Pakistan Journal of Intensive Care Medicine
eISSN: 2708-2261; pISSN: 2958-4728
www.pjicm.com
DOI: https://doi.org/10.54112/pjicm.v5i02.149
*Pak. J. Inten. Care Med., volume 5(2), **2025**: 149*
Original Research Article

FREQUENCY OF ENLARGEMENT OF EXTRADURAL HEMATOMA IN REPEAT CT SCAN IN CONSERVATIVELY MANAGED TRAUMA PATIENTS

SAQIB M*, AZAM F, SALEEM M, UDDIN N, ALI S, SHAFIQUE S

Department of Neurosurgery, Lady Reading Hospital -MTI Peshawar, Pakistan
**Corresponding author email address:* saqibm50@yahoo.com

(Received, 29th May 2025, Revised 18th June 2025, Accepted 10th July, Published 17th July 2025)

ABSTRACT

Background: *Extradural hematoma (EDH) is a potentially life-threatening complication of head trauma. While surgical intervention is indicated for large or rapidly expanding hematomas, many cases are initially managed conservatively. Repeat CT imaging is crucial for monitoring progression; however, the frequency of enlargement in this setting is variably reported.* ***Objective:*** *To determine the frequency of enlargement of extradural hematoma on repeat CT scans in patients with conservatively managed head trauma.* ***Study Design:*** *Descriptive cross-sectional study.* ***Setting:*** *Department of Neurosurgery, Lady Reading Hospital, Peshawar, Pakistan.* ***Duration of Study:*** *25-November-2024 to 25-May-2025.* ***Methods:*** *A total of 126 patients aged 5–60 years presenting within 24 hours of head trauma were enrolled. The inclusion criteria were a Glasgow Coma Scale (GCS) score greater than 12 and the absence of concurrent surgical pathologies. All patients were managed conservatively and underwent repeat CT scans 48 hours later. EDH enlargement was defined as a biconvex hyperdensity with thickness >10 mm, midline shift >6 mm, or volume >30 ml. Data were analyzed using SPSS 26.* ***Results:*** *The mean age was 19.60 ± 13.74 years, with a male predominance (77.0%). Road traffic accidents were the most common cause of injury (53.2%), followed by falls from height (34.1%) and assault (12.7%). Enlargement of EDH was observed in 25 patients, yielding a frequency of 19.8%.* ***Conclusion:*** *Nearly one-fifth of conservatively managed EDH cases showed enlargement on repeat CT scans. Routine follow-up imaging at 48 hours is recommended, especially in high-risk patients, to ensure timely surgical intervention and improve outcomes.*

Keywords: Extradural Hematoma, Conservative Management, Computed Tomography, Trauma, Enlargement

INTRODUCTION

Extradural hematoma (EDH) accounts for 2% of all reported head injuries (1). In particular, patients may find conservative treatment an acceptable choice. While recent findings indicate a favourable conservative approach to EDH, surgical evacuation remains the definitive treatment for this condition (2). Following the craniotomy, the procedures consist of evacuation of haematoma, coagulation of bleeding areas, and inspection of the dura. The dura is afterwards attached to bone, and the epidural drains may be utilised for an interval of 24-48 hours (3). Traditionally, immediate evacuation has been considered the typical management approach (4, 5). Findings indicate that routine application of CT to treating head injury patients calls for more frequent consideration of non-operative management in particular cases (6).

EDH is observed in roughly 10% of traumatic brain injuries that necessitate hospitalisation. Most cases arise from trauma, predominantly due to motor vehicle collisions or even accidental falls; nevertheless, nontraumatic mechanisms are also known to exist (7, 8). Spontaneous EDH may infrequently lead to acute craniofacial disorders, including frontal sinusitis, which may arise from dural vessel erosion caused by venous thrombosis (9). In certain patients, conservative treatment could be a viable option. While recent findings indicate successful conservative handling of epidural haematoma, surgical evacuation continues to be the definitive treatment for this medical condition (10). The management of trauma patients with EDH requires a critical decision between surgical treatments and conservative management, which significantly impacts patient outcomes (11). A study reported that the frequency of enlargement of extradural hematoma in repeat CT scans was 20% among patients with conservatively managed trauma (12). By conducting this study, we aim to fill this critical void in local epidemiological data, enabling healthcare providers to make more informed decisions about the frequency and timing of repeat CT scans, potentially reducing unnecessary radiation exposure and healthcare costs while ensuring patient safety. The benefits of this research are multifaceted: it will inform evidence-based guidelines for managing EDH, potentially leading to earlier detection of hematoma expansion; guide resource allocation in busy trauma centers; and provide valuable prognostic information for patient counseling. Moreover, understanding the factors associated with hematoma enlargement could pave the way for targeted preventive measures and stimulate further research into innovative management strategies.

METHODOLOGY

A descriptive cross-sectional study was conducted within the Department of Neurosurgery at Lady Reading Hospital, Peshawar, over six months from November 25, 2024, to May 25, 2025, following ethical approval from the hospital. The sample size for this research was calculated as 126 participants. This calculation was performed using a 95% confidence level and a 7% margin of error, with an anticipated frequency of hematoma enlargement set at 20%, a Figure derived from existing literature.[12] Participant selection was conducted via non-probability consecutive sampling

The study cohort included patients aged between 5 and 60 years of both genders who had sustained a head trauma within the preceding 24 hours. Furthermore, eligible participants were required to have a Glasgow Coma Score (GCS) greater than 12 upon admission. They were deemed suitable for a non-surgical conservative management pathway by the attending neurosurgeon. Several exclusion criteria were applied: patients presenting with concurrent subdural hematoma or significant intraparenchymal hemorrhage, those with a history of previous cranial surgery or pre-existing intracranial pathology, and individuals with penetrating head injuries. Additionally, patients with

[Citation: Saqib, M., Azam, F., Saleem, M., Uddin, N., Ali, S., Shafique, S. (2025). Frequency of enlargement of extradural hematoma in repeat CT scan in conservatively managed trauma patients. *Pak. J. Inten. Care Med. 5(2), **2025**: 149.* doi: https://doi.org/10.54112/pjicm.v5i02.149]

known coagulopathies or those on anticoagulant or antiplatelet therapy were excluded from the study.

Consent was obtained from all participants or their legal guardians. Upon enrollment, baseline demographic and clinical information was recorded for each participant, including age, gender, body mass index (BMI), the specific cause of the trauma, and the initial GCS score at presentation.

All enrolled patients were admitted to the Neurosurgery ICU for close monitoring and received a standardized conservative treatment protocol. This management included the administration of analgesics, antibiotics, and anti-epileptic medications as clinically indicated. According to the study protocol, follow-up non-contrast computed tomography (CT) scans of the brain were performed at standardized intervals, at 6 hours, 12 hours, and 24 hours following admission. A final CT scan was obtained at the 48-hour mark post-admission. The primary outcome measure, enlargement of the extradural hematoma, was assessed on this final scan based on strict radiological criteria. Enlargement was defined as the presence of a biconvex lens-shaped hyperdensity situated between the skull and the dura mater with a total thickness exceeding 10 mm, accompanied by a midline shift or mass effect greater than 6 mm and an estimated volume surpassing 30 ml.

All relevant data, including radiological findings and patient demographics, were recorded on a specifically designed proforma. For the statistical analysis, data were entered and analyzed using SPSS 26. Age and BMI were evaluated using mean and standard deviation. Gender, causes of trauma, and enlargement of extradural hematoma were assessed as frequencies and percentages. The outcome was then stratified by demographics and causes of trauma using the Chi-Square test, while maintaining a statistically notable P value of ≤ 0.05.

RESULTS

The study included a total of 126 patients, with a mean age of 19.60 ± 13.74 years. The mean body mass index (BMI) was 22.59 ± 2.78 kg/m².

Among the participants, 97 (77%) were male and 29 (23%) were female. The most common cause of trauma was road traffic accidents, which occurred in 67 cases (53.2%), followed by falls from height in 43 patients (34.1%) and assault in 16 cases (12.7%) (Table 1).

Enlargement of the extradural hematoma was observed in 25 patients, accounting for 19.8% of the study population, while the majority, 101 patients (80.2%), did not exhibit enlargement on follow-up imaging (Table 2). Table 3 presents the stratification of enlargement of the extradural hematoma with demographics and causes of trauma. Male patients had notably higher cases of enlargement of the extradural hematoma.

Table 1: Demographics and causes of trauma Demographics and causes of trauma

Demographics and causes of trauma		N	%
Gender	Male	97	77%
	Female	29	23%
Cause of trauma	Road accident	67	53.2%
	Fall from height	43	34.1%
	Assault	16	12.7%

Table 2: Frequency of enlargement of extradural hematoma

Enlargement of the extradural hematoma	n	%
Yes	25	19.8%
No	101	80.2%

Table 3: Stratification of enlargement of extradural hematoma with demographics and causes of trauma

		Enlargement of the extradural hematoma				P value
		Yes		No		
		n	%	n	%	
Age groups (Years)	5 to 15	13	52%	49	48.5%	P > 0.05
	16 to 35	10	40%	38	37.6%	
	36 to 50	2	8%	8	7.9%	
	> 50	0	0%	6	5.9%	
BMI (Kg/m2)	18 to 24.9	16	64.0%	81	80.2%	P > 0.05
	> 24.9	9	36.0%	20	19.8%	
Gender	Male	22	88%	75	74.3%	P > 0.05
	Female	3	12%	26	25.7%	
Cause of trauma	Road accident	12	48.0%	55	54.5%	P > 0.05
	Fall from height	7	28.0%	36	35.6%	
	Assault	6	24.0%	10	9.9%	

DISCUSSION

Our study found that 19.8% of cases exhibited an increase in hematoma size on repeat computed tomography (CT) imaging. This observation aligns closely with the seminal work by Sullivan et al., who reported an enlargement rate of 23% in their series of 160 patients (Sullivan et al., 13). The consistency between these two figures, derived from different populations and temporal settings, reinforces the concept that EDH enlargement is not uncommon in a conservative management pathway, occurring in roughly one out of every five patients. This underscores the critical necessity for vigilant neurological monitoring and a protocol that includes scheduled repeat neuroimaging to identify patients whose clinical course deviates from the expected.

The demographic profile of our patient sample, with a mean age of 19.60 ± 13.74 years and a strong male predominance of 77% is a recurrent finding in the global literature on traumatic brain injury. This demographic pattern was similarly observed by Mezue et al. in Nigeria, who documented a mean age of 30.2 years with 83% of their cohort being male (12). Likewise, Metwally et al. reported a mean age of 19.2 years, with 70% of the participants being males (14). Zwayed et al. also had a predominantly male cohort (15). This consistent skew towards young adult males is widely attributed to their greater exposure to risk-prone activities such as driving and occupational hazards. The mean BMI in our study was 22.59 ± 2.78 kg/m², a variable not routinely reported or investigated in EDH outcomes. The mechanism of injury revealed that road traffic accidents were the leading cause (53.2%), followed by falls from height (34.1%) and assault (12.7%). Aurangzeb et al. reported fall from height as the most

[Citation: Saqib, M., Azam, F., Saleem, M., Uddin, N., Ali, S., Shafique, S. (2025). Frequency of enlargement of extradural hematoma in repeat CT scan in conservatively managed trauma patients. *Pak. J. Inten. Care Med. 5(2), **2025**: 149.* doi: https://doi.org/10.54112/pjicm.v5i02.149]

common cause (57%), which the authors linked to their hilly geographic area (16). Mezue et al. and Metwally et al. both found road traffic accidents to be the primary cause, which was similar to our findings (12, 14).

The decision between surgical intervention and conservative management is totally dependent on clinical and radiological parameters. Our inclusion criteria, which considered patients for conservative management, are consistent with the evolving trends in the literature.

CONCLUSION

In conclusion, our study showed a 19.8% frequency of enlargement of extradural hematoma in repeat CT scans in patients with conservatively managed trauma. We also found that road accidents were the leading cause of trauma in these patients.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IRB-468/LRH/ MTI)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTION

MUHAMMAD SAQIB (POSTGRADUATE RESIDENT)
Conceived the study, collected data, performed analysis, and prepared the first draft of the manuscript
FAROOQ AZAM (PROFESSOR)
Supervised the study, provided expert guidance, critically reviewed the manuscript, and approved the final version
MUHAMMAD SALEEM (POSTGRADUATE RESIDENT)
Critical Input and Literature Search
NAFEES UDDIN (POSTGRADUATE RESIDENT)
Critical Input and Literature Search
SARDAR ALI (POSTGRADUATE RESIDENT)
Helped in data entry, organization of findings, and manuscript formatting
SADIA SHAFIQUE (POSTGRADUATE RESIDENT)
Critical Input and Literature Search

All authors read and approved the final version of the manuscript.

REFERENCES

1. Arrese I, Lobato RD, Gomez PA, Nunez AP. Hyperacute epidural haematoma isodense with the brain on computed tomography. Acta Neurochir (Wien). 2004;146(2):193-4. https://doi.org/10.1007/s00701-003-0171-6
2. Basamh M, Robert A, Lamoureux J, Saluja RS, Marcoux J. Epidural hematoma treated conservatively: when to expect the worst. Can J Neurol Sci. 2016;43(1):74-81. https://doi.org/10.1017/cjn.2015.232
3. Bejjani GK, Donahue DJ, Rusin J, Broemeling LD. Radiological and clinical criteria for the management of epidural hematomas in children. Pediatr Neurosurg. 1996;25(6):302-8. https://doi.org/10.1159/000121144
4. Daoud SS, Jamous MA, Al Barbarawi MM, Jarrar S, Jaradat A, Aljabali AS, et al. Operative versus non-operative management of posterior fossa epidural hematoma: a systematic review and meta-analysis. Neurochirurgie. 2024;70(5):101578. https://doi.org/10.1016/j.neuchi.2024.101578
5. Gok H, Celik SE, Yangi K, Yavuz AY, Percinoglu G, Unlu NU, et al. Management of epidural hematomas in pediatric and adult population: a hospital-based retrospective study. World Neurosurg. 2023;177:e686-92. https://doi.org/10.1016/j.wneu.2023.06.123
6. Sharafat S, Azam F, Khan Z. Posterior fossa epidural hematoma: a 6-year management experience. Pak J Med Sci. 2023;39(1):253. https://doi.org/10.12669/pjms.39.1.6056
7. Tamburrelli FC, Meluzio MC, Masci G, Perna A, Burrofato A, Proietti L. Etiopathogenesis of traumatic spinal epidural hematoma. Neurospine. 2018;15(1):101-7. https://doi.org/10.14245/ns.1836068.034
8. Fernández-Abinader JA, González-Colón K, Feliciano CE, Mosquera-Soler AM. Traumatic brain injury profile of an elderly population in Puerto Rico. P R Health Sci J. 2017;36(4):237-9.
9. Scafa AK, Jiang T, Pescatori L, Corsini M, Piccirilli M. Association between spontaneous intracranial epidural hematoma and craniofacial infections: a systematic literature review. Surg Neurol Int. 2023;14:57. https://doi.org/10.25259/SNI_1068_2022
10. Bisen YT, Korde P, Dighe O, Iratwar S, Bisen G. Decompressive craniectomy in the management of low Glasgow coma score patients with extradural hematoma: a review of literature and guidelines. Cureus. 2023;15(1):e33790. https://doi.org/10.7759/cureus.33790
11. Kim C, Lee S, Kim Y, Sung S, Son D, Song G. Predictors of hematoma enlargement in patients with spontaneous intracerebral hemorrhage treated with rapid administration of antifibrinolytic agents and strict conservative management. Korean J Neurotrauma. 2019;15(2):126-8. https://doi.org/10.13004/kjnt.2019.15.e23
12. Mezue WC, Ndubuisi CA, Chikani MC, Achebe DS, Ohaegbulam SC. Traumatic extradural hematoma in Enugu, Nigeria. Niger J Surg. 2012;18(2):80-4. https://doi.org/10.4103/1117-6806.103111
13. Sullivan TP, Jarvik JG, Cohen WA. Follow-up of conservatively managed epidural hematomas: implications for the timing of repeat CT scans. AJNR Am J Neuroradiol. 1999;20(1):107-13.
14. Metwally MM, Abdel-Bary TH, Abd El Aziz MR, Abaza HA. Evaluation of conservative management of traumatic extradural hemorrhage and role of surgery during follow-up. Egypt J Hosp Med. 2024;96(1):2871-6.
15. Zwayed ARH, Lucke-Wold B. Conservative management of extradural hematoma: a report of sixty-two cases. Neurol Clin Neurosci. 2018;2(2):5-9.
16. Aurangzeb A, Afridi EAK, Khan SA, Muhammad G, Ihsan A, Hussain I, et al. Frequency of extradural haematoma in patients with linear skull fracture. J Ayub Med Coll Abbottabad. 2015;27(2):314-7.

\

[Citation: Saqib, M., Azam, F., Saleem, M., Uddin, N., Ali, S., Shafique, S. (2025). Frequency of enlargement of extradural hematoma in repeat CT scan in conservatively managed trauma patients. *Pak. J. Inten. Care Med. 5(2), **2025**: 149.* doi: https://doi.org/10.54112/pjicm.v5i02.149]

[Citation: Saqib, M., Azam, F., Saleem, M., Uddin, N., Ali, S., Shafique, S. (2025). Frequency of enlargement of extradural hematoma in repeat CT scan in conservatively managed trauma patients. *Pak. J. Inten. Care Med. 5(2), **2025**: 149*. doi: https://doi.org/10.54112/pjicm.v5i02.149]