surgery in gunshot victims^{15,16}.

The need for corneal transplantation in two cases underscores the severity of some injuries, which can lead to irreversible corneal damage. The outcomes of surgical interventions were generally favorable, with 73.0% of patients preserving their vision. However, 27.0% of patients experienced permanent vision loss, which highlights the challenges of managing severe orbital gunshot injuries¹⁷. One of the most significant findings in this study was the correlation between timely radiological assessment and successful surgical outcomes. Patients who underwent early imaging and intervention had better outcomes, a result that has been widely reported in trauma surgery literature¹⁸. Moreover, the high possibility of postoperative complications emphasizes the need for rigorous post-surgical care and monitoring, as infections and inflammation are common risks following traumatic ocular surgeries¹⁹.

This study highlights the critical importance of multidisciplinary care in the management of orbital gunshot injuries. The collaboration between emergency medical teams, radiologists, and ophthalmic surgeons is crucial for optimizing patient outcomes. Future research should focus on refining imaging protocols, improving surgical techniques, and exploring innovative rehabilitation strategies to further enhance the management of these complex injuries.

This study was limited by its single-center design and short follow-up period. The retrospective nature may have introduced selection bias, while the lack of advanced imaging in all cases could affect injury assessment. Additionally, psychosocial impacts and long-term visual rehabilitation outcomes were not evaluated.

Conclusion

This study demonstrates that radiological imaging serves as a cornerstone in the effective management of orbital gunshot injuries, enabling accurate diagnosis and timely intervention. The findings reveal that early surgical intervention coupled with multidisciplinary care yields favorable outcomes. These results underscore the importance of establishing standardized protocols for imaging and surgical management in ocular trauma cases. However, the significant rate of permanent vision loss highlights the need for continued research to refine surgical techniques and develop more effective treatment strategies. Future studies should focus on long-term outcomes, advanced imaging

modalities, and innovative surgical approaches to further improve visual prognosis in these complex cases.

Acknowledgements

The authors gratefully acknowledge the contributions of the Ophthalmology and department of Radiology & Imaging at the National Institute of Ophthalmology and Hospital, Dhaka, for their dedicated patient care and technical support. We extend our sincere appreciation to all participating patients and their families-special thanks to the hospital administration for facilitating this research.

Conflict of interest

All authors declare that they have no competing interest.

Financial Disclosure

This research project was not funded by any organization.

Contribution to authors

Conception and design: Mahmud Hasan Mostofa Kamal, Monir Uddin Ahamed; Acquisition, analysis, and interpretation of data: Md. Mahbub Hossain; Data collection, consultation, and surgical team: ASM Shahidul Hossain & Md. Ishaque Ali; Manuscript drafting and revising it critically: Mahmud Hasan Mostofa Kamal; Approval of the final version of the manuscript: Monir Uddin Ahamed. All authors read and approved the final manuscript.

Data Availability

The datasets generated and analyzed during this study are not publicly available due to patient confidentiality and institutional data protection policies. However, anonymized data may be made available from the corresponding author upon reasonable request, subject to approval by the institutional ethics committee.

Ethics Approval and Consent to Participate

Ethical approval for the study was obtained from the Institutional Review Board. As this was a prospective study the written informed consent was obtained from all study participants. All methods were performed in accordance with the relevant guidelines and regulations. The ethical approval was obtained from July 2024 to December 2024.

How to cite this article: Kamal MHM, Ahamed MU, Hossain MM, Hossain ASMS, Ali MI. Radiological Profiles of Orbital Gunshot Injuries Sustained During the July 2024 Political Unrest and Mass Movement in Bangladesh: Experience at a National Referral Eye Hospital. *J Natl Inst Neurosci Bangladesh*, 2025;11(2):176-180

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Article Info

Received on: 7 April 2025

Accepted on: 24 May 2025

Published on: 1 July 2025

References

1. Kuhn F, Pieramici DJ, editors. Ocular trauma: principles and practice. New York: Thieme Medical Publishers; 2002. Available from: Amazon
2. Owen JL, Kibbi N, Worley B, Kelm RC, Wang JV, Barker CA, et al. Sebaceous carcinoma: evidence-based clinical practice guidelines. *Lancet Oncol.* 2019;20(12):e699-e714
3. Hassan B, Liang F, Grant MP. Pediatric orbital fractures. *Oral Maxillofac Surg Clin North Am.* 2023;35(4):585-596
4. Khangura S, Polisena J, Clifford TJ, Farrah K, Kamel C. Rapid review: an emerging approach to evidence synthesis in health technology assessment. *Int J Technol Assess Health Care.* 2014;30(1):20-27
5. DiMaio VJ. Gunshot wounds: practical aspects of firearms, ballistics, and forensic techniques. Boca Raton: CRC Press; 2015. Available from: Taylor & Francis
6. Stevenson T. Ballistic extremity wounding: quantifying tissue damage associated with military firearms [dissertation]. Cranfield: Cranfield University; 2018. Available from: Cranfield University Repository
7. Rishi P, Rishi E, Uparkar M, Sharma T, Gopal L, Bhende P, et al. Vitreous hemorrhage in children and adolescents in India. *J AAPOS.* 2013;17(1):64-69
8. Wright C, Churcher K, McConnell J. Principles of imaging modalities. In: *Practical radiotherapy: physics and equipment.* 3rd ed. 2019. p. 59-110
9. Malayil Lincoln CM, Nash R, Lee S. Imaging of infected orbits and sinuses. In: *Orbital cellulitis and periorbital infections.* Cham: Springer; 2017. p. 35-54.
10. Islam MS, Rahman MM, Hossain MA, et al. Pattern of ENT emergencies in tertiary level hospital. *Sir Salimullah Med Coll J.* 2022;30(1):67-74
11. Shah FQ, Dar MF, Wani ML, et al. Clinical spectrum and functional outcome of firearm pellet-related eye injuries: a prospective follow-up study. *Injury.* 2022;53(9):2998-3004
12. Sibley D, et al. Exercise in isolating during novel coronavirus 19: a case report of bilateral ocular trauma from elastic resistant bands. *Can J Ophthalmol.* 2020;55(6):e209
13. Kraker JA, Smith WM. Treatment options for necrotizing scleritis in rheumatoid arthritis patients. *Expert Rev Ophthalmol.* 2024;19(5):357-377
14. Shah N, Bansal N, Logani A. Recent advances in imaging technologies in dentistry. *World J Radiol.* 2014;6(10):794-807
15. Tietjens JR, Claman D, Kezirian EJ, et al. Obstructive sleep apnea in cardiovascular disease: a review of the literature and proposed multidisciplinary clinical management strategy. *J Am Heart Assoc.* 2019;8(1):e010440
16. Karahan E, Tuncer I, Zengin MO, et al. Spontaneous resolution of macular edema after silicone oil removal. *Int J Ophthalmol.* 2014;7(6):1005-1007
17. Sharma SP, Sharma R, Gupta A, et al. Bacterial and fungal keratitis: current trends in its diagnosis and management. *Curr Clin Microbiol Rep.* 2023;10(4):266-278
18. Al-Hassani A, Abdulrahman Y, Abdelrahman H, et al. Relationship of optic nerve sheath diameter and intracranial hypertension in patients with traumatic brain injury. *J Emerg Trauma Shock.* 2020;13(3):183-189
19. Ahmed N, Islam MR, Hossain MM, et al. Olfactory nerve schwannoma: a case series with a systematic review of the literature focusing on risk factors, etiology, clinical presentation, and management. *Oncologie.* 2024;26(3):379-393.