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RESEARCH ARTICLE

Gunshot head injuries in Dhaka amid the violent crackdown in July 2024

Md Ruhul Kuddus[1] | Ferdousi Tabassum[2] | Md Mahfuzur Rahman[3] | Shamsul Alam[1] | Mohammad Sujan Sharif[4]

[1]Department of Neurosurgery, Bangladesh Medical University, Dhaka, Bangladesh
[2]Department of Ophthalmology, Makka Eye Hospital, Dhaka, Bangladesh
[3]Department of Neurosurgery, National Institute of Neurosciences, Dhaka, Bangladesh
[4]Department of Neurosurgery, Dhaka Medical College, Dhaka, Bangladesh

Correspondence
Ferdousi Tabassum
ferdousitabassum@gmail.com

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Abstract

Background: Gunshot head injuries are a major cause of death and illness, particularly in regions experiencing civil unrest. During the civil unrest in Bangladesh in 2024, violent crackdowns resulted in numerous gunshot injuries, many to the head. This study assesses the clinical features, surgical interventions, and outcomes of patients with gunshot head injuries during the civil unrest.

Methods: This study at Bangabandhu Sheikh Mujib Medical University (currently Bangladesh Medical University), National Institute of Neurosciences, and two private hospitals in Dhaka (July 16–September 9, 2024) included 217 patients with gunshot head injuries. Data were collected from medical records and patient interviews. Injury characteristics, surgical interventions, post-operative complications, and functional outcomes (Glasgow Outcome Scale, GOS) at two months were analysed.

Results: All patients were male, with the majority aged 14–25 years (80.2%), and most were students (70.5%). Low-velocity firearms caused 89.9% of injuries. Radiological findings showed scalp involvement in 76.5% of cases, parietal lobe injury in 8.3%, brain oedema in 71.9%, and haemorrhagic contusions in 46.5%. Surgical intervention was necessary for 54.8% of patients. Post-operative complications included brain oedema (30.4%), infection (9.7%), and hemiparesis (7.4%). A good recovery (GOS 5) was achieved in 76.5% of patients, 7.4% experienced moderate disability (GOS 4), and 16.1% died (GOS 1).

Conclusion: Despite the high-risk nature of gunshot brain injuries, early intervention resulted in favourable functional outcomes. Rapid neurosurgical care, combined with intensive care support, significantly contributed to the high survival and recovery rates.

Key messages

Gunshot head injuries are uncommon in Bangladesh. We report here 217 individuals who sustained gunshot injuries during the crackdown in July 2024. Most victims were adolescents and young adult students. More than half of them required neurosurgical interventions. There were 35 deaths, but most survived with mild or no residual disabilities due to early intervention along with intensive care support.

Introduction

Penetrating gunshot injuries to the brain are among the most severe types of traumatic brain injury, often linked with high mortality rates and long-term disability. These injuries, frequently seen in military conflicts and areas affected by urban violence, cause significant tissue destruction due to the high kinetic energy transferred to intracranial structures [1]. Despite advances in neurosurgical techniques and critical care, the prognosis for gunshot-related brain trauma remains poor, with global survival rates below 10% and only a minority of cases achieving functional recovery [2].

In 2024, Bangladesh experienced one of its most significant civil movements, which met with violent suppression by state forces [3, 4]. During this time, over 30,000 people were injured, many of whom suffered gunshot wounds, especially to the head [5]. Public and private hospitals in Dhaka became overwhelmed with critical trauma cases, many involving complex skull injuries that required urgent neurosurgical treatment [6, 7].

Reports from human rights organisations indicated that of the 1,581 reported deaths, 77% resulted from gunshot wounds, with over 60% involving military-grade firearms [8]. Such ballistic trauma generally involves high-velocity projectiles, which cause both direct tissue laceration and secondary damage from shockwave propagation, bone fragmentation, and cavitation effects. These injuries are often complicated by haemorrhage, cerebral oedema, infection, and herniation syndromes [9].

Despite the rising incidence of civilian cranial gunshot injuries in politically unstable regions, literature from low-resource settings remains scarce. Prognostic factors such as the initial Glasgow Coma Scale (GCS) score, bullet trajectory, injury location, and complications, such as abscess or hematoma, are vital for predicting outcomes but are understudied in these environments [10]. The aim of the study was to evaluate the clinical management and outcomes of gunshot brain injuries sustained during the civil unrest in 2024.

Methods

Study design and setting

This study was conducted at BSMMU, which has since been renamed Bangladesh Medical University (BMU), National Institute of Neurosciences, Islami Bank Central Hospital, Aurora Specialised Hospital in Dhaka, which played an important role in delivering neurosurgical care to trauma patients due to violent crackdowns during the civil unrest from 16 July to 9 September 2024.

Patient selection and data collection

A total of 217 inpatients were included in the study sample based on available medical records during the study period who sustained gunshot-related head injuries, including pellets in the orbits. Those who survived the first post-operative day were followed up for two months. The exclusion criteria comprised patients with non-penetrating head injuries, injuries resulting from mechanisms such as blunt force trauma, and individuals with incomplete medical records.

Data were collected from intensive care unit (ICU) and trauma ward records, and patient interviews. The documented variables included age, sex, occupation, and medical history. Injury details recorded were the date, circumstances, bullet type (low, medium, high velocity), location, and mechanism. The initial assessment included Glasgow Coma Scale (GCS) scores, vital signs, and neurological examinations. Radiological findings focused on computed tomography (CT) scans showing brain injury extent, haemorrhage, foreign bodies, oedema, and skull fractures. Surgical procedures, timing, and anesthesia were documented. Postoperative follow-up assessed complications and neurological recovery using the GCS and Glasgow Outcome Scale (GOS). Post-discharge follow-ups were conducted at 2-month intervals, either in person at the hospital or by telephone. The primary outcome was functional recovery measured by GOS. Secondary outcomes included survival and complications like oedema, infection, and cognitive deficits.

Classification of the firearm identified

Gunshot injuries were classified based on the bullet's velocity. The injuries were categorised as follows:

Low velocity: *e.g.*, handguns or small-calibre bullets (*e.g.*, 1.27 mm, 2.3 mm). Medium velocity: *e.g.*, submachine guns (9.02 mm), High velocity: *e.g.*, assault rifles such as AK-47 (9.07 mm).

Injury location

Parietal, frontal-temporal, occipital, and parasellar regions were identified as the primary injury locations. The site of injury was recorded for each patient, and the associated clinical presentation was noted.

Surgical approach

The choice of surgical approach was influenced by the injury's location and severity, as well as the patient's condition upon admission. Most patients underwent standard craniotomy, decompressive craniectomy, and surgical toileting. Almost all bullets in the brain were removed by keyhole craniotomy. Some pellets in the scalp were removed under local anaesthesia those who were symptomatic. A significant number of patients did not require any surgery and were treated conservatively, especially, patients diagnosed with multiple pellets in the scalp and deep brain who were asymptomatic needed no surgery. However, a patient presenting with a deep brain injury and a brain abscess required a more comprehensive surgical procedure. One major surgery was performed under local anaesthesia due to the nature of the injury and the patient's clinical condition.

Functional outcome

The patients' functional outcomes were assessed using GOS at 2-month follow-up, and the following categories were used: GOS 1 (Death), GOS 2 (Persistent vegetative state), GOS 3 (Severe disability), GOS 4 (Moderate disability), and GOS 5 (No disability).

Ethical concern

Each treatment and procedure was performed after proper counselling regarding the possible outcome and risk of the procedure. Consent was obtained from the patient and legal guardian, along with assent from the minors, as applicable. This study was conducted

Table 1 Radiological findings in patients with gunshot brain injuries and types of firearms identified in the injured persons (n=217)

Radiological findings	Number (%)
Computed Tomography Scan	
Intracerebral Hemorrhage	55 (25.4)
Pellets in scalp and skull only	61 (28.1)
Pellets in orbit	23 (10.6)
Intracerebral pellets	20 (9.2)
Intracerebral bullet	7 (3.2)
Compound depressed fracture	99 (45.6)
Brain edema	156 (71.9)
Hemorrhagic contusion	101 (46.5)
Types of bullets/pellets identified	
Low velocity (*e.g.,* 1.27 mm and 2.3 mm)	195 (89.9)
Medium velocity (*e.g.,* 9.02 mm)	4 (1.8)
High velocity (*e.g.,* 9.07 mm)	17 (7.8)
Intracerebral location of bullets	
Parietal	18 (8.3)
Fronto-temporal	14 (6.5)
Para-Sellar	10 (4.6)
Occipital	9 (4.1)
Scalp with or without other locations	166 (76.5)

in accordance with the ethical principles outlined in the Declaration of Helsinki. Retrospective ethical approval was obtained from the Institutional Review Board at BMU, given the emergency nature and the life -threatening injuries sustained by the patients. The patient's treatment was prioritised over obtaining ethical approval beforehand.

Statistical analysis

Quantitative variables, such as age, GCS scores, and surgical duration, are presented as means and standard deviations. Categorical variables, including sex, bullet type, injury location, surgical procedure, and GOS, are expressed as frequencies and percentages. The GOS (five categories) was used to assess patients' functional recovery at 2-month follow-up. All data analyses were conducted using SPSS version 27.

Results

Most patients (out of a total of 217) with gunshot head injury were adolescents and young adults aged 14–25 years (80.2%), students (70.5%) and all were male. Table 1 presents the details of radiological findings and types of firearms used among the injured patients. The vast majority of gunshot brain injuries were caused by low-velocity firearms (89.9%), while smaller proportions resulted from high-velocity weapons such as AK-47 rifles (7.8%) and medium-velocity arms (1.8%).

Radiologically, brain oedema (71.9%) and hemorrhagic contusion (46.5%) were the most frequent findings. Nearly half of the cases also showed compound depressed skull fractures (45.6%), hemorrhagic contusion (46.5%) and about one-fourth demonstrated intracerebral haemorrhage (25.4%). Foreign body localisation revealed isolated pellets in the scalp and skull (28.1%), pellets in orbit 10.6%, intracerebral pellets (9.2%), and intracerebral bullets

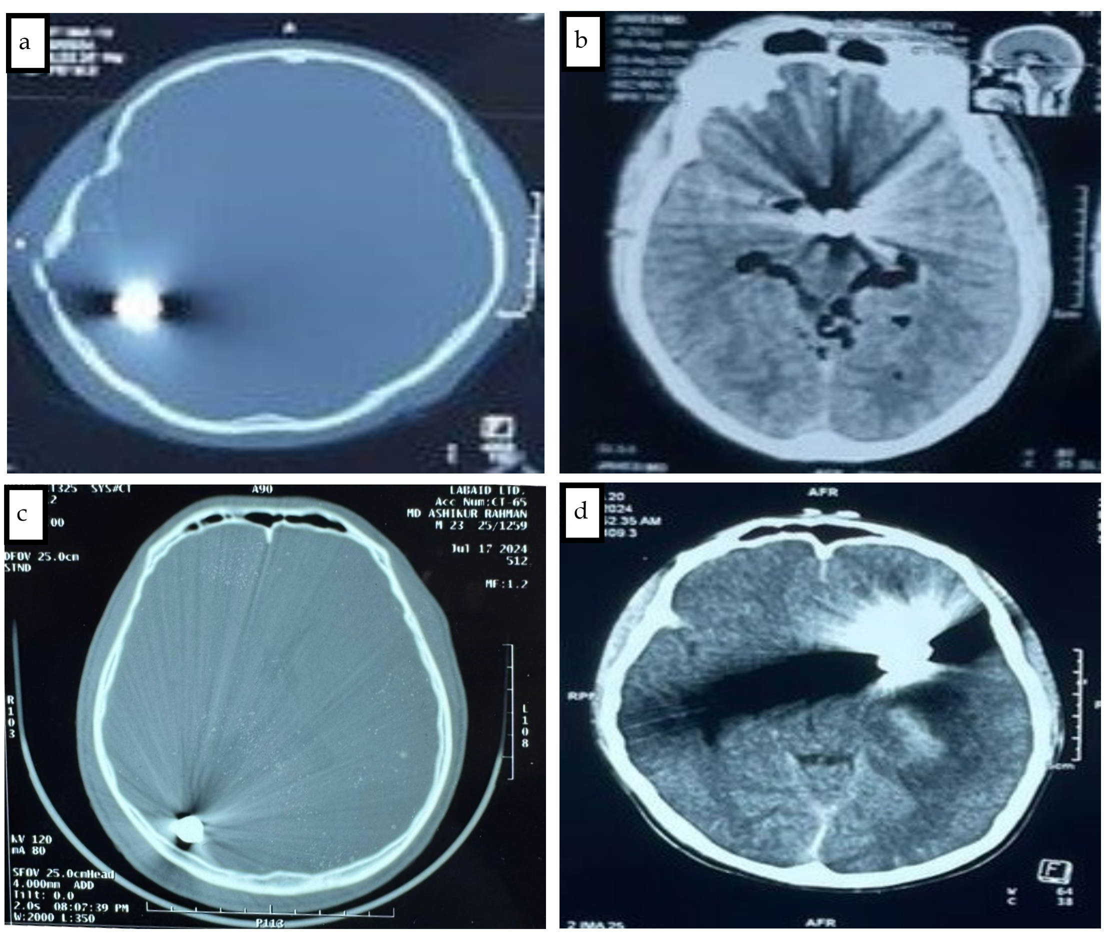

Figure 1 Bullets in various locations of the head: a) parietal, b) sellar, c) parieto-occipital, and d) parasellar region

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Table 2 **Surgical interventions and anesthesia used in patients with gunshot brain injuries (n=217)**

Surgical interventions and anesthesia used in patients	Number (%)
Type of procedure	
Surgical (n=119)	
Keyhole craniotomy	5 (2.3)
Craniotomy (extensive)	61 (28.1)
Incision and removal of pellets	53 (24.4)
Non-surgical for asymptomatic pellets	98 (45.2)
Types of anesthesia (n=119)	
General anesthesia	66 (55.5)
Local anesthesia	53 (44.5)

(3.2%), pellets in the scalp along with or without other locations (76.4%), highlighting varied ballistic penetration patterns (Figure 1).

Table 2 summarises the surgical procedures and anaesthesia modalities employed in management. Nearly half of the patients (45.2%) were managed conservatively for asymptomatic pellets, while the remaining underwent surgery—most commonly extensive craniotomy (28.1%) and incision with pellet removal (24.4%). A smaller proportion (2.3%) underwent keyhole craniotomy. Among 119 surgeries done, general anaesthesia was used in 55.5% of cases.

On arrival at the emergency room, the GCS scores were assessed; 15 (69.1%) had mild traumatic head injuries (GCS 13–15), while 13.4% had moderate (GCS 9–12), and 17.5% had severe (GCS 3–8) injuries (Figure 2). The overall survival rate was 83.9%, while 16.1% of patients succumbed within one day post-operatively (Table 3). Post-surgical complications were common, with brain oedema (30.4%) being the most frequent, followed by infection (9.7%), unilateral blindness (9.1%), and hemiparesis (7.4%). Rare complications included bullet bed hematoma (0.5%) and seizures (0.5%). At the 2-month follow-up (in survivors beyond postoperative day 1), functional outcomes were assessed using the GOS. The majority (76.5%) achieved good recovery (GOS 5), while 7.4% experienced moderate disability (GOS 4). No patients were reported to have GOS 2 or 3-grade disabilities.

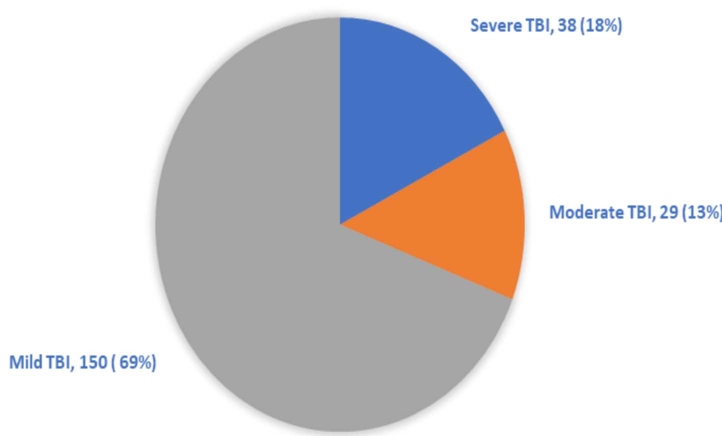

Figure 2 **Pie chart showing the initial scores of the Glasgow Coma Scale of 217 patients with gunshot head injuries.** TBI indicates traumatic brain injury

Discussion

This study provides valuable insights into the clinical management, surgical interventions, and functional outcomes of patients with gunshot head injuries. The study's findings offer a broader understanding of gunshot head injury management and outcomes in a civilian setting, with a particular focus on the importance of early surgical intervention, injury characteristics, and post-operative recovery.

Most patients (89.9%) in this study sustained injuries from low-velocity (e.g., handgun, shotgun), which is not similar to cases reported in conflict zones [11]. The rate of scalp injuries (76.5%) matches findings in civilian populations, where gunshot head injuries often affect superficial skull areas [12]. This high rate of scalp injuries may stem from the typical bullet trajectory that impacts the outer regions of the head. High-velocity projectiles, such as those from AK-47 rifles, tend to cause more severe neurological damage, including brain haemorrhages and foreign body retention [13]. The scalp involvement, brain oedema, hemorrhagic contusion and depressed skull fractures were consistent with reports on civilian gunshot injuries where low-velocity projectiles commonly result in less severe intracranial penetration [14, 15].

On arrival, most patients presented with mild traumatic brain injuries and maintained consciousness; there is a need for rapid assessment and intervention [16, 17]. Surgical management was tailored based on the location and severity of the injury. Conservative treatment of asymptomatic pellets was used in about 45% of patients, while the rest underwent surgery. Among the 119 operated patients, the use of local anaesthesia in nearly half reflects a pragmatic approach adapted to patient condition and resource availability, consistent with best practices in civilian neurosurgical trauma [18, 19]. It underscores the inherent flexibility in surgical techniques, contingent upon the severity of the injury and the patient's condition. This methodology is corroborated by prior studies in which local anaesthesia is employed for less complex or critical conditions [20]. On the other hand, general anaesthesia was used in more than half of the surgeries to ensure optimal patient comfort and effective control during the critical intervention phase [21].

The post-operative complications in our study were similar to those in other studies on traumatic

Table 3 **Outcomes observed during the 2-month follow-up of 217 patients with gunshot head injuries**

Variables	Number (%)
Clinical	
Death	35 (16.1)
Bullet bed hematoma	1 (0.5)
Infection	21 (9.7)
Brain edema	66 (30.4)
Hemiparesis	16 (7.4)
Seizures	1 (0.5)
Unilateral Blindness	20 (9.1)
No complications	57 (26.3)
Glasgow outcome scale (GOS)[a]	
GOS 1 (Death)	35 (16.12)
GOS 4 (Moderate disability)	16 (7.37)
GOS 5 (Good recovery)	166 (76.49)

[a]None had GOS 2 and 3 stages

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brain injuries, especially the penetrating brain injuries [22, 23]. The infection rate in our study is relatively low compared to military settings with a higher occurrence of gunshot wounds [24]. The incidence of brain oedema is a significant complication, as cerebral oedema often develops after brain injuries, particularly in high-velocity trauma [11]. Similarly, the occurrence of seizures in one patient matches reported rates of post-traumatic epilepsy following penetrating brain injuries [25].

We could achieve good functional outcomes for patients, as measured by GOS, which were higher than those reported in other studies, possibly due to delayed or insufficient medical care [26]. These findings align with research on military and civilian brain injuries, where many patients with penetrating brain injuries may experience long-term functional impairments [20]. The low mortality rate observed is encouraging despite having high-velocity gunshot wounds that usually lead to high mortality [14, 19]. This positive result may be attributed to rapid intervention and early surgical management, as well as the rapid deployment of intensive care at the participating hospitals.

In contrast to military environments where gunshot-related brain injuries are frequently observed, our research indicates more favourable outcomes within a civilian context. Military trauma management often entails delayed or intricate injuries, commonly impacting multiple body systems and constrained by resource limitations [27]. Nonetheless, analogous findings regarding the significance of early surgical intervention and immediate medical treatment have been reported in both civilian and military settings, underscoring the importance of multidisciplinary approaches to improving survival rates and recovery outcomes [16, 22]. The environment during the crackdown compelled emergency medical teams to limit patients' civil identity and to seek ethical approval before surgical interventions, because saving lives was prioritised over strict research ethics.

Conclusion

This study shows that gunshot brain injuries caused by the violent crackdown during civil unrest in Bangladesh mainly affected young male civilians, with low-velocity firearms being the most common cause. While brain oedema, haemorrhagic contusions, and skull fractures were frequent, personalised surgical management—including conservative care for asymptomatic cases, keyhole craniotomy, and extensive craniotomy—resulted in favourable outcomes. Early intervention, prompt use of intensive care, and adaptable surgical strategies contributed to a high rate of good functional recovery and relatively low mortality.

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Author contributions

Concept or design of the work; or the acquisition, analysis, or interpretation of data for the work: MRK, FT, MR, SA, MSS. *Drafting the work or reviewing it critically for important intellectual content:* MRK, FT, MR. *Final approval of the version to be published:* MRK, FT, MR, SA, MSS. *Accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved:* MRK, FT.

Conflict of interest

We do not have any conflict of interest.

Data availability statement

We confirm that the data supporting the findings of the study will be shared upon reasonable request.

AI disclosure

None

Supplementary file

None

References

1. Alvis-Miranda HR, M Rubiano A, Agrawal A, Rojas A, Moscote-Salazar LR, Satyarthee GD, Calderon-Miranda WG, Hernandez NE, Zabaleta-Churio N. Craniocerebral gunshot injuries; A Review of the Current Literature. Bull Emerg Trauma. 2016 Apr;4(2):65-74. PMID: 27331062
2. Hofbauer M, Kdolsky R, Figl M, Grünauer J, Aldrian S, Ostermann RC, Vècsei V. Predictive factors influencing the outcome after gunshot injuries to the head: A retrospective cohort study. J Trauma. 2010 Oct;69(4):770-775. doi: https://doi.org/10.1097/TA.0b013e3181c81d7d
3. Moral S. Student-people uprising: More than 18,000 injured. Prothom Alo. 2024 Sep 7. Available at: https://en.prothomalo.com/bangladesh/1qyly6muhk [Accessed on 10 Dec 2025]
4. Campbell C. Bangladesh protests become 'people's uprising' against government. TIME. 2024 Aug 5. Available at: https://time.com/7007756/bangladesh-protests-sheikh-hasina-uprising-analysis/ [Accessed on 10 Dec 2025]
5. At least 875 killed in July mass uprising. The Daily Star. 2024 Sep 14. Available at: https://www.thedailystar.net/news/bangladesh/crime-justice/news/least-875-killed-july-mass-uprising-3702451 [Accessed on 10 Dec 2025]
6. Nandy D, Mollah S, Mizan M. Patients with bullet, pellet wounds: Dhaka hospitals stretched to the limit. The Daily Star. 2024 July 24. Available at: https://www.thedailystar.net/news/bangladesh/news/patients-bullet-pellet-wounds-dhaka-hospitals-stretched-the-limit-3660581 [Accessed on 10 Dec 2025]
7. Masum O, Mitra P. Injured people crowd Dhaka Medical College Hospital, most with gunshot wounds. bdnews24.com. 2024 Aug 7. Available at: https://bdnews24.com/bangladesh/d5bf7a4d5349 [Accessed on 10 Dec 2025]
8. Human Rights Support Society (HRSS). Report on July Uprising 2024. HRSS Report. 2024 Jul–Sep. Available at: https://hrssbd.org/storage/report_post_file/d0dDyyHxsp7Ks7uBeFIldPBURgvvfWhoxcTQudvT.pdf [Accessed on 10 Dec 2025]
9. Quinn J, Panasenko SI, Leshchenko Y, Gumeniuk K, Onderková A, Stewart D, Gimpelson AJ, Buriachyk M, Martinez M, Parnell TA, Brain L, Sciulli L, Holcomb JB. Prehospital Lessons From the War in Ukraine: Damage control resuscitation and surgery experiences from point of injury to role 2. Mil Med. 2024 Jan 23;189(1-2):17-29. doi: https://doi.org/10.1093/milmed/usad253
10. Quinn J, Panasenko SI, Leshchenko Y, Gumeniuk K, Onderková A, Stewart D, Gimpelson AJ, Buriachyk M, Martinez M, Parnell TA, Brain L, Sciulli L, Holcomb JB. Prehospital lessons from the war in Ukraine: Damage control resuscitation and surgery experiences from point of injury to role 2. Mil Med. 2024 Jan 23;189(1-2):17-29. doi: https://doi.org/10.1093/milmed/usad253
11. Roy T, NAMS task force report on gunshot and blast injuries. Ann Natl Acad Med Sci (India) 2024;60:299-323. doi: https://doi.org/10.25259/ANAMS_TFR_09_2024

12. Alvis-Miranda HR, Adie Villafañe R, Rojas A, Alcala-Cerra G, Moscote-Salazar LR. Management of craniocerebral gunshot injuries: A Review. Korean J Neurotrauma. 2015 Oct;11(2):35-43. doi: https://doi.org/10.13004/kjnt.2015.11.2.35
13. Izci Y, Kayali H, Daneyemez M, Koksel T, Cerrahoglu K. The clinical, radiological and surgical characteristics of supratentorial penetrating craniocerebral injuries: A retrospective clinical study. Tohoku J Exp Med. 2003 Sep;201(1):39-46. doi: https://doi.org/10.1620/tjem.201.39
14. Josua M, Edel M. The Arab uprisings and the return of repression. Mediterranean Politics. 2021; 26(5): 586–611. doi: https://doi.org/10.1080/13629395.2021.1889298
15. Kaufman HH, Makela ME, Lee KF, Haid RW Jr, Gildenberg PL. Gunshot wounds to the head: A perspective. Neurosurgery. 1986 Jun;18(6):689-695. doi: https://doi.org/10.1227/00006123-198606000-00002
16. Pedachenko YH, Grotenhuis A. Classification of gunshot wounds of skull and cerebrum. Kyiv: Ukrainian Military Medical Academy; 2018. ISBN: 978-966-1543-56-9. Available at: https://redcross.org.ua/wp-content/uploads/2024/04/Classification-of-gunshot-wounds-of-skull-and-cerebrum.pdf [Accessed on 10 Dec 2025]
17. Vlahos NC, Tapia RN. TBI by pattern: Penetrating, nonpenetrating, and blast injury. In: Zasler ND, Katz DI, Zafonte RD, editors. Brain Injury Medicine. 2nd ed. Elsevier; 2021. p. 23–46. Available at: https://neupsykey.com/tbi-by-pattern-penetrating-nonpenetrating-and-blast-injury/ [Accessed on 10 Dec 2025]
18. Narayan RK, Michel ME, Ansell B, Baethmann A, Biegon A, Bracken MB, Bullock MR, Choi SC, Clifton GL, Contant CF, Coplin WM, Dietrich WD, Ghajar J, Grady SM, Grossman RG, Hall ED, Heetderks W, Hovda DA, Jallo J, Katz RL, Knoller N, Kochanek PM, Maas AI, Majde J, Marion DW, Marmarou A, Marshall LF, McIntosh TK, Miller E, Mohberg N, Muizelaar JP, Pitts LH, Quinn P, Riesenfeld G, Robertson CS, Strauss KI, Teasdale G, Temkin N, Tuma R, Wade C, Walker MD, Weinrich M, Whyte J, Wilberger J, Young AB, Yurkewicz L. Clinical trials in head injury. J Neurotrauma. 2002 May;19(5):503-557. doi: https://doi.org/10.1089/089771502753754037
19. Liebenberg WA, Demetriades AK, Hankins M, Hardwidge C, Hartzenberg BH. Penetrating civilian craniocerebral gunshot wounds: A protocol of delayed surgery. Neurosurgery. 2007 Jul;61(1 Suppl):242-247; discussion 247-248. doi: https://doi.org/10.1227/01.neu.0000279219.53504.b7
20. Levy ML, Masri LS, Levy KM, Johnson FL, Martin-Thomson E, Couldwell WT, McComb JG, Weiss MH, Apuzzo ML. Penetrating craniocerebral injury resultant from gunshot wounds: Gang-related injury in children and adolescents. Neurosurgery. 1993 Dec;33(6):1018-1024; discussion 1024-1025. doi: https://doi.org/10.1227/00006123-199312000-00009
21. Siccardi D, Cavaliere R, Pau A, Lubinu F, Turtas S, Viale GL. Penetrating craniocerebral missile injuries in civilians: a retrospective analysis of 314 cases. Surg Neurol. 1991 Jun;35(6):455-460. doi: https://doi.org/10.1016/0090-3019(91)90179-d
22. Kim PE, Zee CS. The radiologic evaluation of craniocerebral missile injuries. Neurosurg Clin N Am. 1995 Oct;6(4):669-687. PMID: 8527910
23. Izci Y, Kayali H, Daneyemez M, Koksel T. Comparison of clinical outcomes between anteroposterior and lateral penetrating craniocerebral gunshot wounds. Emerg Med J. 2005 Jun;22(6):409-410. doi: https://doi.org/10.1136/emj.2004.014704
24. Xiong Y, Lee CP, Peterson PL. Mitochondrial dysfunction following traumatic brain injury. In: Miller LP, Hayes RL, editors. Head Trauma: Basic, preclinical, and clinical directions. New York: John Wiley and Sons Inc; 2001: p. 257–280.
25. Okie S. Traumatic brain injury in the war zone. N Engl J Med. 2005 May 19;352(20):2043-2047. doi: https://doi.org/10.1056/NEJMp058102
26. Weiss GH, Salazar AM, Vance SC, Grafman JH, Jabbari B. Predicting posttraumatic epilepsy in penetrating head injury. Arch Neurol. 1986 Aug;43(8):771-773. doi: https://doi.org/10.1001archneur.1986.00520080019013
27. Jamous MA. Outcome of craniocerebral penetrating injuries: Experience from the Syrian war. J Neurol Surg A Cent Eur Neurosurg. 2019 Sep;80(5):345-352. doi: https://doi.org/10.1055/s-0039-1683878