RJNMSR
Review Journal of Neurological & Medical Sciences Review

Volume 4, Issue 3, 2026

ASSOCIATION OF VOLUME AND TYPE OF INTRACRANIAL HEMATOMA WITH MIDLINE SHIFT IN PATIENTS WITH HEAD INJURY ON COMPUTED TOMOGRAPHY

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DOI: http://doi.org/10.5281/zenodo.18998783

Received	Accepted	Published
13 January 2026	25 February 2026	13 March 2026

ABSTRACT

Background: *Traumatic brain injury (TBI) is physical injury to brain tissue that temporarily or permanently impairs brain function.It happens when a sudden,external,physical assault damages brain.*

Objective: *To find out association between volume and type of intracranial hematoma with midline shift in patients with head injury on computed Tomography.*

Methodology: *A crosssectional analytical study was conducted at Department of Radiology, LGH Hospital. Data of 55 participants were collected, done by suitable sample method. SPSS version 21.0 was used for data analysis. The inclusion criteria was all adult patients (>15 years) with traumatic hematoma. The exclusion criteria were patients who had any history of previous brain surgery and patients who were already undergoing treatment . Association of volume and type of intracranial hematoma with midline shift in patients with head injury was measured by using Computed Tomography Machine 64 slices Toshiba edition 2002 was used.*

Results: *Out of total number of 55 patients, 35(63.6%) were males and 20(36.4%) were females. Out of all 55 cases Mode of injury was fall in 12(21.8%) and RTA in 43(78.2%) patients, Type of hematoma out of all 55 cases 33(60.0%) patients had epidural hematoma, 1(1.8%) had intracerebral hematoma and 21(38.2%) had subdural hematoma.Side involved in 28(50.9%) patients was right and in 27(49.1%) patients was left. Locations accounted Fronto Parietal for 2 cases (3.6%), "Fronto - Temporal" for 3 cases (5.5%), "Occi - Temporal" for 2 cases (3 .6%), "Occipital" for 10 cases (18.2%), "Parietal" for 5 cases (9.1%), "Parieto - Occipital" for 2 cases (3.6%), "Parieto - Temporal" for 2 cases (3.6%), the highest frequency, 29 cases (52.7%), were observed in Temporal.Out of all 55 cases midline shift was present in 27(49.1%) and was absent in 28(50.9%) patients.*

Conclusion: *Our study was aimed to find out association between volume and type of intracranial hematoma with midline shift in patients with head injury.Patients with traumatic brain injury were more prone to midline shift and epidural hematoma was observed in more cases. Hence the study concluded that there is association between intracranial hematoma with midline shift in patients with head injury on computed tomography.*

Keywords: *Epidural Hematoma, Midline Shift, Occipito Frontal and Traumatic Brain Injury, Head Injury, Computed Tomography.*

INTRODUCTION:

Traumatic brain injury (TBI) refers to a physical injury to brain tissue that disrupts normal brain function either temporarily or permanently. It represents a major neurological and public health problem worldwide due to its high incidence, long-term disability, and associated mortality. TBI occurs when an external mechanical force damages brain tissue, leading to cognitive, physical, emotional, and behavioral impairments that may vary in severity depending on the nature of the injury and the region of the brain affected (Parikh, 2007). The condition places a substantial burden on healthcare systems, patients, and their families due to prolonged treatment, rehabilitation, and potential long-term disability. Globally, traumatic brain injury is increasingly recognized as one of the most common causes of neurological morbidity. It has been estimated that nearly half of the global population will experience at least one traumatic brain injury during their lifetime, with approximately 50 million individuals affected each year (Jain S, 2019). Epidemiological data further indicate a steady increase in the number of emergency department visits, hospitalizations, and deaths related to traumatic brain injuries in recent decades. This growing trend reflects the combined effects of population growth, increased motorization, urbanization, and aging populations, all of which contribute to a higher risk of injury (Pargaonkar R, 2019).

Traumatic brain injury can occur due to a wide variety of causes. The most common mechanisms include road traffic accidents, falls, assaults, sports-related injuries, and occupational incidents. Motor vehicle accidents remain one of the leading causes of severe traumatic brain injuries worldwide, particularly in developing countries where road safety measures and traffic regulations may be limited. Falls are another major cause of TBI, especially among elderly individuals and young children who are more vulnerable to balance problems and environmental hazards. Other causes include bicycle crashes, pedestrian collisions, and recreational or sports-related activities that involve high-impact forces to the head (Parikh, 2007). The mechanism of injury plays an important role in determining the severity and type of brain damage. Traumatic brain injuries are generally categorized as either penetrating or non-penetrating injuries. Non-penetrating injuries occur when the head experiences a sudden impact or rapid acceleration and deceleration forces without disruption of the skull. In contrast, penetrating injuries occur when an object enters the skull and directly damages the brain tissue. The resulting brain damage may be localized or diffuse depending on the nature of the trauma. Focal injuries involve damage confined to a specific area of the brain, whereas diffuse injuries affect multiple regions and are often associated with widespread neuronal damage (Ayaz, 2003).

One of the most significant consequences of traumatic brain injury is intracranial bleeding. Intracranial hemorrhage may occur within the brain tissue itself or in the spaces surrounding the brain. The main types of intracranial hemorrhage include epidural hematoma, subdural hematoma, subarachnoid hemorrhage, and intracerebral hematoma. Among these, intracerebral hematomas are frequently observed in severe head injuries and are often detected as hyperdense lesions on computed tomography (CT) scans. These hematomas commonly occur in the frontal and temporal lobes and may appear immediately after trauma or develop later during

hospitalization. Delayed intracerebral hematomas are typically detected on follow-up CT scans within 24 to 48 hours after the initial injury and are often associated with neurological deterioration (Ayaz, 2019). The incidence of traumatic brain injury varies across different populations but is commonly estimated to be around 200 cases per 100,000 individuals annually in developed countries. Epidemiological studies have shown that the occurrence of TBI follows a trimodal distribution pattern with peaks in early childhood, late adolescence or early adulthood, and in older adults. In the elderly population, the risk of traumatic brain injury is particularly high due to age-related physiological changes such as impaired vision, reduced balance, muscle weakness, and cognitive decline. In addition to its high incidence, TBI is responsible for a substantial proportion of trauma-related deaths and is considered a primary cause of mortality in many severe injury cases (Bruns Jr & Hauser, 2003).

Certain demographic factors significantly influence the risk of traumatic brain injury. Males are nearly three times more likely to sustain a TBI than females, primarily due to greater involvement in high-risk activities and occupational hazards. Age is another important risk factor, with higher prevalence observed among children under the age of fourteen and adults over sixty-five years. Although traumatic brain injuries can vary in severity, the majority of cases are classified as mild. Nevertheless, even mild injuries can lead to persistent neurological symptoms and reduced quality of life if not properly managed (Zafonte, 2016). Another critical complication associated with traumatic brain injury is increased intracranial pressure (ICP). Brain injuries often cause swelling or edema within the brain tissue. Because the cranial cavity is a rigid structure filled with brain tissue, cerebrospinal fluid, and blood, any increase in intracranial volume leads to elevated intracranial pressure. As pressure increases within the skull, brain structures may shift from their normal position, resulting in what is known as midline shift. This displacement of intracranial structures is an important radiological indicator of mass effect and is strongly associated with poor neurological outcomes in patients with severe brain injury (Liao CC, 2018).

Accurate prediction of outcomes in patients with traumatic brain injury is essential for effective clinical management. Early prognostic assessment assists clinicians in selecting appropriate treatment strategies, monitoring disease progression, and planning rehabilitation programs. It also helps healthcare providers communicate realistic expectations to patients and their families regarding recovery and long-term outcomes. Moreover, reliable prediction models are particularly important in developing countries where healthcare resources are limited and must be allocated efficiently (Jiang C, 2019).

Radiological imaging plays a fundamental role in the diagnosis and evaluation of traumatic brain injury. Computed tomography (CT) scanning is considered the primary imaging modality for the initial assessment of acute TBI because of its rapid acquisition time and high sensitivity in detecting intracranial hemorrhage and skull fractures. CT scans are widely available in emergency settings and can quickly identify life-threatening intracranial lesions that require immediate intervention. Studies have reported that approximately nine percent of CT scans performed in patients with acute traumatic brain injury reveal intracranial hemorrhage (Lin, 2022). Magnetic resonance imaging (MRI), although more sensitive in detecting certain subtle brain injuries such as traumatic axonal injury and small cortical contusions, is not routinely used in the acute phase due to longer scanning times and limited accessibility in emergency departments. Instead, MRI is commonly used during the follow-up period in patients who continue to experience persistent neurological symptoms after the initial injury.

Traumatic intracerebral hemorrhage represents one of the most serious complications of traumatic brain injury. It occurs in approximately 13–35% of patients following head trauma and may develop after either closed or penetrating injuries. The expansion of intracerebral hemorrhage over time can significantly worsen neurological outcomes and increase mortality

risk. Several clinical and radiological factors influence hemorrhage progression, including the severity of the injury and the presence of associated intracranial lesions (Maas AI, 2015). Other types of intracranial hematomas also contribute significantly to morbidity and mortality. Acute subdural hematoma is associated with particularly high mortality rates, which may range from 35% to 70% depending on the severity of injury and patient age. Epidural hematoma, although less common, occurs in a small proportion of head injury cases but may rapidly become life-threatening if not diagnosed and treated promptly (Raj R, 2014).

Midline shift of the brain is a key radiological parameter used to assess the severity of intracranial pathology. It represents the displacement of brain structures caused by increased intracranial pressure or mass effect from lesions such as hematomas or tumors. Measurement of midline shift using CT or MRI provides valuable information about the degree of brain compression and the risk of neurological deterioration. Due to its prognostic importance, midline shift has been incorporated into several CT-based classification systems used to evaluate traumatic brain injury severity (Jacobs, 2011).

Given the critical role of radiological findings in clinical decision-making, assessment of intracranial lesion volume and midline shift has become an essential component of traumatic brain injury evaluation. These imaging parameters provide important prognostic information that can help clinicians identify patients at high risk of complications and guide appropriate treatment strategies.

Methodology:

Study Design and Settings

This study was conducted as a cross-sectional analytical study in the Department of Radiology, Lahore General Hospital, Lahore.

Duration of Study

The total duration of the study was 7 months, including 4 months dedicated to data collection.

Sample Size and Sampling Technique

A total of 55 patients were included in the study. The participants were selected using a convenience sampling technique.

Sample Selection

Inclusion Criteria

Patients presenting with brain trauma associated with intracranial hematoma.

Adult patients older than 15 years who underwent cranial CT scan for traumatic hematoma.

Exclusion Criteria

Patients who were already undergoing treatment for intracranial hematoma.

Patients with a previous surgical history related to brain injury.

Equipment

CT scans were performed using a 64-slice Toshiba Computed Tomography machine (Serial No. 60591, Edition 2002).

Ethical Considerations

Ethical approval was obtained from the Ethical Committee of the University of Lahore prior to the commencement of the study. Written informed consent was obtained from all participants. Confidentiality of all patient information and collected data was strictly maintained throughout the study. Participants were informed that the procedure had no associated disadvantages and that they were free to withdraw at any stage of the study. All collected data were securely stored on a password-protected personal computer, while CT images and data collection sheets were stored in a secured USB device. Personal identification of participants remained confidential.

Data Collection Procedure

Data were collected using structured data collection sheets. Information regarding age, gender, CT findings, and consent forms was obtained from all participants. During the CT scan procedure, patients were positioned supine with the head in the midline position on a

movable scanning table. The X-ray tube rotated around the patient's head while the table moved gradually during data acquisition. Images were obtained with a slice thickness of 5 mm and reconstructed in axial, sagittal, and coronal planes using multiplanar reformation (MPR).

Data Analysis

Data entry and statistical analysis were performed using SPSS version 24. Quantitative variables such as age were presented as mean ± standard deviation (SD). Qualitative variables were expressed as frequencies and percentages, and results were illustrated using bar charts. The Chi-square test was used to assess the presence or absence of hematoma and to determine the association between hematoma type and midline shift. An independent sample t-test was applied to evaluate the relationship between hematoma volume and midline shift. A p-value less than 0.05 was considered statistically significant.

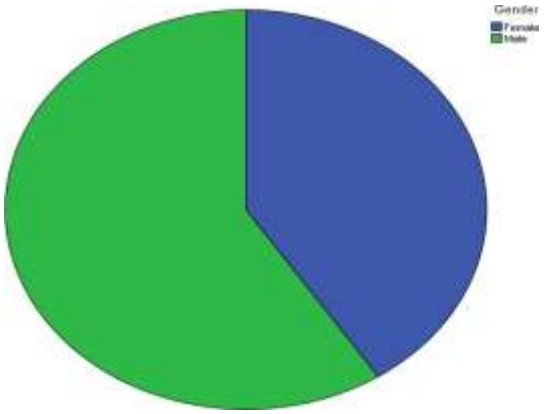
Result

This cross-sectional study included 55 patients at Lahore General Hospital, of whom 35 (63.6%) were males and 20 (36.4%) were females. The mode of injury was predominantly road traffic accident (43 cases, 78.2%) compared to falls (12 cases, 21.8%). Regarding hematoma type**,** 33 patients (60.0%) had epidural hematoma, 21 (38.2%) had subdural hematoma, and 1 (1.8%) had intracerebral hematoma. Side involvement was nearly equal, with 28 cases (50.9%) on the right and 27 cases (49.1%) on the left. Anatomical locations included temporal (29 cases, 52.7%), occipital (10 cases, 18.2%), parietal (5 cases, 9.1%), fronto-temporal (3 cases, 5.5%), and smaller frequencies in fronto-parietal, occi-temporal, parieto-occipital, and parieto-temporal regions. Midline shift was observed in 27 patients (49.1%) and absent in 28 patients (50.9%)**.**

Table 1:Gender Frequency

	Frequency	Percent
Female	20	36.4
Male	35	63.6
Total	55	100.0

Table 1, shows "Gender," out of 55 cases, 20 (36.4%) were females, while 35 (63.6%) were males.



Bar chart 1 represents Gender.

Table 2:Descriptive Statistics

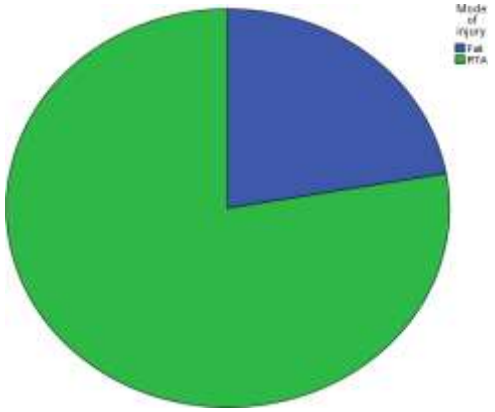
	N	Range	Minimum	Maximum	Mean		Std. Deviation
						Std. Error	
Age	26	36.00	28.00	64.00	47.0385	1.85512	9.45931
GCS	26	3.00	6.00	9.00	7.7692	.19460	.99228
Volume (cm3)	26	51.00	46.00	97.00	64.2692	2.34196	11.94172
MidlineShift(mm)	26	14.70	4.10	18.80	8.0346	.70737	3.60688

Table 2, shows The descriptive statistics shows the "Age" variable was based on 26 cases, with a range from 28.00 to 64.00 years, a mean of 47.0385 years, and a standard deviation of 9.45931. The "GCS" variable, had a range of 6.00 to 9.00, a mean of 7.7692, and a standard deviation of 0.99228. The "Volume (cm3)" variable, ranged from 46.00 to 97.00 cm3, with a mean of 64.2692 cm3 and a standard deviation of 11.94172. Lastly, the "Mid line Shift2 (mm)" variable, ranged from 4.10 to 18.80 mm, with a mean of 8.0346 mm and a standard deviation of 3.60688.

Table 3: Mode of Injury

	Frequency	Percent
Fall	12	21.8
RTA	43	78.2
Total	55	100.0

Table 3 shows "Mode of Injury", out of 55 cases, 12 instances (21.8%) were classified as Fall," while a significant majority of 43 cases (78.2%) fell under the category of "RTA."

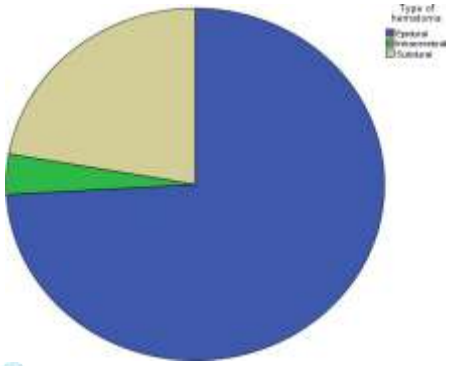


Bar Chart 2 Represents Mode Of Injury.

Table: 4 Types of Hematoma

	Frequency	Percent
Epidural	33	60.0
Intracerebral	1	1.8
Subdural	21	38.2
Total	55	100.0

Table 3 shows "Types of Hematoma," out of 55 cases, 33 (60.0%) were "Epidural" hematoma, 21 (38.2%) were "Subdural" hematoma whereas "Intracerebral" hematoma was observed in only 1 (1.8%) case.

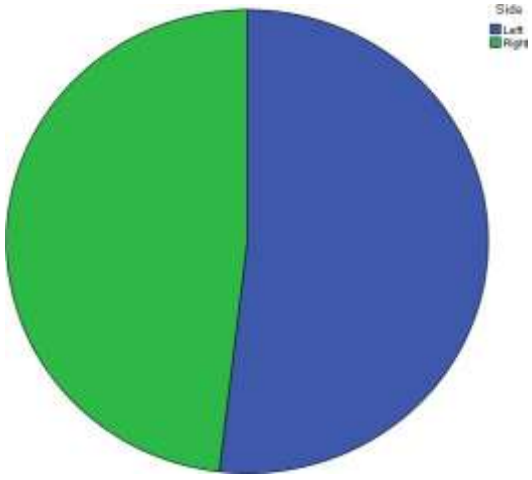


Bar Chart 3 represents Types of hematoma.

Table: 5 Side of hematoma

	Frequency	Percent
Left	27	49.1
Right	28	50.9
Total	55	100.0

Table 4 shows "Side involved" , out of 55 cases, 27 (49.1%) involved "Left side" whereas 28 (50.9%) involved "Right side".

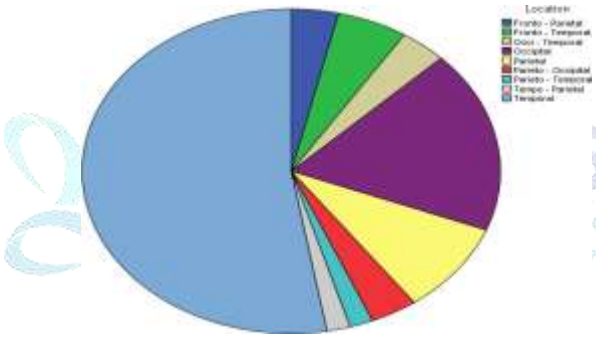


Bar Chart 4 Represents Side Involved.

Table: 6 location of hematoma

	Frequency	Percent
Fronto – Parietal	2	3.6
Fronto – Temporal	3	5.5
Occi – Temporal	2	3.6
Occipital	10	18.2
Parietal	5	9.1
Parieto – Occipital	2	3.6
Parieto – Temporal	2	3.6
Temporal	29	52.7
Total	55	100.0

Table 5 presents the distribution of injuries across various anatomical locations. Out of total 55 cases, "Fronto - Parietal" accounted for 2 cases (3.6%), "Fronto - Temporal" for 3 cases (5.5%), "Occi - Temporal" for 2 cases (3.6%), "Occipital" for 10 cases (18.2%), "Parietal" for 5 cases (9.1%), "Parieto - Occipital" for 2 cases (3.6%), "Parieto - Temporal" for 2 cases (3.6%),and the highest frequency, 29 cases (52.7%), were observed in "Temporal" locations.

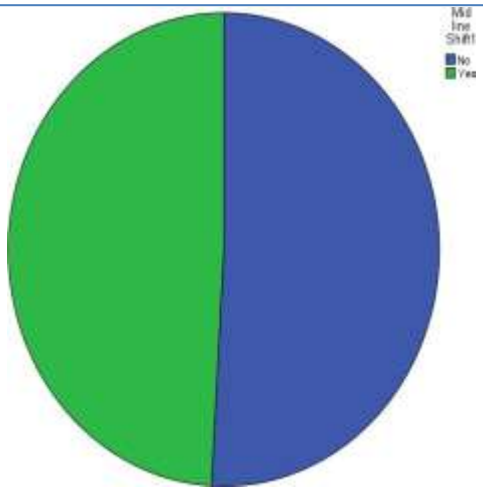


Bar Chart 5 represents distribution of injuries across various anatomical locations

Table: 7 Midline shift

	Frequency	Percent
No	28	50.9
Yes	27	49.1
Total	55	100.0

Table 6, shows “Midline shift," out of 55 cases, 28 (50.9%) cases had no midline shift, while 27 (49.1%) cases exhibited a midline shift.



Bar Chart 6 represents Midline Shift.

Table 8: Crosstabulation of type of hematoma and location

		Location								Total
		Fronto - Parietal	Fronto - Temporal	Occi - Temporal	Occipital	Parietal	Parieto - Occipital	Parieto - Temporal	Temporal	
Type Of hematoma	Epidural	2	2	1	6	2	2	1	17	33
	Intracerebral	0	0	0	0	1	0	0	0	1
	Subdural	0	1	1	4	2	0	0	12	21
Total		2	3	2	10	5	2	1	29	55

In Table 8, shows relationship between the "Type of hematoma" and its corresponding "Location." Out of 55 cases, 33 were "Epidural" hematoma cases, 17 were located in the "Temporal" region, 6 in "Occipital," 2 in "Fronto - Parietal" and "Parietal" each, and 1 in "Fronto - Temporal," "Occi - Temporal," "Parieto - Temporal," and "Tempo - Parietal." The "Intracerebral" hematoma had 1 occurrence in "Parietal." For the "Subdural" hematoma, there were 12 cases in "Temporal," 4 in "Occipital," 2 in "Fronto - Temporal," "Parietal," and "Parieto - Temporal" each, and 1 in "Occi - Temporal" and "Parieto - Occipital" each. The Chi-Square Tests, show a significance association between hematoma type and location.

Chi Square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.424[a]	16	.494
Likelihood Ratio	12.230	16	.728
N of Valid Cases	55		

a. 24 cells (88.9%) have expected count less than 5. The minimum expected count is .02.

Table 9:Crosstabulation of type of hematoma and midline shift

Count		Mid line Shift1		Total
		No	Yes	
Type of hematoma	Epidural	13	20	33
	Intracerebral	0	1	1
	Subdural	15	6	21
Total		28	27	55

Table 8 shows crosstabulation of the relationship between "Type of hematoma" and the occurrence of "Mid line Shift." Out of total of 55 cases, 33 were "Epidural" hematoma, 13 cases had no midline shift ("No") while 20 cases had a midline shift ("Yes"). For the "Intracerebral" hematoma, there was 1 case with "Yes" midline shift. Among the 21 "Subdural" hematoma cases, 15 had no midline shift ("No") and 6 had a midline shift ("Yes"). Chi-Square Tests, including Pearson Chi-Square and Likelihood Ratio, shows a significant association between hematoma type and midline shift status 0.49.

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.326[a]	2	.042
Likelihood Ratio	6.849	2	.033
N of Valid Cases	55		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .49.

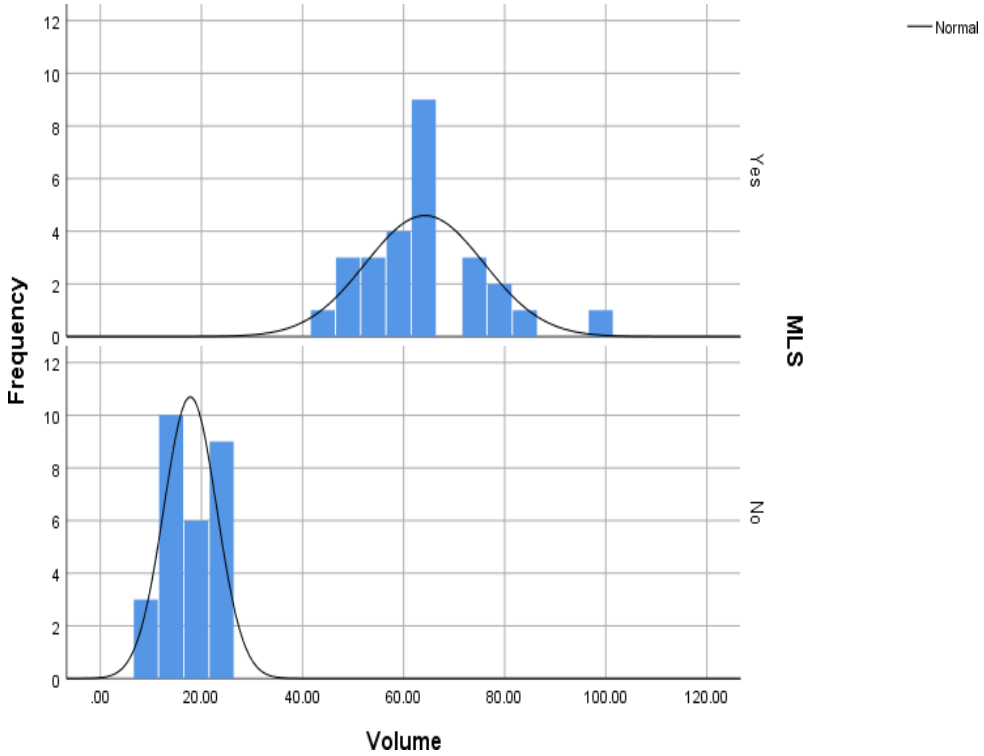
Table 10 Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Volume	Equal variances assumed	7.866	.007	19.088	53	.000	46.39947	2.43085	41.52380	51.27514
	Equal variances not assumed			18.853	35.634	.000	46.39947	2.46118	41.40618	51.39276

Group Statistics

	MLS	N	Mean	Std. Deviation	Std. Error Mean
Volume	Yes	27	64.1852	11.71796	2.25512
	No	28	17.7857	5.21648	.98582

In table 9, the group statistics reveal a significant difference in volume between two groups ("Yes" and "No"), with the "Yes" group having a mean volume of 64.1852 compared to 17.7857 for the "No" group. The independent samples t-test, considering unequal variances, indicates a highly significant difference in means ($t = 18.853$, $p < 0.001$), confirming that the two groups significantly differ in volume. The 95% confidence interval for the difference in means ranges from 41.40618 to 51.39276, supporting the robustness of this contrast. The findings suggest a statistically significant association between group membership and volume.



Bar chart 8 shows Frequency for MLS and Volume.

Discussion:

Multiple studies have been done to show the association of volume and type of intracranial hematoma with midline shift. In the present study, we aimed to explore the prognostic value of lesion volume and midline shift in moderate and severe traumatic brain injury as measured from acute cranial CT scans. Also, we determine interpreter reliability for the evaluation of these CT and measurement of overall mid-surface shift is proposed that quantifies the total volume of brain tissue shifted across the midline. Cross-sectional Analytical study was performed. 55 patients who visited Department of Radiology, Lahore General Hospital were included. All patient with brain trauma having intracranial hematoma and cranial CT scan of all adult patients (>15 years) with traumatic hematoma were included in the study.

Traumatic brain injury (TBI) is a grave epidemic that is an important cause of death and disability

worldwide. (Xiao F, 2010) Around fifty percent of the world's population is expected to suffer from one or more traumatic brain injuries (TBI) during their lifetime, with more than 50 million individuals suffering from TBI each year. (Jain S, 2019) TBI commonly causes rise in intracranial pressure that can lead to a certain amount of midline shift. The more the midline shift, the worse the outcome becomes for the patient. (Liao CC, 2018) Traumatic intracerebral hemorrhage (TICH) is a common complication of traumatic brain injury. It occurs in approximately 13 to 35% of patients following a traumatic brain injury. It can occur following either closed or penetrating head injury. It may be associated with other lesions including skull fractures and extra parenchyma bleeding. Traumatic Intracerebral hemorrhage, like spontaneous hemorrhage, often expands over time. Several studies have analyzed the factors related to their expansion. (Maas AI, 2015)Table 1 shows Mode of Injury, out of 55 cases, 12 instances (21.8%) were classified as fall, while a significant majority of 43 cases (78.2%) fell under the category of RTA. Table 2 shows of research shows Types of Hematoma, out of 55 cases, 33 (60.0%) were "Epidural" hematoma, 21 (38.2%) were "Subdural" hematoma whereas "Intracerebral" hematoma was observed in only 1 (1.8%) case. Table 3 of research shows Gender, out of 55 cases, 20 (36.4%) were females, while 35 (63.6%) were males.'

Table 4 of research shows Side of brain involved, out of 55 cases, 27 (49.1%) involved Left side whereas 28 (50.9%) involved right side. Next table shows the distribution of injuries across various anatomical locations. Out of total 55 cases, Fronto - Parietal accounted for 2 cases (3.6%), Fronto - Temporal for 3 cases (5.5%), Occi - Temporal for 2 cases (3.6%), Occipital for 10 cases (18.2%), Parietal for 5 cases (9.1%), Parieto - Occipital for 2 cases (3.6%), Parieto

Temporal for 2 cases (3.6%), and the highest frequency, 29 cases (52.7%), were observed in Temporal locations. TBI commonly causes rise in intracranial pressure that can lead to a certain amount of midline shift. The more the midline shift, the worse the outcome becomes for the patient. (Liao CC, 2018) Table 6, shows Midline shift, out of 55 cases, 28 (50.9%) cases had no midline shift, while 27 (49.1%) cases exhibited a midline shift. The descriptive statistics shows the "Age" variable was based on 26 cases, with a range from 28.00 to 64.00 years, a mean of 47.0385 years, and a standard deviation of 9.45931. The "GCS" variable, had a range of 6.00 to 9.00, a mean of 7.7692, and a standard deviation of 0.99228. The "Volume (cm3)" variable, ranged from 46.00 to 97.00 cm3, with a mean of 64.2692 cm3 and a standard deviation of 11.94172. Lastly, the "Mid line Shift2 (mm)" variable, ranged from 4.10 to 18.80 mm, with a mean of 8.0346 mm and a standard deviation of 3.60688.

Table 7 of study shows relationship between the Type of hematoma and its corresponding Location. Out of 55 cases, 33 were Epidural hematoma cases, 17 were located in the Temporal region, 6 in Occipital, 2 in Fronto - Parietal and Parietal each, and 1 in Fronto - Temporal, Occi

Temporal, Parieto - Temporal, and Tempo - Parietal. The Intracerebral hematoma had 1 occurrence in Parietal. For the Subdural hematoma, there were 12 cases in Temporal, 4 in Occipital, 2 in Fronto - Temporal, Parietal, and Parieto - Temporal each, and 1 in Occi - Temporal and Parieto - Occipital each. The Chi-Square Tests, show a significance association between hematoma type and location. Table 8 shows cross-tabulation of the relationship between Type of hematoma and the occurrence of mid line Shift. Out of total of 55 cases, 33 were Epidural hematoma, 13 cases had no midline shift ("No") while 20 cases had a midline shift ("Yes"). For the Intracerebral hematoma, there was 1 case with "Yes" midline shift. Among the 21 Subdural hematoma cases, 15 had no midline shift ("No") and 6 had a midline shift ("Yes"). Chi-Square Tests, including Pearson Chi-Square and Likelihood Ratio, shows a significant association between hematoma type and midline shift status 0.49.

Hence the study find out association between volume and type of intracranial hematoma with midline shift in patients with head injury on computed Tomography

Conclusion:

This study aimed to determine the association between the volume and type of intracranial hematoma with midline shift in patients presenting with head injury using computed tomography (CT). The findings indicated that patients with traumatic brain injury were more prone to developing a midline shift, with epidural hematoma being the most frequently observed type among the studied cases. Based on the results, the study concludes that there is a significant association between intracranial hematoma characteristics and the presence of midline shift in patients with head injury as detected on computed tomography.

References:

Parikh, S., Koch, M., & Narayan, R. K. (2007). Traumatic brain injury. *International Anesthesiology Clinics, 45*(3), 119–135.

Jain, S., Iverson, L. M., & Glasgow, S. D. (2019). Traumatic brain injury: global epidemiology and future perspectives. *Lancet Neurology, 18*(1), 56–64.

Pargaonkar, R., El-Gabalawy, R., & Mackenzie, C. S. (2019). Trends in traumatic brain injury emergency department visits, hospitalizations, and deaths in the United States. *Journal of Head Trauma Rehabilitation, 34*(5), E1–E9.

Ayaz, M., Khan, A., & Rahman, S. (2003). Classification and mechanisms of traumatic brain injury. *Journal of Neuroscience and Clinical Practice, 15*(2), 85–92.

Ayaz, H., Izzetoglu, M., Izzetoglu, K., Onaral, B., & Ben Dor, B. (2019). Early diagnosis of traumatic intracranial hematomas. *Journal of Biomedical Optics, 24*(5), 051411–051411.

Bruns Jr, J., & Hauser, W. A. (2003). The epidemiology of traumatic brain injury: a review. *Epilepsia, 44*, 2–10.

Zafonte, R., Hammond, F. M., Mann, N. R., Wood, D. L., Black, K. L., & Millis, S. R. (2016). Traumatic brain injury: epidemiology, pathophysiology, and clinical management. *Physical Medicine and Rehabilitation Clinics of North America, 27*(2), 207–218.

Liao, C. C., Chiu, W. T., & Chen, L. R. (2018). Midline shift as a prognostic factor in patients with traumatic brain injury. *Journal of Clinical Neuroscience, 55*, 44–49.

Jiang, C., Zhu, G., & Zhou, X. (2019). Prediction of outcomes in patients with traumatic brain injury. *Frontiers in Neurology, 10*, 123.

Lin, E., & Lee, C. (2022). Imaging evaluation of acute traumatic brain injury using computed tomography. *Radiologic Clinics of North America, 60*(3), 453–470.

Maas, A. I., Menon, D. K., Adelson, P. D., Andelic, N., Bell, M. J., Belli, A., & Ingebrigtsen, T. (2015). Traumatic brain injury: integrated approaches to improve prevention, clinical care, and research. *The Lancet Neurology, 14*(10), 987–1048.

Raj, R., Siironen, J., Skrifvars, M. B., Hernesniemi, J., & Kivisaari, R. (2014). Mortality in patients with severe traumatic brain injury and acute subdural hematoma. *Acta Neurochirurgica, 156*(3), 445–452.

Jacobs, B., Beems, T., van der Vliet, T. M., Diaz-Arrastia, R., Borm, G. F., & Vos, P. E. (2011). Computed tomography and outcome in moderate and severe traumatic brain injury: hematoma volume and midline shift revisited. *Journal of Neurotrauma, 28*(2), 203–215.

Vilcinis, R., & Allan, R. (2017). Resource allocation and outcome prediction in traumatic brain injury management. *Health Policy, 121*(8), 878–884.

Xiao, F., & Wang, H. (2010). Traumatic brain injury: epidemiology and clinical management. *Journal of Neurotrauma, 27*(3), 473–482.

Jain, S., Iverson, L. M., & Glasgow, S. D. (2019). Traumatic brain injury: global epidemiology and future perspectives. *The Lancet Neurology, 18*(1), 56–64.

Liao, C. C., Chiu, W. T., & Chen, L. R. (2018). Midline shift as a prognostic factor in patients with traumatic brain injury. *Journal of Clinical Neuroscience, 55*, 44–49.

Maas, A. I., Menon, D. K., Adelson, P. D., Andelic, N., Bell, M. J., Belli, A., & Ingebrigtsen, T. (2015). Traumatic brain injury: integrated approaches to improve prevention, clinical care, and research. *The Lancet Neurology, 14*(10), 987–1048.