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Clinical Assessment of Subdural Hematoma Using Multi-Detector Computed Tomography in TBI Cases

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ABSTRACT:
Traumatic brain injury (TBI) is a leading cause of disability and death globally, with subdural hematoma (SDH) being one of the most common and serious complications. Prompt and accurate identification of SDH is crucial for effective treatment and improving patient outcomes. This study examines how Multi-Detector Computed Tomography (MDCT) is used to assess SDH in patients with TBI. Thanks to its high resolution and quick imaging capabilities, MDCT provides better detection, precise localization, and detailed characterization of hemorrhages compared to traditional imaging methods.

1.1 INTRODUCTION

Subdural hematoma is a medical condition characterized by the accumulation of blood between the brain and its outermost protective covering, called the dura mater. It occurs when blood vessels rupture or tear, causing bleeding in the subdural space. This condition is considered a medical emergency as it can lead to increased pressure on the brain and potentially life-threatening complications if not promptly treated. Subdural hematomas are typically classified into two types: acute and chronic. Acute subdural hematomas develop rapidly, usually within 48 hours of the injury, and are commonly associated with severe head trauma or significant impact to the head. On the other hand, persistent subdural hematomas appear more gradually and may be brought on by less severe trauma or even minor head traumas[1]. Chronic subdural hematomas sometimes have an unclear underlying cause. The size, location, and the person's general health can all affect the subdural hematoma patient's symptoms. Common symptoms include-Headache, Confusion or disorientation, Dizziness, Nausea or vomiting, Changes in behavior or personality, Difficulty speaking or slurred speech, Weakness or numbness in the limbs, Seizures, Loss of consciousness[2]. Subdural hematomas can cause serious problems such brain herniation, coma, or even death if they are not addressed. Therefore, immediate medical attention is crucial in suspected cases of subdural hematoma[3]. A combination of a physical examination, a medical history evaluation, and imaging tests like CT or MRI are used to determine the subdural hematoma's cause[4]. Surgical intervention may be used as a kind of treatment to get rid of the blood clot, release pressure on the brain, and fix any broken blood vessels[5]. The size and location of the hematoma, the patient's general health, and the promptness of treatment are only a few variables that affect recovery from a subdural hematoma. Rehabilitation may be necessary to address any neurological deficits or cognitive impairments that result from the injury. It's important to note that this is a general introduction to subdural hematoma, and individual cases may vary.

A healthcare professional's advice is necessary for an accurate diagnosis, effective treatment, and advice that is personalised to the patient's situation[6].

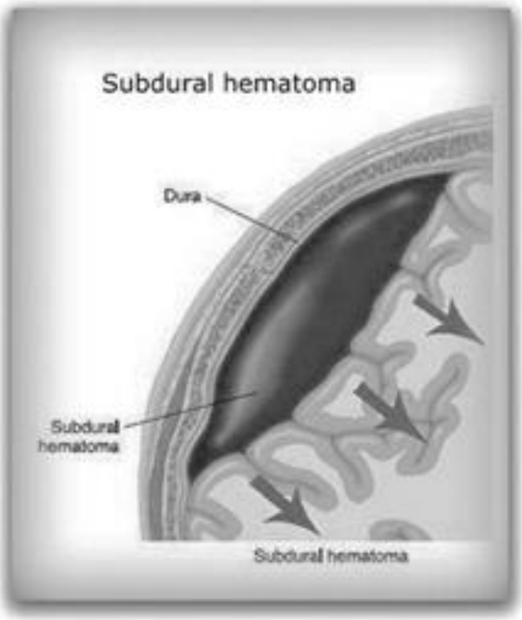


Fig: 1. Subdural hematoma

In the assessment and treatment of individuals with subdural hematoma (SDH) brought on by traumatic brain injury (TBI), MDCT (Multidetector Computed Tomography) is extremely important. SDH is a condition in which blood builds up between the arachnoid mater, the middle layer, and the dura mater, the outermost layer covering the brain[7]. MDCT is a type of computed tomography (CT) scan that utilizes multiple detectors to acquire high-resolution images of the brain. It provides detailed information about the extent, location, and characteristics of the SDH, helping in the diagnosis and treatment planning. In the context of SDH in TBI patients, MDCT serves multiple important roles. Firstly, it is often the initial imaging modality used in the emergency department to evaluate patients with TBI and suspected SDH[8]. Time is of the essence in these cases, and MDCT can quickly detect the presence of a SDH and assess its size, shape, and midline shift. Midline shift refers to the displacement of brain structures due to the hematoma and is an important indicator of the severity of brain injury. Furthermore, MDCT allows the radiologist to assess the density and age of the hematoma, which aids in its characterization[9]. Acute SDH appears hyperdense on MDCT, while subacute SDH is isodense or slightly hypodense, and chronic SDH can be hypodense. By evaluating the density characteristics, the radiologist can determine the age of the hematoma. MDCT also provides information about the presence and degree of mass effect caused by the hematoma. Mass effect refers to the compression or displacement of brain tissue due to the expanding hematoma. MDCT helps evaluate the extent of mass effect and assess midline shift. This information is crucial for determining the severity of brain injury, identifying signs of brain herniation, and may require urgent surgical intervention. MDCT allows the assessment of associated brain injuries that often occur in TBI patients. It can detect brain contusions, cerebral edema, or skull fractures, which are frequently observed alongside SDH[10].

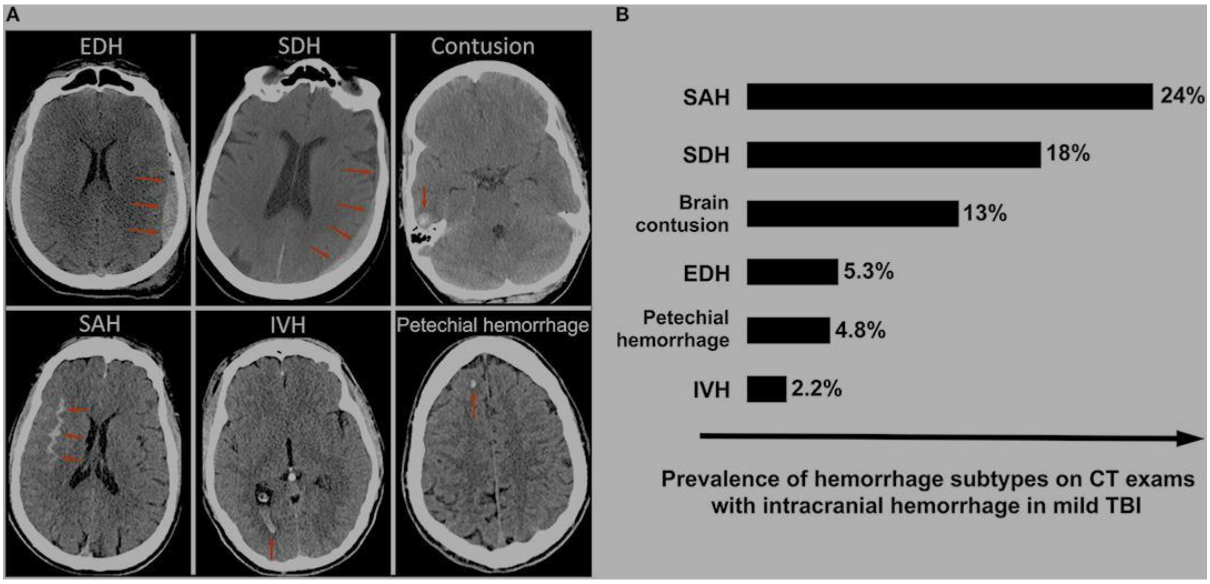


Fig.2. Hemorrhage on CT Examination in mild TBI

These additional findings provide a comprehensive understanding of the overall extent of the traumatic brain injury and help guide further management decisions. When it comes to surgical planning, MDCT plays a critical role. For patients with significant SDH requiring surgical intervention, MDCT helps neurosurgeons determine the size, location, and complexity of the hematoma[11]. This information assists in selecting the appropriate surgical approach, such as burr hole evacuation or craniotomy, and aids in surgical decision-making. In summary, When treating patients with subdural hematoma brought on by traumatic brain injury, MDCT is a crucial tool for the initial assessment, diagnosis, and management of the condition. It offers comprehensive details on the size of the hematoma, any accompanying brain damage, and aids in directing surgical intervention when it's required. It's crucial to keep in mind that the precise management strategy will rely on the clinical state of each patient and can necessitate additional imaging and clinical evaluation[12].

1.2. BACKGROUND OF THE STUDY

Multi-detector computed tomography (MDCT) has emerged as a vital imaging modality in the evaluation of TBI. MDCT provides high-resolution, multiplanar imaging capabilities that enable accurate detection and characterization of SDH. The advent of MDCT technology has revolutionized the field of radiology and significantly enhanced the ability to identify and classify SDH, thus influencing clinical decision-making. A primary cause of death and disability, traumatic brain injury (TBI) is a significant global public health concern. The buildup of blood between the dura mater and the arachnoid mater surrounding the brain is known as a subdural hematoma (SDH), one of the several intracranial lesions connected to TBI that may be fatal.. The timely detection and accurate diagnosis of SDH are critical for appropriate management and improved patient outcomes[13].

1.3. STATEMENT OF THE PROBLEM

The goal of the current study is to better understand how MDCT is used to evaluate SDH in TBI patients. This study aims to offer important insights into the diagnostic and prognostic significance of MDCT in the management of TBI patients with SDH by analysing the features, distribution, and related findings of SDH on MDCT scans.

1.4. ASSUMPTION OF THE STUDY

The assumption underlying the study on subdural hematoma in traumatic brain injury patients using multi-detector computed tomography (MDCT) can be stated as It is assumed that For the diagnosis and characterisation of subdural hematomas in patients with traumatic brain injury, MDCT provides a trustworthy and accurate imaging method. According to this presumption, MDCT can successfully detect the presence, location, size, and other pertinent features of subdural hematomas, giving crucial data for clinical judgement and treatment planning. It is believed that subdural hematomas frequently occur in traumatic brain injury patients. By assuming that MDCT is good in diagnosing subdural hematomas and that they are common in people with traumatic brain injury, the study aims to investigate the utility and diagnostic accuracy of MDCT in the context of subdural hematomas and potentially contribute to improving patient care and outcomes.

1.5. DELIMITATIONS

The delimitations of studying subdural hematoma in traumatic brain injury patients using multi-detector computed tomography (MDCT) can help to narrow down the scope of the research. In this context, the delimitations could include of The study might concentrate on a certain group of people who have suffered traumatic brain injury and have been found to have subdural hematomas by MDCT. Patients with other kinds of brain injuries or those who received imaging procedures using various imaging modalities, such as magnetic resonance imaging (MRI) or single-detector computed tomography (SDCT), may not be included in the study.. By focusing on a specific patient population, the study can provide more targeted insights into the characteristics and diagnostic utility of MDCT for subdural hematoma. This study may also specifically examine the role of MDCT as the imaging technique for diagnosing and assessing subdural hematoma. Other imaging modalities like MRI or SDCT may not be considered within the scope of the research. This delimitation allows for a more comprehensive evaluation of the capabilities and limitations of MDCT in detecting and characterizing subdural hematoma in traumatic brain injury patients.

1.6. OPERATIONAL DEFINITIONS:

Operational definitions help to provide clear and precise descriptions of concepts or variables in a study or research project. When considering traumatic brain injury patients who have undergone multi-detector computed tomography (MDCT) and have a subdural hematoma, here are some operational definitions that can be considered[14].

1. **Traumatic Brain Injury (TBI)**: TBI can be operationally defined for the study as a head injury brought on by an outside force or trauma that results in a temporary or permanent impairment of brain function. This definition should include specific criteria such as the mechanism of injury, signs and symptoms, and diagnostic criteria used to identify TBI[15].
2. **Subdural Hematoma**: Operational definition for subdural hematoma can be provided based on the imaging findings obtained through MDCT. It is defined as a buildup of blood between the dura mater, the brain's outermost protective covering, and the arachnoid membrane, its intermediate layer, as visualized on MDCT scans. This definition should specify the criteria used to differentiate subdural hematoma from other types of intracranial hemorrhages.
3. **Multi-Detector Computed Tomography (MDCT)**: MDCT refers to a specific type of computed tomography (CT) scanning technique that utilizes an array of multiple detectors to acquire high-resolution cross-sectional images of the brain. The operational definition should include details about the specific MDCT equipment used, imaging parameters (e.g., slice thickness, radiation dose), and the protocol for image acquisition[16].

4. **Midline Shift**: Midline shift refers to the displacement of the midline structures of the brain due to the presence of a subdural hematoma. It can be operationally defined as the measurement, in millimeters or centimeters, of the distance between the midline structure (e.g., falx cerebri) and the midline of the brain on MDCT scans. This measurement provides an objective indication of the degree of brain displacement caused by the hematoma.
5. **Time of Injury**: The time of injury can be operationally defined as the specific point in time when the traumatic event causing the subdural hematoma occurred. This can be obtained through patient interviews, medical records, or other reliable sources.
6. **Time to CT Scan**: Time to CT scan refers to the duration between the time of injury and the time when the patient undergoes the multi-detector computed tomography (MDCT) scan. It can be operationally defined as the elapsed time, in hours or minutes, from the injury occurrence to the initiation of the MDCT scan.
7. **Glasgow Coma Scale (GCS) Score**: The Glasgow Coma Scale is a popular instrument for determining the level of consciousness and neurological function in people who have suffered severe brain injuries. The numerical number derived by measuring the patient's eye-opening reaction, verbal response, and motor response in accordance with the standardised GCS criteria is known operationally as the GCS score[17].
8. **Hematoma Location**: The operational definition of hematoma location can involve categorizing the subdural hematoma based on its anatomical position within the cranial cavity. For example, hematoma location can be defined as "frontal," "temporal," "parietal," or "occipital," indicating the specific region of the brain where the subdural hematoma is localized.
9. **Follow-up Imaging**: Follow-up imaging refers to additional MDCT scans performed after the initial scan to monitor the progression or resolution of the subdural hematoma. The operational definition can specify the time intervals for follow-up scans (e.g., 24 hours, 72 hours) and the criteria for determining the need for additional imaging (e.g., neurological deterioration, increase in hematoma size).
10. **Outcome Measures**: Outcome measures can be operationally defined as specific variables used to evaluate the clinical outcomes or prognosis of traumatic brain injury patients with subdural hematoma. Examples of operational definitions for outcome measures include Glasgow Outcome Scale (GOS) score, mortality rate, length of hospital stay, or presence of long-term neurological sequelae.

1.7. CONCEPTUAL FRAMEWORK:

A conceptual framework for studying subdural hematoma in traumatic brain injury patients using multi-detector computed tomography (CT) can involve several key elements. Here's an example of a conceptual framework that can be used as a starting point for your study[18]:

1. **Research Objective**: Clearly define the objective of your study, such as understanding the diagnostic accuracy and prognostic value of multi-detector CT in detecting and characterizing subdural hematomas in traumatic brain injury patients.
2. **Study Population**: Define the target population for your study, which would typically include patients with traumatic brain injury. Specify any inclusion or exclusion criteria, such as age range, severity of injury, or specific types of subdural hematomas[19].
3. **Variables**: Identify the key variables that you will investigate in your study, such as:

- Independent variables: Use of multi-detector CT, timing of CT scan, presence of other intracranial injuries.

- Dependent variables: Presence, location, size, and characteristics of subdural hematomas, clinical outcomes, mortality rates.

4. **Data Collection**: Describe the methods you will use to collect the necessary data, such as reviewing medical records or conducting prospective data collection.

- Consider using a standardized data collection form to ensure consistency.

5. **Multi-Detector CT Technique**: Provide details about the multi-detector CT technique you will use, including parameters like slice thickness, reconstruction algorithm, and contrast administration protocol. Explain any specific protocols for detecting and characterizing subdural hematomas.
6. **Image Analysis**: Outline the process for analyzing the CT images, including methods for measuring hematoma size, assessing hematoma characteristics (e.g., density, shape), and identifying associated findings (e.g., midline shift). Specify who will perform the image analysis (e.g., radiologists, researchers), and consider interobserver variability assessments.
7. **Statistical Analysis**: Explain the statistical methods you will employ to analyze the collected data. Consider appropriate tests, such as sensitivity, specificity, receiver operating characteristic (ROC) analysis, or regression models to evaluate the diagnostic accuracy and prognostic value of multi-detector CT.
8. **Ethical Considerations**: Discuss ethical considerations, such as obtaining informed consent, protecting patient privacy, and ensuring compliance with relevant research regulations and guidelines.
9. **Results and Discussion**: Present the findings of your study, including any significant associations, correlations, or diagnostic/prognostic accuracy measures. Discuss the implications of your results, their limitations, and areas for future research.

1.8. SUMMARY

This thesis looks into how multi-detector computed tomography (MDCT) is used to diagnose and treat subdural hematomas in individuals with traumatic brain injury. The deposit of blood between the dura mater and the arachnoid membrane, known as a subdural hematoma, is a dangerous condition that typically follows head trauma. The study focuses on the use of MDCT, a complex imaging technique that enables the precise visualisation of the brain's structures and detection of pathological alterations. The thesis explores the specific advantages of MDCT in diagnosing subdural hematoma, such as its high spatial resolution, multiplanar imaging capabilities, and ability to provide both anatomical and functional information. This thesis investigates various aspects related to subdural hematoma, including its etiology, pathophysiology, clinical presentation, and treatment options. By analyzing a comprehensive range of literature and patient data, the study aims to provide a comprehensive understanding of the condition and its management. Additionally, the thesis examines the potential of MDCT in predicting the prognosis and outcomes of subdural hematoma patients. By assessing the hematoma size, location, and associated brain injuries, the study aims to determine the correlation between MDCT findings and patient outcomes, such as mortality, morbidity, and functional recovery.

This thesis aims to contribute to the existing knowledge regarding the use of MDCT in the assessment and management of subdural hematoma in traumatic brain injury patients. The findings have the potential to improve clinical decision-making, prognosis prediction, and ultimately enhance patient outcomes.

The literature review section explores the existing research and studies related to subdural hematoma, focusing on its pathophysiology, risk factors, clinical manifestations, and current diagnostic methods. It discusses the limitations and challenges associated with traditional imaging techniques, such as X-ray and single-slice computed tomography (CT), in accurately detecting and characterizing subdural hematomas.

The thesis then delves into the technical aspects and advantages of MDCT in imaging subdural hematomas. It highlights the multi-slice capabilities of MDCT, which allow for rapid image acquisition and high-resolution imaging of the brain. The ability to visualize the hematoma in multiple planes provides valuable information for accurate diagnosis, localization, and characterization of the hematoma. The methodology section describes the study design and data collection process. It outlines the inclusion and exclusion criteria for patient selection and explains the retrospective nature of the study. The thesis clarifies the process of collecting relevant clinical data, including patient demographics, injury mechanisms, presenting symptoms, and outcomes. It also discusses the standardized protocol followed for MDCT imaging and the criteria used for evaluating the hematoma size, midline shift, and associated brain injuries. The results section presents the findings obtained from the analysis of the collected data. It provides statistical information on the prevalence of subdural hematoma in the study population and describes the distribution of hematoma locations, sizes, and associated brain injuries. The section highlights the correlations found between MDCT findings and patient outcomes, such as mortality rates, functional disability, and neurological deficits. The discussion section interprets the results in the context of the existing literature and clinical implications. It examines the strengths and limitations of MDCT in diagnosing and managing subdural hematoma and compares its performance with other imaging modalities. The thesis explores the potential benefits of early detection using MDCT in guiding appropriate surgical interventions and optimizing patient outcomes. Lastly, the conclusion summarizes the key findings of the study and discusses their implications for clinical practice. It highlights the advantages of MDCT in the diagnosis, localization, and prognostication of subdural hematoma in TBI patients. The thesis concludes by emphasizing the need for further research and prospective studies to validate the findings and expand our understanding of the role of MDCT in this clinical context. Overall, this thesis provides a comprehensive analysis of the use of MDCT in the assessment and management of subdural hematoma in traumatic brain injury patients. It contributes to the existing knowledge by highlighting the advantages of MDCT and its potential to improve patient care and outcomes in this challenging clinical scenario.

CHAPTER II
REVIEW OF LITERATURE

A literature review is a complete, critical analysis of the published literature (books, journals, dissertations, etc.) on a certain subject or research question. To get a thorough picture of the state of the art and pinpoint any gaps or potential research areas, it entails methodically exploring, analysing, and synthesising the body of existing literature. A well-conducted literature review provides a comprehensive overview of existing knowledge, helps identify research gaps, and informs the development of new tools or research directions. It also allows researchers to contextualize their work within the broader scientific landscape and build upon the existing literature to advance the field[20].

Provenzale, James M. concluded that In the recent medical literature, this review has detailed a number of different elements of head trauma imaging. It is important to summarise both the imaging developments and some of the unresolved problems. First, it is obvious that MRI is significantly more sensitive than CT for detecting minute brain anomalies caused by trauma. Additionally, some MRI sequences are especially sensitive to detecting particular types of brain injuries. The therapeutic significance of this heightened sensitivity, meanwhile, is not entirely evident. There is some usefulness in papers that compare imaging results to clinical outcomes, but more data is required to understand how the greater sensitivity of MRI techniques impacts medical professionals' judgement[21].

Lolli, V., Pezzullo, M., Delpierre, I. and Sadeghi et.al, The care of patients with TBI is primarily based on imaging. The best imaging method for acute head trauma is computed tomography (CT), which allows for the precise detection and treatment of vascular damage, hydrocephalus, and mass effects. CT is useful in follow-up because it is accurate at identifying subsequent injuries. Despite the absence of structural brain damage on CT in the acute setting, MRI is only given to individuals with significant neurological impairment. In cases of subacute and chronic TBI, MRI is preferred over CT because it is thought to be more accurate at predicting outcome[22].

Huang, L.K., Wang, H.H., Tu, H.F. and Fu, C.Y conclude that Patients suffering from traumatic brain injury (TBI) may also have facial fractures. While most head injury patients undergo first head computed tomography (CT) scans, the goal of this study was to look into the utility of simultaneous facial CT scans in assessing facial fractures in TBI patients. Methods: In addition to conventional head CT scans, 166 (83.0%) patients with face fractures required additional facial CT scans. Surgical intervention was required in 73 (44.0%) of the 166 patients, who had fractures in the lower part of the face (p 0.001) and orbital fractures (p = 0.019) more commonly. Conclusions: Patients with TBI who are at risk for facial fractures may be more likely to experience them concurrently. In normal head CT scans, fractures of the lower third of the face and the orbit are easily missed, but frequently necessitate surgical repair. Therefore, it is advised that certain TBI patients undergo simultaneous head and facial CT scans[23].

Nithesh, N. and Ravindranand, R.C., conclude that the present study was to In the examination of computed tomography in patients with craniocerebral trauma, determine the role of multi-detector CT. Methodology: This study comprised a total of fifty injured individuals. All patients underwent clinical evaluation, MDCT imaging for radiological evaluation, and patient prognosis. 50 patients in total—both males and females—were included. 35 males and 15 girls sustained CT head injuries. The oldest patient was 50 years old, and the youngest was 16 years old. Pneumocephalus was linked to 37 single skull fractures, 23 linear, 12 depressed, and 2 skull base fractures. Twelve individuals experienced extradural haemorrhages, and all of them also had underlying fractures. to target extra- and intra-axial stress to a specific compartment. Conclusion: Fractures, traumatic consequences, and management decisions all employ different MDCT spectrums[24].

Wong, G.K., Yeung, J.H., Graham, C.A., Zhu, X.L.,et.al,.. conclude that A bad prognostic indicator for traumatic brain injury is traumatic subarachnoid haemorrhage (SAH). By analysing the predictive qualities of CT patterns of traumatic SAH, in particular, the thickness and distribution, the authors sought to further explore the neurological outcome among head injury patients. Methods: In a regional trauma centre in Hong Kong, a database was used to conduct the study. Between January 2006 and December 2008, data were prospectively gathered on a series of trauma victims. According to admission CT, all of the patients included in the study had traumatic SAH and serious head injury, which is indicated by a head Abbreviated Injury Scale [AIS] score of 2 or higher. Results: 661 patients with major brain injuries were admitted to the Prince of Wales Hospital in Hong Kong throughout the course of the 36-month period. On the admission CT, 214 patients (32%) had traumatic SAH. In patients with traumatic SAH, the mortality rate was substantially higher and a 6-month unfavourable outcome was significantly more common. According to multivariate analysis, the maximal thickness (mm) of traumatic SAH was not related to the size or location of the haemorrhage but was independently associated with neurological prognosis (OR 0.8, 95% CI 0.7-0.9) and death (OR 1.3, 95% CI 1.2-1.5). Conclusions: The maximum thickness of traumatic SAH was a significant independent predictor of clinical outcome and mortality. Clinical result was not impacted by anatomical distribution in and of itself[25].

Bendinelli, C., Bivard, A., Nebauer, S., Parsons, M.W et.al,.. says that The function of brain CT perfusion (CTP) imaging in severe traumatic brain injury (STBI) remains unknown. We hypothesised that in STBI, early CTP could provide extra information beyond non-contrast CT (NCCT). Methods: A subset analysis of an ongoing prospective observational study on trauma patients with STBI who did not require craniectomy and deteriorated or failed to improve neurologically within the first 48 hours after trauma. Following a follow-up NCCT, a CTP was obtained. Additional results were characterised as an area of altered perfusion on CTP that was bigger than the abnormal area found by the concurrent NCCT. Patients who had additional finding (A-CTP) were compared with patients who did not have additional findings (NA-CTP). Results: The study included 30 patients. [Male: 90%, mean age: 38.6 (SD 16.9), blunt trauma: 100%; 6 (20%) prehospital intubation; lowest GCS before intubation: 5.1 (SD 2.0); mean ISS: 30.5 (SD 8.3); mean head and neck AIS: 4.4 (SD 0.8). ICU stay: 10.2 days (standard deviation: 6.3). In 12 (40%), intracranial pressure (ICP) was measured. The maximum mean ICP in mmHg was 30.1 (SD14.1). There were five (17%) fatalities. NCCT findings included a mostly diffuse axonal injury (DAI) pattern in seven (23%), a predominantly haematoma in ten (33%), and a predominantly intracerebral contusion in nine (30%). CTP was done 24.9 (SD 13) hours after the event. In eight individuals (27%), the degree of hypoperfusion was judged to be significant enough to be in the ischemic range. Despite only minor alterations on NCCT, CTP changed clinical care in three individuals (10%) who were diagnosed with severe and fatal strokes. Conclusion: In 60% of patients with STBI, CTP added new diagnostic information compared to NCCT. 10% of patients had their clinical care revised by CTP[26].

Nithesh N., Ravindranand, R. Chidambaram the present study was to assess the function of a multi-detector CT in assessing computed tomography in those who have had a skull or brain injury. Methodology: This study involved a total of fifty injured individuals. All patients underwent clinical examination, radiological assessment, and patient prognosis utilising MDCT imaging. Results: There were 50 patients overall, 50 of them male and female. 35 males and 15 girls sustained CT head injuries. The oldest patient was 50 years old, and the youngest was 16 years old. Pneumocephalus was linked to 37 single skull fractures, 23 linear, 12 depressed, and 2 skull base fractures. Twelve individuals experienced extradural haemorrhages, and all of them also had underlying fractures. to target extra- and intra-axial stress to a specific compartment. Conclusion: Fractures, traumatic consequences, and management decisions all employ different MDCT spectrums[27].

Rincon-Guio, C conclude that Traumatic brain injury (TBI) is a serious issue for the public's health. It stands for one of the most significant medical-surgical pathologies in the entire planet. It is important to prioritise the patient and determine the extent of the injury because the incidence of this kind of injury indicates that it results in a significant number of fatalities and impairments that result in permanent disabilities. Imaging is becoming a crucial diagnostic tool for TBI patients as well as a reliable predictor of patient outcomes. The evidence of the current state of computed tomography (CT) imaging for TBI, as well as its advantages and restrictions, is provided by this review of the literature[28].

Hsu, Y.T. and Jao, J.C conclude that Multi-detector computed tomography (CT) exams present radiologic technologists with a variety of patients. There are frequently individuals in emergency rooms who are unable to follow directions for the examinations. The accuracy of the clinician's diagnosis may be impacted by the head CT's asymmetries in the axial view. This study used two phantoms to evaluate the effect of head placement on the quality of the head CT images. A 16-slice CT scanner was used to perform each scan. In the control group, there was no multiplanar reconstruction (MPR) and the tilted angle of the phantoms was set to 0°.The tilted head positioning-related image asymmetry and artefacts can be somewhat corrected with MPR, but it takes time. The head should be positioned as precisely as possible when performing head CT scans[29].

1Lee, B. and Newberg conclude that Traumatic brain injury (TBI) is a prevalent clinical issue that has the potential to be very harmful. Neuroimaging techniques have become a crucial component of the diagnostic workup of such patients because timely, appropriate care of TBI sequelae can drastically modify the clinical course, especially within 48 hours after the injury. These imaging studies can help with surgical planning and minimally invasive procedures in the acute environment by determining the presence and amount of damage. Neuroimaging can be useful in evaluating the prognosis, identifying chronic sequelae, and assisting with rehabilitation following TBI[30].

These literature review underscores the importance of MDCT in the evaluation of SDH in TBI patients. MDCT provides accurate and rapid diagnosis, characterization, and follow-up assessment of SDH. By identifying associated injuries and complications, MDCT facilitates prompt intervention and improved patient outcomes[31]. However, caution should be exercised regarding radiation exposure, and further research is needed to compare the diagnostic accuracy of MDCT with other imaging modalities, such as MRI, in specific cases.

CHAPTER III
METHODOLOGY

The study will be a retrospective analysis of TBI patients who underwent MDCT imaging within a specified time period. The study population will comprise patients with confirmed or suspected SDH based on initial clinical assessment. MDCT images will be reviewed by experienced radiologists, and relevant data, including patient demographics, SDH characteristics, associated findings, and clinical outcomes, will be extracted from medical records.

The research approach in studying subdural hematoma (SDH) in traumatic brain injury (TBI) patients with multi-detector computed tomography (MDCT) typically involves a combination of retrospective and prospective designs[32]. The following is a description of the common research approach used in this field:

1. **Study Design**: Researchers often employ retrospective studies, which involve analyzing existing medical records, imaging data, and clinical outcomes of TBI patients with SDH who have undergone MDCT. This approach allows for a large sample size and can provide valuable insights into the diagnostic accuracy and clinical implications of MDCT in SDH.
2. **Sample Selection**: Researchers identify a cohort of TBI patients with confirmed SDH who have undergone MDCT imaging. The inclusion criteria may vary across studies but typically include patients of different ages and varying severity of TBI. In some cases, researchers may also include a comparison group of TBI patients without SDH for reference.
3. **Data Collection**: For retrospective studies, researchers collect relevant data from medical records, including patient demographics, injury characteristics, MDCT imaging findings (such as hematoma location, thickness, and density), associated injuries, and clinical outcomes. In prospective studies, researchers collect data prospectively, following patients with SDH who undergo MDCT at specific intervals to assess changes in the hematoma over time[33].

4. **Imaging Protocol**: Researchers describe the MDCT imaging protocol used in their studies, including technical parameters such as slice thickness, contrast administration, and reconstruction algorithms. Standardized imaging protocols are desirable to ensure consistency and comparability of findings across different studies.
5. **Data Analysis**: Researchers analyze the collected data using statistical methods to determine the diagnostic accuracy of MDCT in detecting and characterizing SDH. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic odds ratio are commonly calculated to assess the performance of MDCT. The association between MDCT findings and clinical outcomes, such as surgical intervention or patient prognosis, may also be examined.
6. **Limitations and Future Directions**: Researchers discuss the limitations of their studies, such as sample size, potential selection bias, and the retrospective nature of the data. They may also highlight the need for future research, including prospective studies with larger cohorts and comparative studies with other imaging modalities like magnetic resonance imaging (MRI).

RESEARCH DESIGN

The research design in studying subdural hematoma (SDH) in traumatic brain injury (TBI) patients with multi-detector computed tomography (MDCT) typically involves a combination of retrospective and prospective approaches[34]. Here is a breakdown of the research design in this context:

1. **Retrospective Design**: In retrospective studies, researchers analyze existing medical records, imaging data, and clinical outcomes of TBI patients with SDH who have undergone MDCT. This design allows for the evaluation of a larger sample size and the assessment of historical data.
2. **Prospective Design**: In prospective studies, researchers prospectively collect data from TBI patients with SDH who undergo MDCT imaging. This design allows for the collection of real-time data and enables the evaluation of longitudinal changes in the SDH over time.
3. **Sample Selection**: Researchers identify a cohort of TBI patients with confirmed SDH who have undergone MDCT imaging. The sample may include patients of various ages, genders, and TBI severity levels. The inclusion criteria are defined based on the research objectives and may differ across studies.
4. **Data Collection**: For retrospective studies, researchers collect relevant data from medical records, including patient demographics, injury characteristics, MDCT imaging findings, associated injuries, and clinical outcomes. Prospective studies involve the systematic collection of data from patients undergoing MDCT at specific intervals, including follow-up scans to assess changes in the SDH.
5. **MDCT Imaging Protocol**: Researchers describe the MDCT imaging protocol used in their studies, including technical parameters such as slice thickness, contrast administration, and acquisition timing. Standardized imaging protocols are desirable to ensure consistency and comparability of findings across different studies.
6. **Data Analysis**: Researchers analyze the collected data using appropriate statistical methods. They assess the diagnostic accuracy of MDCT in detecting and characterizing SDH by calculating sensitivity, specificity, positive predictive value, negative predictive value, and other relevant measures. They may also analyze the association between MDCT findings and clinical outcomes or other variables of interest.
7. **Limitations and Future Directions**: Researchers discuss the limitations of their studies, such as potential selection bias, limited generalizability, and the retrospective nature of some designs. They

also highlight areas for future research, including larger prospective studies, comparative studies with other imaging modalities, or investigations into specific subgroups of TBI patients.

SETTINGS OF THE STUDY POPULATIONS

The setting of the study populations in research on subdural hematoma (SDH) of traumatic brain injury (TBI) patients with multi-detector computed tomography (MDCT) can vary depending on the specific study design and research objectives[35]. Here are some potential settings where these studies may take place:

1. **Hospital-Based Studies**: Many studies on SDH in TBI patients with MDCT are conducted within hospital settings. These studies typically involve retrospective analysis of medical records and imaging data from patients who have been admitted to the hospital following a TBI. The study populations may consist of patients treated at a single hospital or multiple hospitals, depending on the scope of the research.
2. **Trauma Centers**: Research on SDH in TBI patients with MDCT may focus on trauma centers, which are specialized healthcare facilities equipped to handle severe and complex injuries. These centers often have advanced imaging capabilities, including MDCT, making them suitable settings for conducting studies on SDH. The study populations in these settings would primarily include TBI patients who were admitted to trauma centers for evaluation and treatment.

SAMPLE AND SAMPLING TECHNIQUES

Sample and sampling techniques in studies on subdural hematoma (SDH) of traumatic brain injury (TBI) patients with multi-detector computed tomography (MDCT) can vary depending on the study design and research objectives. Here are some considerations related to sample selection and sampling techniques in this context:

1. **Sample Selection**: The sample for these studies typically includes TBI patients with confirmed SDH who have undergone MDCT imaging. The selection criteria may vary across studies, but they generally include patients with a range of TBI severities and demographic characteristics. The sample size should be determined based on the research objectives and statistical power calculations.
2. **Convenience Sampling**: Convenience sampling is often used in retrospective studies due to the availability of data. Researchers may select patients based on their accessibility, such as those who have undergone MDCT imaging within a specified timeframe. While this approach is convenient, it may introduce selection bias and limit the generalizability of the findings.
3. **Stratified Sampling**: In some cases, researchers may employ stratified sampling to ensure representation across different subgroups within the sample. Stratification may be based on factors such as TBI severity, age groups, or other relevant variables. This technique helps ensure an adequate representation of different patient characteristics in the study population.
4. **Multicenter Studies**: In multicenter studies, researchers may use a combination of convenience sampling and purposive sampling. Convenience sampling may be employed to select participating hospitals or research institutions, while purposive sampling may be used to recruit patients within each center based on specific criteria to ensure a diverse and representative sample.

ETHICAL CLEARANCE

Ethical clearance is an important aspect of conducting research on subdural hematoma (SDH) in traumatic brain injury (TBI) patients with multi-detector computed tomography (MDCT). The following considerations regarding ethical clearance are relevant to studies in this field:

1. **Informed Consent**: Informed consent is a fundamental ethical principle in research involving human subjects. Researchers must obtain informed consent from participants or their legally authorized representatives before including them in the study. In the case of TBI patients with SDH, obtaining informed consent may require additional considerations due to the patients' medical condition and potential cognitive impairment.
2. **Privacy and Confidentiality**: Researchers must take measures to ensure the privacy and confidentiality of the participants' personal and medical information. Data should be anonymized or de-identified to protect the participants' identities. Researchers should adhere to relevant data protection regulations and guidelines when handling and storing sensitive patient information.
3. **Risk-Benefit Assessment**: Ethical clearance requires researchers to conduct a thorough risk-benefit assessment. They must weigh the potential benefits of the study against any potential risks or harms to the participants. Special consideration should be given to vulnerable populations, such as patients with TBI, to minimize any potential harm and ensure their well-being.
4. **Research Integrity**: Researchers must conduct their studies with integrity and adhere to ethical principles throughout the research process. This includes maintaining scientific rigor, accurately reporting findings, and avoiding any conflicts of interest that could compromise the objectivity and integrity of the study.
5. **Data Sharing and Publication**: Researchers should consider the ethical implications of data sharing and publication. They should determine how and under what conditions they will share research data and results to ensure transparency and promote the advancement of scientific knowledge while respecting patient confidentiality and privacy.

It is essential for researchers to obtain ethical clearance and adhere to ethical guidelines and regulations when conducting studies on SDH in TBI patients with MDCT. Compliance with ethical standards ensures that the research is conducted ethically and upholds the rights and welfare of the participants.

SELECTION OF TOOL

The selection of a tool or instrument in studies on subdural hematoma (SDH) of traumatic brain injury (TBI) patients with multi-detector computed tomography (MDCT) primarily revolves around the use of MDCT itself. MDCT is a specialized imaging technique that plays a central role in the diagnosis, characterization, and management of SDH in TBI patients. Here are some key considerations related to the selection and utilization of MDCT as the primary tool:

1. **Imaging Technique**: MDCT is chosen as the imaging technique due to its ability to provide detailed cross-sectional images of the brain with high spatial resolution. It allows for the visualization of the extent, location, density, and other characteristics of the SDH, which are essential for accurate diagnosis and treatment planning.
2. **Technical Parameters**: The specific technical parameters of MDCT, such as slice thickness, acquisition timing, and contrast administration, are carefully determined based on the research objectives and the requirements for optimal SDH visualization. Standardized imaging protocols are typically established to ensure consistency and comparability of results across different patients and studies.

3. **Multi-Detector Capability**: MDCT is equipped with multiple detectors that capture a larger volume of data simultaneously, resulting in faster acquisition times and improved image quality. The multi-detector capability allows for quicker imaging of TBI patients, which is particularly important for patients with potential medical emergencies.
4. **Diagnostic Accuracy**: MDCT has demonstrated high diagnostic accuracy in detecting and characterizing SDH in TBI patients. It is capable of differentiating between acute, subacute, and chronic SDH based on density measurements. MDCT findings can also aid in determining the need for surgical intervention and assessing the prognosis of the patient.
5. **Accessibility and Availability**: MDCT is widely available in hospital settings and trauma centers, making it a convenient tool for studying SDH in TBI patients. Its accessibility ensures that a sufficient number of patients can undergo MDCT imaging, facilitating the recruitment of participants and data collection for research studies.
6. **Comparison with Other Imaging Modalities**: In some cases, researchers may also compare MDCT with other imaging modalities, such as magnetic resonance imaging (MRI), to assess their respective strengths and limitations in detecting and characterizing SDH. Such comparisons help evaluate the unique benefits and challenges associated with MDCT.

The selection of MDCT as the primary tool in studying SDH in TBI patients is based on its ability to provide detailed and accurate imaging information for diagnosis, treatment planning, and clinical management. Researchers should carefully consider the technical parameters and capabilities of MDCT to ensure the optimal visualization and analysis of SDH in their studies.

DEVELOPMENT AND DESCRIPTION OF TOOL

The development of tools used in the assessment of subdural hematoma in traumatic brain injury patients with multi-detector computed tomography (MDCT) involves several considerations. MDCT is a powerful imaging technique that can provide detailed anatomical information about the brain and its associated pathologies. To develop a tool for subdural hematoma assessment, the following steps are typically involved:

1. **Study Design**: Researchers and medical professionals would design a study to evaluate and validate the tool. This would involve defining the study population, inclusion/exclusion criteria, and the specific objectives of the study.
2. **Data Collection**: Patient data would be collected, including MDCT scans of traumatic brain injury patients with confirmed subdural hematomas. The scans should cover the entire brain to ensure comprehensive evaluation.
3. **Image Analysis**: An important aspect of tool development is the development of algorithms for image analysis. This could involve techniques such as image segmentation, which allows for the identification and delineation of the subdural hematoma from surrounding brain tissue.
4. **Feature Extraction**: Relevant features from the MDCT scans need to be extracted. This may include hematoma volume, location, density, and shape characteristics. These features would help in characterizing the subdural hematoma and assessing its severity.
5. **Algorithm Development**: Based on the extracted features, machine learning algorithms can be developed to aid in the automatic detection and classification of subdural hematomas. These algorithms can be trained using labeled data to recognize patterns associated with different types of hematomas.

6. **Validation and Testing**: The developed tool would then be validated and tested using independent datasets. This would involve comparing the tool's results with the assessments of expert radiologists or neurosurgeons to evaluate its accuracy and reliability.
7. **Clinical Integration**: Once the tool has been validated, it can be integrated into clinical practice. This would involve assessing its performance in real-world scenarios and determining its utility in assisting clinicians in making accurate diagnoses and treatment decisions.

It's important to note that the development of such a tool requires collaboration between radiologists, neurosurgeons, and medical imaging specialists. Ethical considerations, patient privacy, and regulatory requirements should also be taken into account throughout the development process.

CONTAIN VALIDITY OF TOOL

To assess the validity of a tool in the context of subdural hematoma in traumatic brain injury (TBI) patients with multi-detector computed tomography (MDCT), several factors need to be considered. Validity refers to the extent to which a tool or measurement accurately and effectively measures what it intends to measure. In this case, the tool would be MDCT, and its validity would be determined by its ability to accurately detect and characterize subdural hematomas.

There are different aspects of validity that can be evaluated for MDCT in subdural hematoma:

1. **Diagnostic Accuracy:** Validity can be assessed by comparing MDCT findings with a reference standard, such as surgical exploration or follow-up imaging (e.g., MRI). Sensitivity (the ability of MDCT to correctly identify true positive cases) and specificity (the ability of MDCT to correctly identify true negative cases) can be calculated. Receiver operating characteristic (ROC) analysis can provide information about the overall accuracy of MDCT in distinguishing between subdural hematomas and other conditions.
2. **Predictive Validity:** This aspect refers to the ability of MDCT findings to predict clinical outcomes and guide treatment decisions. For example, if MDCT accurately identifies the size, location, and extent of subdural hematomas, it should have a significant correlation with surgical interventions, neurological outcomes, or mortality rates.
3. **Construct Validity:** This refers to the ability of MDCT to measure the underlying construct of interest, which, in this case, is the presence and characteristics of subdural hematomas. Correlational analyses or comparisons with other imaging modalities (such as MRI) can be performed to establish the construct validity of MDCT.

To determine the validity of MDCT in subdural hematoma, a well-designed study would typically compare MDCT findings with an appropriate reference standard, involve multiple observers to assess interobserver agreement, and analyze the correlation between MDCT findings and relevant clinical outcomes. The results of such studies would provide evidence on the validity of MDCT as a tool for diagnosing and characterizing subdural hematomas in TBI patients.

PILOT STUDY

A pivotal study refers to a clinical trial or research study that plays a significant role in establishing the effectiveness and safety of a particular intervention or treatment. In the context of subdural hematoma in traumatic brain injury patients using multi-detector computed tomography (MDCT), a pivotal study would aim to provide crucial evidence regarding the use of MDCT in diagnosing and managing subdural hematomas.

Subdural hematoma is a serious condition characterized by the accumulation of blood between the dura mater (the outermost layer of the meninges) and the arachnoid mater (the middle layer). It can occur as a result of traumatic brain injury (TBI) when blood vessels rupture due to a head injury.
MDCT is a diagnostic imaging technique that utilizes multiple detectors to capture cross-sectional images of the body. It can provide detailed information about the size, location, and characteristics of subdural hematomas, aiding in their diagnosis and determining the appropriate treatment approach.
A pivotal study on subdural hematoma in TBI patients using MDCT would likely have several objectives, such as:

1. Assessing the accuracy and reliability of MDCT in detecting and characterizing subdural hematomas.
2. Investigating the role of MDCT in determining the severity and extent of subdural hematomas.
3. Evaluating the impact of MDCT findings on treatment decisions and patient outcomes.
4. Comparing MDCT with other imaging modalities, such as magnetic resonance imaging (MRI), in terms of diagnostic accuracy and clinical utility.
5. Assessing the safety profile and potential risks associated with MDCT imaging.

The study design may involve enrolling a large cohort of TBI patients with suspected subdural hematomas and comparing the MDCT findings with other diagnostic modalities, such as MRI or conventional CT. The patients' clinical outcomes, such as surgical interventions, neurological outcomes, and mortality rates, may be evaluated to determine the impact of MDCT on patient management and prognosis.
The results of a pivotal study in this context would provide valuable evidence to guide clinical practice and help healthcare professionals make informed decisions regarding the use of MDCT in subdural hematoma diagnosis and management in TBI patients.

PROCEDURE OF DATA COLLECTION

Record the relevant data from the MDCT images and patient medical records. This can include demographic information, clinical history, injury mechanism, hematoma characteristics, associated injuries, and any other pertinent findings. Formal administrative approval was obtained from the concerned authority to conduct the final study. The final study was conducted at Sharda hospital from January 2023- May2023.

SUMMARY

The methodology for studying subdural hematoma in traumatic brain injury patients using multi-detector computed tomography (MDCT) involves collecting MDCT images and relevant clinical data of the selected patient population. These images undergo preprocessing to enhance image quality and consistency, followed by image segmentation to accurately identify and delineate the subdural hematoma regions. Quantitative analysis is then conducted to extract features such as volume, density, shape, and location of the hematoma within the brain. Statistical analysis is performed to explore relationships between variables, compare hematoma characteristics across patient groups, and examine associations with clinical outcomes. Data visualization techniques are employed to present the analyzed data effectively. The findings are interpreted and discussed in the context of subdural hematoma in traumatic brain injury patients, highlighting novel insights and potential clinical implications. Limitations of the study are acknowledged, and future research directions are suggested to further advance knowledge in this area.

he first step involves clearly defining the study objectives and research questions, along with selecting the appropriate population of traumatic brain injury patients with subdural hematoma. Data collection plays a crucial role in this research. MDCT images, acquired as part of routine clinical care, are gathered for the study population. Alongside the images, relevant clinical data are collected, including patient demographics, injury characteristics, and clinical outcomes. Ensuring the consistency and accuracy of data collection is important to maintain the integrity of the study. Once the data is collected, image preprocessing techniques are employed to improve the quality and consistency of the MDCT images. This may involve correction of artifacts, noise reduction, and standardization of image formats. Preprocessing helps optimize the subsequent analysis steps. Image segmentation is a critical step, wherein the subdural hematoma regions within the MDCT images are identified and delineated. Various image processing techniques or software tools can be utilized for accurate and precise segmentation. The goal is to extract the hematoma area for further analysis. Quantitative analysis involves extracting meaningful features from the segmented hematoma regions. These features include hematoma volume, density measurements, shape characteristics (e.g., irregularity or symmetry), and location within the brain. Additional features related to the surrounding brain tissue or other structures of interest can also be considered. The extracted quantitative features provide objective measures to analyze and compare different aspects of the subdural hematoma. Statistical analysis is performed to explore the relationships between different variables. This includes comparing hematoma characteristics between patient groups based on factors such as age, gender, or injury severity. The analysis may also involve examining the association between hematoma features and clinical outcomes, such as neurological function or treatment response. Statistical tests, such as t-tests, chi-square tests, or regression models, are applied to determine the significance of the observed relationships. Data visualization techniques are utilized to present the analyzed data in a meaningful and interpretable manner. Visual representations, such as charts, graphs, or heatmaps, aid in understanding patterns, trends, and differences within the dataset. Visualizations can highlight important findings and facilitate communication of the results to a wider audience. The findings obtained from the analysis are then interpreted and discussed in the context of subdural hematoma in traumatic brain injury patients. They are compared with existing literature and previous studies to assess consistency or novelty. The implications of the findings, both clinically and scientifically, are considered and discussed. Limitations of the study are acknowledged, such as potential biases, sample size limitations, or challenges associated with MDCT imaging. Future directions for research may be suggested, including improvements in methodology, larger sample sizes, or investigation of additional variables.

In summary, the methodology for studying subdural hematoma in traumatic brain injury patients using MDCT involves data collection, image preprocessing, segmentation, quantitative analysis, statistical analysis, data visualization, interpretation, and discussion. By following this comprehensive methodology, researchers can gain valuable insights into the characteristics, associations, and clinical implications of subdural hematoma in traumatic brain injury patients.

CHAPTER IV:
ANALYSIS AND INTERPRETAION
STATEMENT OF THE PROBLEMS

The current study aims to investigate the role of MDCT in the assessment of SDH in patients with TBI. By examining the characteristics, distribution, and associated findings of SDH on MDCT scans, this research seeks to provide valuable insights into the diagnostic and prognostic significance of MDCT in the management of TBI patients with SDH.

The statement of the problems in the context of subdural hematoma in traumatic brain injury (TBI) patients with multi-detector computed tomography (MDCT) can include the following:

1. **Diagnostic Accuracy:** One problem to address is the need to determine the diagnostic accuracy of MDCT in detecting subdural hematomas. This involves assessing the sensitivity, specificity, positive predictive value, and negative predictive value of MDCT in correctly identifying the presence or absence of subdural hematomas in TBI patients.
2. **Characterization of Subdural Hematomas:** Another problem is the need to evaluate the ability of MDCT to accurately characterize subdural hematomas in terms of size, location, and morphology. Understanding the precision of MDCT in providing detailed information about the hematoma's characteristics is crucial for treatment planning and decision-making.
3. **Comparison with Alternative Imaging Modalities**: It is important to compare the diagnostic performance of MDCT with other imaging modalities commonly used for subdural hematoma evaluation, such as magnetic resonance imaging (MRI). Determining the comparative strengths and limitations of MDCT in relation to alternative imaging techniques can help establish its role in the diagnostic pathway.
4. **Clinical Impact and Treatment Decision-making**: Understanding the clinical impact of MDCT findings is vital to assess its usefulness in guiding treatment decisions. This problem focuses on evaluating the correlation between MDCT findings (e.g., hematoma size, location, and extent) and clinical outcomes, such as the need for surgical intervention, neurological outcomes, and patient prognosis.
5. **Safety and Radiation Exposure:** MDCT involves exposure to ionizing radiation, and the potential risks associated with repeated imaging should be evaluated. Assessing the safety profile of MDCT and quantifying the radiation dose delivered during the examination is important to ensure patient safety and justify its use in TBI patients.

By addressing these problems, researchers can contribute to the understanding of MDCT's role in subdural hematoma management in TBI patients and provide valuable insights for clinical decision-making and patient care.

OBJECTIVES

OBJECTIVES:

1. To determine the prevalence and distribution patterns of SDH in TBI patients using MDCT.
2. To characterize the radiological features of SDH on MDCT scans, including size, shape, density, and mass effect.
3. To identify associated findings on MDCT, such as midline shift, cerebral edema, and other intracranial injuries.
4. To assess the diagnostic accuracy of MDCT in detecting and differentiating acute, sub-acute, and chronic SDH.
5. To evaluate the prognostic value of MDCT findings in predicting patient outcomes, including mortality, disability, and surgical intervention.

ORGANISATION AND PRESENTATION OF DATA

When organizing and presenting data on subdural hematoma in traumatic brain injury patients using multi-

detector computed tomography (MDCT), it is essential to structure the information in a clear and concise manner. The data can be presented in a paragraph format as follows:
In this study, we examined the cases of traumatic brain injury patients with subdural hematoma using multi-detector computed tomography (MDCT). The patient demographics, including age, gender, and relevant medical history, were recorded alongside the date and time of the MDCT scan. The clinical presentation, such as presenting symptoms and the mechanism of injury, was summarized to provide context. The MDCT technique employed for the scan, including slice thickness, reconstruction algorithm, and contrast administration (if applicable), was described.
The MDCT findings revealed detailed information about the subdural hematoma, including its location, size, shape, and density. Associated findings, such as midline shift, brain edema, or other traumatic brain injuries, were also documented. Accurate measurements were taken, including the maximum thickness of the hematoma and the quantification of midline shift, using appropriate anatomical reference points.
The presentation of MDCT images played a crucial role in illustrating the subdural hematoma. Axial, sagittal, and coronal images were included, along with annotations and labels to highlight important findings. Differential diagnoses were discussed, considering conditions that may mimic subdural hematomas, such as epidural hematomas, contusions, or other intracranial hemorrhages.
In conclusion, the key findings of the study were summarized, emphasizing their clinical implications. Urgent management considerations based on the characteristics of the subdural hematoma were highlighted. This organization and presentation of data in subdural hematoma cases with MDCT provide a comprehensive understanding of the condition, aiding in accurate diagnosis and appropriate patient management.

Data Collection

Data generated during the conduct of study was reviewed from the medical records of the patients and then the variables were recorded into the data collection sheet for analysis
Data was obtained by descriptive statistics using n, mean, standard deviation and likelihood ratio test, which was used to characterize the sample
The present study was undertaken to analysis the Association of schmorul's node of lumbar spine with different type of Modic changes.
The data obtained was tabulated in Microsoft Excel spreadsheet and the analysis was done using Chi square test, Paired "t" test, Independent sample "t" test, were used tos check the P value (P<0.05was considered statistically significant) statistical significance between two or more categorial variables. Pears correlation coefficient was used to find the relation between variables.

CHAPTER V
RESULT

PARTICIPANT RIGHTS AND CONFIDENTIALITY.

Institutional Scientific Committee:

The protocol was reviewed by the **Institutional Scientific Committee and** was not submitted to **Institutional Ethics Committee until** approved by Scientific Committee. (AppendixII)

InstitutionalEthicsCommittee(IEC)/InstitutionalReviewBoard(IRB)

The protocol was reviewed by the **Institutional Ethics Committee** and the study subjects weren't enrolled until the Committee/ Board approved the protocol, as submitted or with modifications in subsequent version(s).(AppendixIII). The research was carried out in accordance with the Basic Principles defined in US 21 CFR Part 320,theICH(62FR25692,09May1997)'Guidance for Good Clinical Practice'.ICMR'Ethical Guidelines for biomedical research on human participants (2006)', CDSCO 'Guidance on good clinical practice for clinical researchIndia.

This study is also under process of registration n in the **Clinical Trial Registry of India**

Participant Confidentiality*:*

Patients are identified by a specific code number in the irmsubsequent records.The names will never appear on any form or in a report or a publication. Thus, the confidentiality of the information that concerns the patient is completely secured. Information will not be released without written permission of the participant, except as necessary for monitoring by IEC and any regulatory authority.

All the information was treated as STRICTLY CONFIDENTIAL.

CASE STUDIES

CASE 1:

- NAME: XYZ
- AGE – 3YR
- GENDER- FEMALE
- CLINICAL HISTORY- patient presented with the compliant of fall from height
- PROCEDURE: NCCT BRAIN
- CURRENT STUDY REVEALS –
- There is evidence of linear un-displaced fracture of the frontal bone on the right side extending upto the superio-medical margin of right orbit and to the right nasal bone.
- Mildly depressed fracture of the posterior part of right orbit is seen.
- Suspicious thin un-displaced fractured of the lamina papyracca on the left side in view of adjacent air pockets seen, air foci also seen extending to the superior part of left orbit.
- There is evidence of air of air fluid of blood attenuation seen in the bilateral ethmoid sinuses suggestive of haemosinus.
- Few tiny intracranial air foci seen suggestive of pneumocephalus.
- Soft tissue swelling is seen in the right frontal and right periorbital region with tiny air pockets.
- Mucosal thickening in bilateral maxillary and bilateral ethmoid sinuses.
- Gray and white matter differentiation is normal.
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.

IMPRESSION- Imaging findings are suggestive of

1. **Cranial fracrures with hemosinus as described.**
2. **Subgaleal hematoma in right frontal region with right periorbital swelling as described.**

CASE 2:

- **NAME: XYZ**
- **AGE – 25Y**
- **GENDER- MALE**
- **CLINICAL HISTORY-** Patient presented with the compliant of fall from height
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **There is evidence of linear undisplaced fracture is in the frontal bone of the seen of the frontal bone of the left side extending from coronal suture to the fronto-zygomatic suture on the left side.**
- **Sabgaleal hematoma of maximum thickness approx.. 9.8mm is seen in the frontal convexity.**
- Brain parenchyma appears grossly normal
- Gray and white matter differentiation is normal.
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.

IMPRESSION- Imaging findings are suggestive of

- **Linear undisplaced fracture of left frontal bone as described above.**
- **Subgaleal hematoma in right frontal region with right periorbital swelling as described.**

CASE 3:

- **NAME: XYZ**
- **AGE – 8Y**
- **GENDER- MALE**
- **CLINICAL HISTORY-** Patient presented with the compliant of fall from height
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **There is evidence of air foci seen in the brain parenchyma suggestive of pneumocephalus.**
- **There is a Sabgaleal hematoma of maximum thickness approx.. 12.5mm is seen in the fronto-pariental convexity on the left side**
- **Another subgaleal hematema of maximum thickeness approx.. 14.6mm is seen alog the pariento-temporal convexity on the right side.**
- **Depressed comminuted fracture is seen incvloving the right parietal bone and extending into the right parieto-temporal suture and involving greater wing of sphenoid ont eh right side. The fracture bpne and greater wing of sphenoid on the left side.**
- **Mild edema is noted in the right cerebral hemisphere.**
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The basal cisterns are normal.

IMPRESSION- Imaging findings are suggestive of

- **Linear undisplaced fracture of left frontal bone as described above.**
- **Subgalel hematoma as described.**

CASE 4:

- **NAME: XYZ**
- **AGE – 45YR**
- **GENDER- MALE**
- **CLINICAL HISTORY-** patient presented with the compliant of Road traffic accident.

- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **Subgalel hematoma of maximum thickness approx. 8.6mm seen in lefr parietal region,**
- **Ther eos lacerated wound with multiple air pockets and few foreign bodies within (HU approx.. 400-500units) seen in the bilateral frontal region.**
- **Age related cerebral atrophy seen in the form of prominent sulci, sylvian fissure, basal cistern, and ventricles with deep fronto-parietal and periventricular white matter ischemic changes.**
- Gray and white matter differentiation is normal.
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system and the CSF spaces show normal configuration.
- The basal cisterns are normal.

IMPRESSION- Imaging findings are suggestive of

- **Lacerated wound in bilateral frontal region**
- **Subgaleal hematoma in right frontal region with right periorbital swelling as described.**
- **Age related vertebral atrophy.**

CASE 5 :

a. **NAME: XYZ**
b. **AGE – 35Y**
c. **GENDER- FEMALE**
d. **CLINICAL HISTORY-** patient presented with the compliant of RTA

2. **PROCEDURE: NCCT BRAIN**
3. **CURRENT STUDY REVEALS –**
4. **There is evidence of hyperdense collection of blood attenuation is seen along the bilateral parito-occipital convexity suggestive of subgaleal hematoma.**
5. Brain parenchyma appears grossly normal.
6. Gray and white matter differentiation is normal.
7. Basal ganglia are normal.
8. There is no evidence of midline shift.
9. Cerebellum and brainstem appears normal.
10. The ventricular system And the CSF spaces show normal configuration.
11. The basal cisterns are normal.

IMPRESSION- Imaging findings are suggestive of Subgaleal hematoma in right frontal region with right periorbital swelling as described.

CASE 6:

- **NAME: XYZ**
- **AGE – 22Y**
- **GENDER- MALE**
- **CLINICAL HISTORY-** patient presented with the compliant of RTA
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **A curvilinear hyperdensity of blood attenuation is seen in the right fronto-parietal convexity with maximum thickness of 7.2mm in the right frontal convexity suggestive of sub dural haemorrhage.**
- **Hyperdensity of blood attenuation is also seen in the sulcal spaces and sylvian fissure on the right side suggestive of sub arachnoid haemorrhage.**
- **Multiple areas of ill defines hypodensities involvinf the brain parenchyma more so in right front-temporo and parietal lobes with effacement of adjnacent sulci and sylvian fissure, compression of right lateral venricles and midline shift tp the left side approx.. 13mm. Sulcal effacement also seen on the left side. Mild sub falcine herniation is also noted to the left.**
- **Sub galeal hemtoma is een in the right front pariertal convexity of maximum thickness approx.. 9mm**
- Gray and white matter differentiation is normal.
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of**
- **Sub dural hemorrhage in the right fronto parietal convexity.**
- **Sub arachnoid hemorrhage on the right side as mentioned.**
- **Diffuse cerebral edema with mass effects with mass effects and midline shift to the left.**
- **Sub galel hematoma in the right fronto parietal region as described.**

CASE 7 :

- **NAME: XYZ**
- **AGE – 8Y**
- **GENDER- MALE**
- **CLINICAL HISTORY-** patient presented with the compliant of RTA
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**

- **Depressed communited fracture involving the right parietal bone and extending into the right parieto-temporal suture and involving greater wing of sphenoid on the right side. The fracture is depressed inwards by approx.. 5.8mm.**
- **Mild edema in the right cerebral hemisphere.**
- **Sutural diastasis in the coronal suture with frature line extending into the left frontal bone and greater wing of sphenoid on the left side.**
- **Subgaleal hematoma along the left front-parietal convexity**
- **Subgaleal hematoma along the left fronto-parietal convexity.**
- **Pneumocephalus.**
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of**
- **Hemorrhagic contusions as described.**
- **Fractures in the frontal bone on the left side as described .**

CASE 8:

- **NAME: XYZ**
- **AGE – 23YR**
- **GENDER- MALE**
- **CLINICAL HISTORY-** patient presented with the compliant of road traffic accident.
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **A depressed communited displaced fracture of the left parietal bone extending upto the left temporal bone communicating with another fracture line of left temporal bone extending upto the –parietal suture is seen.**
- **Calcification of falx is seen.**
- Gray and white matter differentiation is normal.
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of**
- **Hemorrhage contusion in the left parietal lobe as described.**
- **Subarachnoid hemorrhage in the left frontal-parietal region as described.**
- **Subdural hemorrhage of left tempo parietal region is described.**
- **Subgaleal hemorrhage of left parieto temporal as described**

- **Depressed comminuted displaced fracture of the left parietal bone and left temporal bone as described.**

CASE 9:

- **NAME: XYZ**
- **AGE – 3YR**
- **GENDER- FEMALE**
- **CLINICAL HISTORY-** patient presented with the compliant of RTA
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **A hyperdense focus of blood attenuation with surrounding hypodense area is seen in the left parietal lobe suggestive of haemorrhagic contusion.**
- **Sulcal hyperdensity of blood attenuation is seen in the left fronto-parietal region suggestive of subarachnoid hemorrhage.**
- **Small subcentimeteric hyperdense foci are seen in the frontal lobe of the right side at the grey white matter interface.**
- **Subgaleal hematoma with maximum thickness of approx.. 5.8mm is seen in the left parieto-temporal region.**
- Gray and white matter differentiation is normal.
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- imaging appearance are suggestive of**
  - **Hemorrhage contusions as described**
  - **Fractures in the frontal bone on the left side as described**
  - **Subgaleal hematoma as described**
  - **Preseptal swelling on the left side as described**

CASE 10:

- **NAME: XYZ**
- **AGE – 85YR**
- **GENDER- FEMALE**
- **CLINICAL HISTORY-** patient presented with the history of loss consciousness since morning .
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **Age related cerebral atrophy seen in the form of prominent sulci, sylvian fissure, basal cisterns and ventricles**
- **There are wedge shaped hypodense chronic infracts are seen in the bilateral capsuloganglionic region..**
- Gray and white matter differentiation is normal.

- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of**
- **Age related diffuse cerebral atrophy.**
- **Chronic infracts in the bilateral capsuloganglionic region.**

CASE 11:

- **NAME: XYZ**
  - **AGE – 30YR**
  - **GENDER- MALE**
  - **CLINICAL HISTORY-** patient presented with the history of headache
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **Early diffuse cerebral atrophy is seen in the form of prominent sulci, sylvian fissure, basal cisterns and ventricles with deep fronto-parietal and periventricular white matter ischemic changes.**
- Gray and white matter differentiation is normal.
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **Bone window shows disuse symmetrical mild thicekening of calvarium**
- **IMPRESSION- Imaging findings are suggestive of early stage of dissue cerebral atrophy.**

CASE 12:

- **NAME: XYZ**
- **AGE – 34YR**
- **GENDER- MALE**
- **CLINICAL HISTORY-** patient presented with the history of RTA
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**

- **Multiple hyperdense areas of blood attenuation are seen in the left frontal lobe extending upto the basal frontal region, left temporal and left parietal lobes largest measuring approx.. 3*1.5*1.4com in the left basifrontal local suggestive of hemorrhagic contusions.**
- **A curvilinear hyperdensity of blood attenuation is seen in the left fronto parietal convexity with a minimum thickens of 6mm in the left fronto parietal convexity with a maximum thickens of 6mm in the left frontal convexity suggestive of sub dural hemorrhage**
- **There is thin undisplaced fracture of left temporal bone is seen.**.
- Basal ganglia are normal.

- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of**
- **Small hemorrhage contusions in the left frontal, left parietal and left temporal lobes as described.**
- **Subdural hemorrhage in the left fronto-parietal convexity.**
- **Thin undisplaced fracture of left temporal bone.**

CASE 13:

- **NAME: XYZ**
- **AGE – 35YR**
- **GENDER- FEMALE**
- **CLINICAL HISTORY-** patient presented with the history of Trauma
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **Small extra axial collection of blood attenuation in seen along the left fronto-temporal region with maximum thickness of 4.66mm. underlying brain parenchyma show focal cortical hyper densities with blood along the left sylvian fissure suggestive of subarachnoid hemorrhage.**
- **Scalp soft tissues hematoma is seen in right high parietal region.** Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of small subdural hematoma along left fronto-temporal region with underlying cortical contusions and left sylvian fissure SAH.**

CASE 14: sample

- **NAME: XYZ**
- **AGE – 49YR**
- **GENDER- FEMALE**
- **CLINICAL HISTORY-** patient presented with the history of RTA
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **Hyperdensity of blood attenuation is noted in right fronto-parietal sulcal spaces and right sylvian fissure suggestive of acute sub-arachnoid.**
- **A 10*4.5mm sized rounded blood attenuationarea is noted in sellar region, just adjacent to the right MI MCA.**
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.

- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of acute SAH in right fronto-parietal sulcal spaces and right sylvian fissure with a blood attenuation area in sellar region.**

CASE 15: Sample

- **NAME: XYZ**
- **AGE – 34YR**
- **GENDER- MALE**
- **CLINICAL HISTORY-** patient presented with the history of RTA
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **There is thin undisplaced fracture of left temporal bone is seen.**.
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of**
- **Small remnant extra-dural hematoma in the right frontal region.**
- **Changes of resolving contusions in right temporal region.**

- **CASE 16: Sample**
- **NAME: XYZ**
- **AGE – 4YR**
- **GENDER- FEMALE**
- **CLINICAL HISTORY-** patient presented with the complaint of vomiting and loss of consciousness.
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **III defined intra-axial hyerdense collection of blood attenuatiom measuring approx.. 53*25*26mm in size is seen involving the pons is extending into the bilateral cerebellar hemisphere. Marked perilesional edema is seen. It is causing effect in the form of effacement of the perpontine cistern and the 4th ventricle. Dilation of the bilateral lateral ventricles and 3rd ventricle is seen.**
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of**
- **VP shunt seen in situ with tip in the 4th ventricle**
- **Mild asymmetry of bilateral lateral ventricles is seen.**

- **Ill defined intra-axial hyperedense collection of blood attenuation measuring approx.. 41*14.9*13.7mm in six=ze is seen involving the pons is extending into the bilateral cerebellar hemisphere. Perilesional edema is seen.**
- **Small hemorrhage contusions in the left frontal, left parietal and left temporal lobes as described.**
- **Subdural hemorrhage in the left fronto-parietal convexity.**

CASE 17:

- **NAME: XYZ**
- **AGE – 21YR**
- **GENDER- MALE**
- **CLINICAL HISTORY-** patient presented with the compliant of fall from heigt.
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **There is evidence of extra-axial hyperdense collection of maximum thickness of 4.7mm along the left temporo-parietal convexity and extending into the falx- suggestive of subdural hemorrhage. There is no evidence of midline shift**
- **Multiple hemorrhage contusions are seen in bilateral basifrontal region with surrounding edema, the largest contusion m2esures of 3.1*1.6cm in size.**
- **Subgaleal hematoma with maximum thickness of 7.1mm is seen along the bilateral frontal, bilateral high parietal and right temporal convexity.**
- **There is a linear undisplaced fracture seen involving left and right parietal bone crossing the sagittal suture extending upto the right temopro-parietal bone crossing the sagittal suture extending upto the right temporo-parietal sutue and causing sutural diastasis with minimal adjacent hemomastoid.**
- **Another linear undisplaced fracture is seen involving left parietal bone.**
- Gray and white matter differentiation is normal.
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of mucosal thickening seen in the right maxillary sinus.**

CASE 18:

- **NAME: XYZ**
- **AGE – 78YR**
- **GENDER- FEMALE**
- **CLINICAL HISTORY-** patient presented with the compliant of HYPERTENSION
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**

- **Age related cerebral atrophy seen in the form of prominent sulci sylvian fissure , basal cisterns and ventricles with deep fronto-parietal and periventricular white matter ischemic changes.**
- **Few lacunar infracts are seen in the bilateral capsule ganglionic region.**
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of**
- **Mucosal thickening seen in the right maxillary sinus.**
- **Hypopneumatization of frontal sinus.**

CASE 19:

- **NAME: XYZ**
- **AGE – 42YR**
- **GENDER- FEMALE**
- **CLINICAL HISTORY-** patient presented with the compliant of MCA aneurysm
- **PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **Multiple post aneurysm treatment artefacts are seen in the region of left MCA.**
- **Rest of the visualized part of bran parenchyma does not show any significant abnormaility**
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.
- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of**
- **Mucosal thickening seen in the right maxillary sinus.**
- **Hypopneumatization of frontal sinus.**

- **CASE 20:**
- **NAME: XYZ**
- **AGE – 42YR**
- **GENDER- FEMALE**
- **CLINICAL HISTORY-** patient presented with the compliant of MCA aneurysm
- **5, PROCEDURE: NCCT BRAIN**
- **CURRENT STUDY REVEALS –**
- **Multiple post aneurysm treatment artefacts are seen in the region of left MCA.**
- **Rest of the visualized part of bran parenchyma does not show any significant abnormaility**
- Basal ganglia are normal.
- There is no evidence of midline shift.
- Cerebellum and brainstem appears normal.

- The ventricular system And the CSF spaces show normal configuration.
- The basal cisterns are normal.
- **IMPRESSION- Imaging findings are suggestive of**
- **Mucosal thickening seen in the right maxillary sinus.**
- **Hypopneumatization of frontal sinus.**

DATA ANALYSIS

Data Collection

Data generated during the conduct of study was reviewed from the medical records of the patients and then the variables were recorded into the data collection sheet for analysis

Data was obtained by descriptive statistics using n, mean, standard deviation and likelihood ratio test, which was used to characterize the sample

- The present study was undertaken to analysis the Association of schmorul's node of lumbar spine with different type of Modic changes.
- The data obtained was tabulated in Microsoft Excel spreadsheet and the analysis was done using Chi square test, Paired "t" test, Independent sample "t" test, were used tos check the P value ($P<0.05$was considered statistically significant) statistical significance between two or more categorial variables. Pears correlation coefficient was used to find the relation between variables.

RESULT

This prospective study included 70 patients.in which 52 were male and 18 were females.
Subdural changes are seen on most of male
GROUP A consist of NORMAL PATIENT (NO SDH)
10 Patients shows normal report having no pathology in which 5 were male and 5 were female
GROUP B consist of patient having SDH
In this 60 patients were found in which 13 were MALE and 47 were female.

Table 5.1 Age Range, mean and S.D. of participants.

A total of 70 patients participated in this study from age 4 to 60 years. The mean of their age is 28.

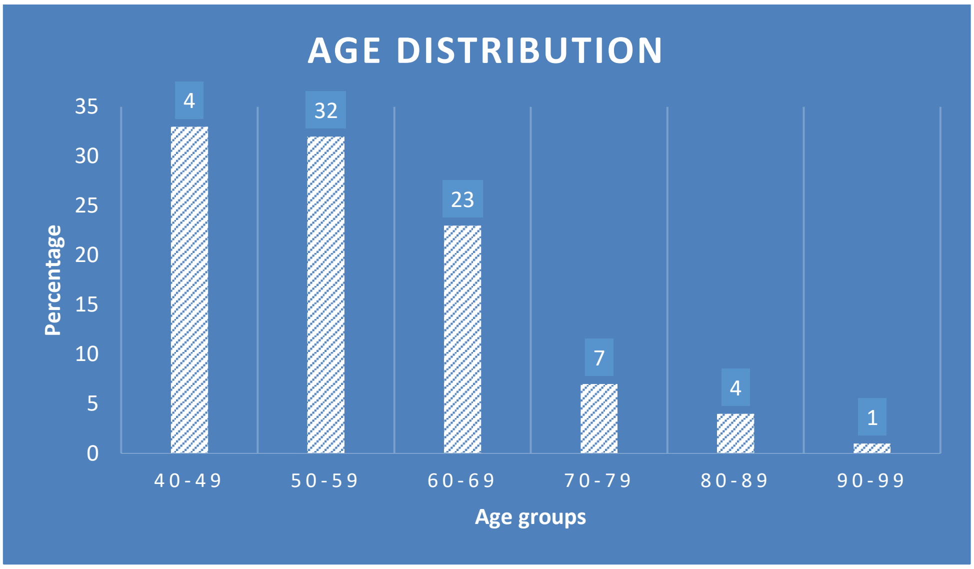
(n = 50)	Range	Mean	S.D.
Age	4 to 60	28.0	5.7

Table 5.2 Represents the percentage of males and females as well as their distribution of age.

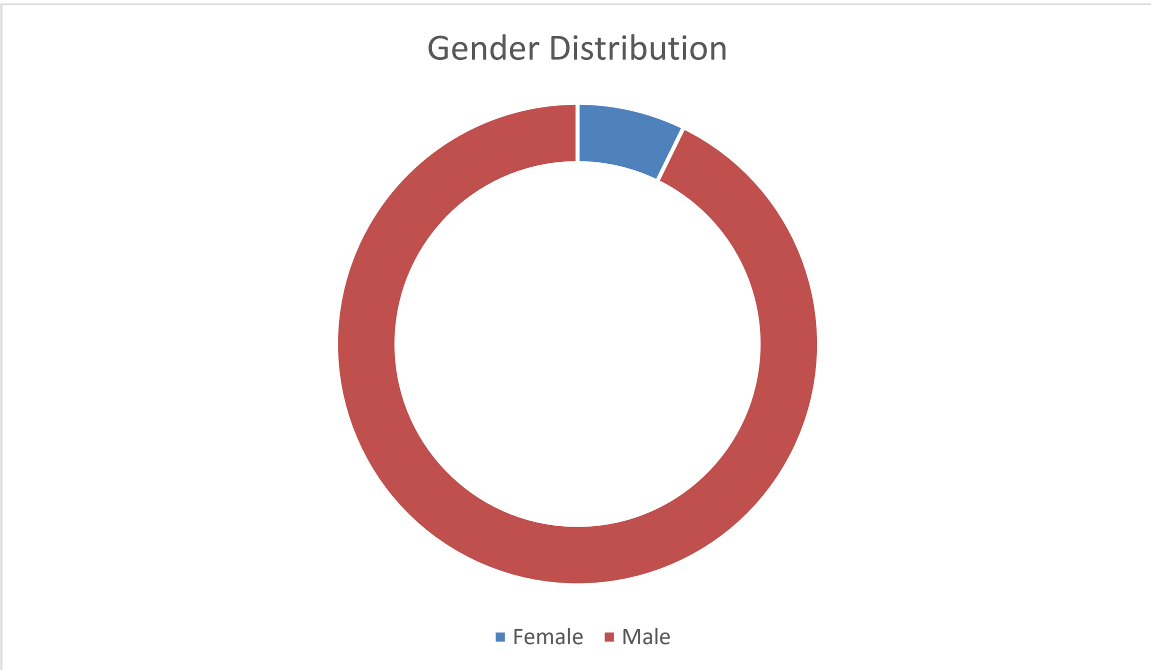
(n = 170)		Percentage
Age	4-13	4
	14-23	22
	24-33	20
	34-43	10

	44-53	8
	54+	6
Gender	Male	18
	Female	52

Age (In years)
70 patients



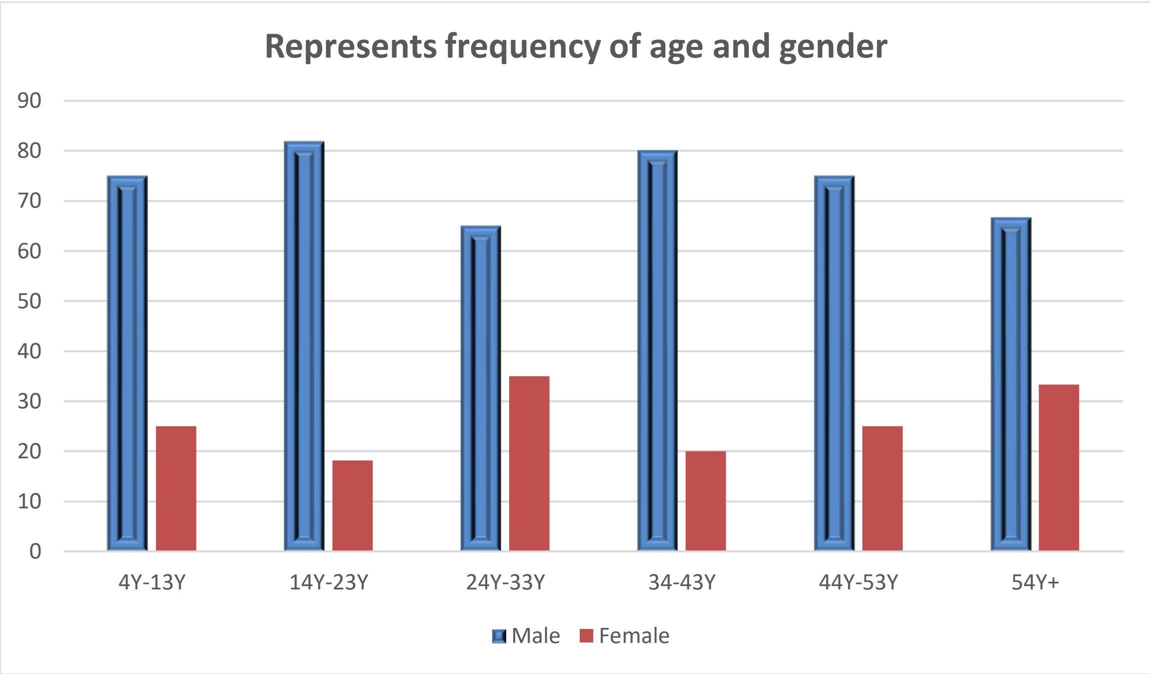
GRAPH 1 - AGE WISE DISTRIBUTION OF PATIENTS



GRAPH 2 – GENDER WISE DISTRIBUTION OF PATIENTS

TABLE –Represents frequency of age and gender

		Gender			
		Male		Female	
		n	%	n	%
Age	4-13	3	75	1	25
	14-23	18	81.81	4	18.18
	24-33	13	65	7	35
	34-43	8	80	2	20
	44-53	6	75	2	25
	54+	4	66.66	2	33.33

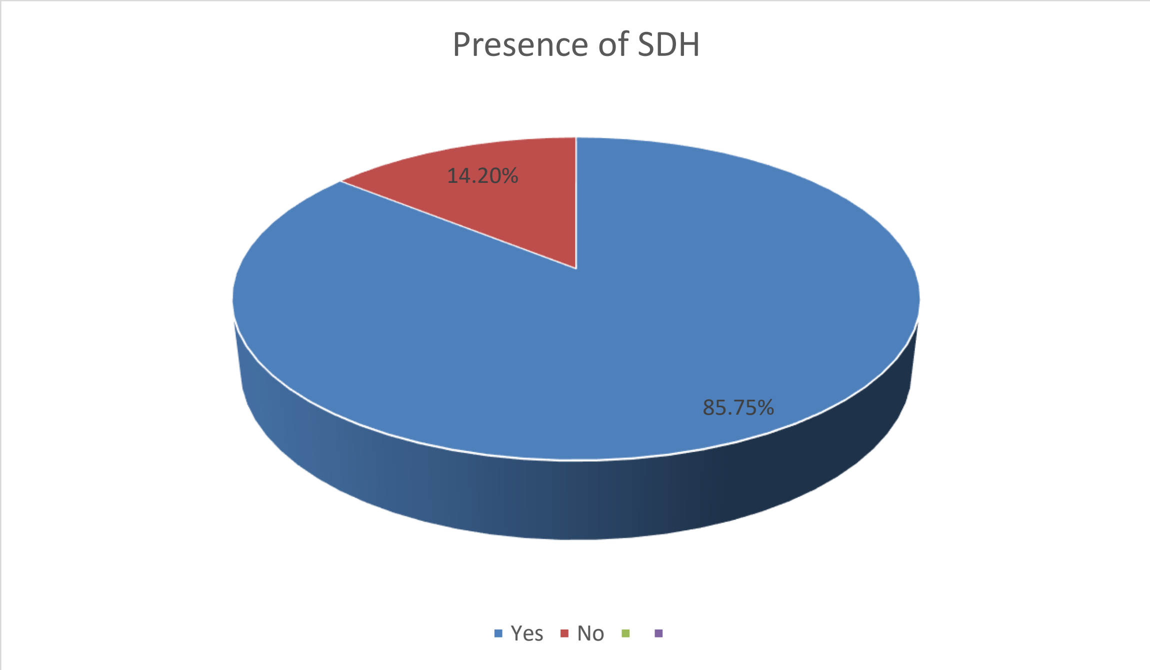


GRAPH – FREQUENCY OF AGE AND GENDER

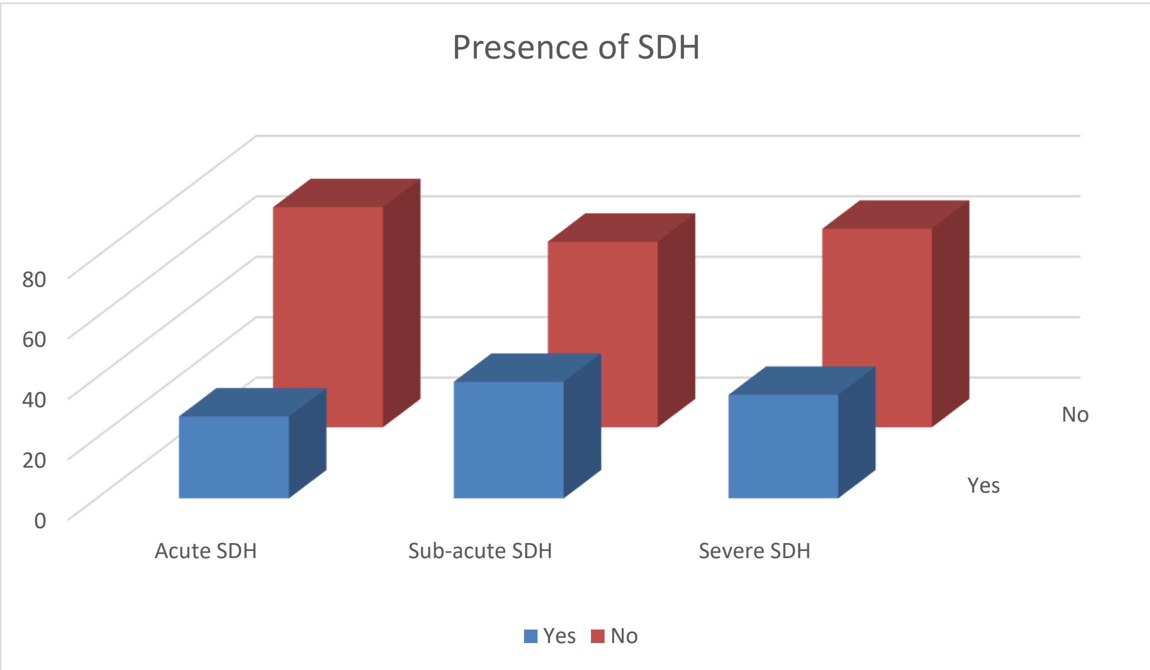
TABLE – Represents presence and absence of SDH along with their frequencies at Acute, Sub-Cute and Severe.

		Frequency	%
Presence of SDH	Yes	60	85.75
	No	10	14.2
Acute SDH	Yes	19	27.14
	No	51	72.85
Sub-acute SDH	Yes	27	38.57

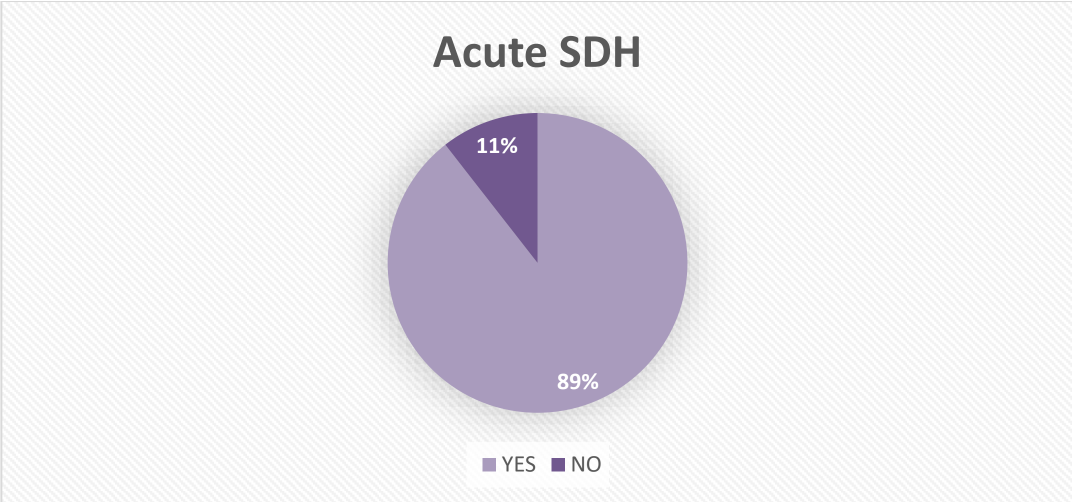
	No	43	61.42
Severe SDH	Yes	24	34.28
	No	46	65.71



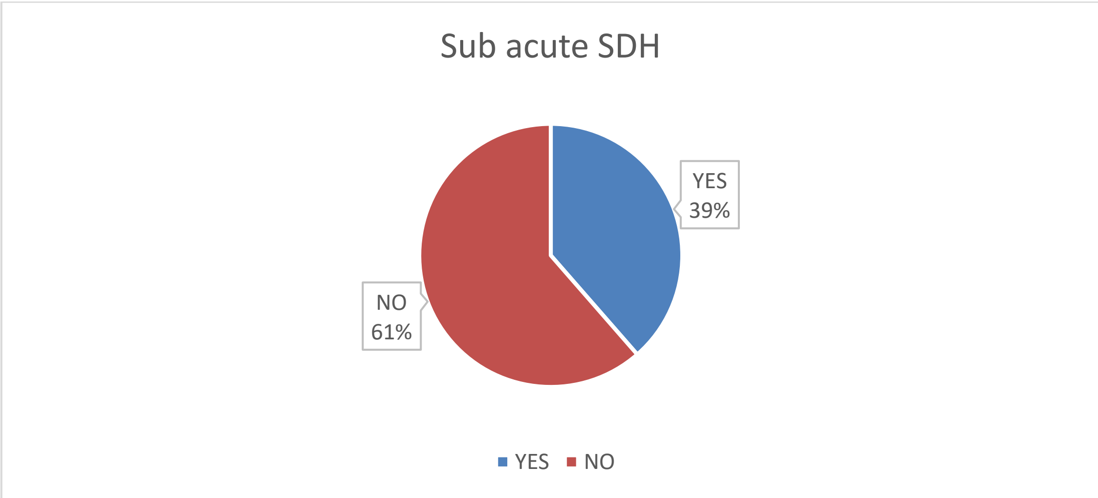
GRAPH 4 – PRESENCE AND ABSENCE OF SDH



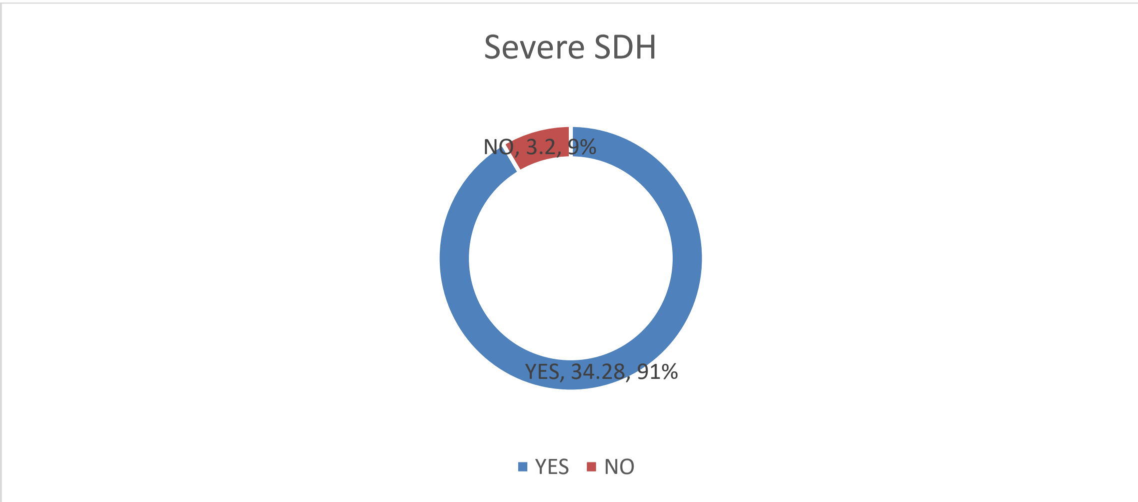
GRAPH – FREQUENCY OF SDH AT DIFFERENT LEVELS



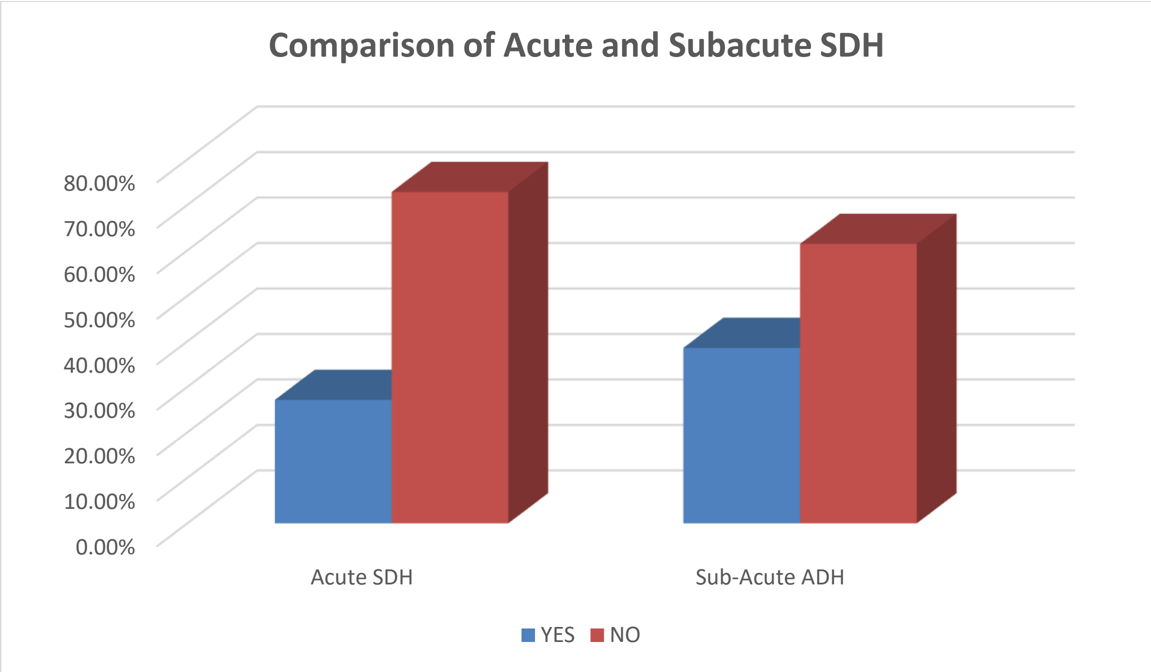
PIE CHART – Represents Acute SDH



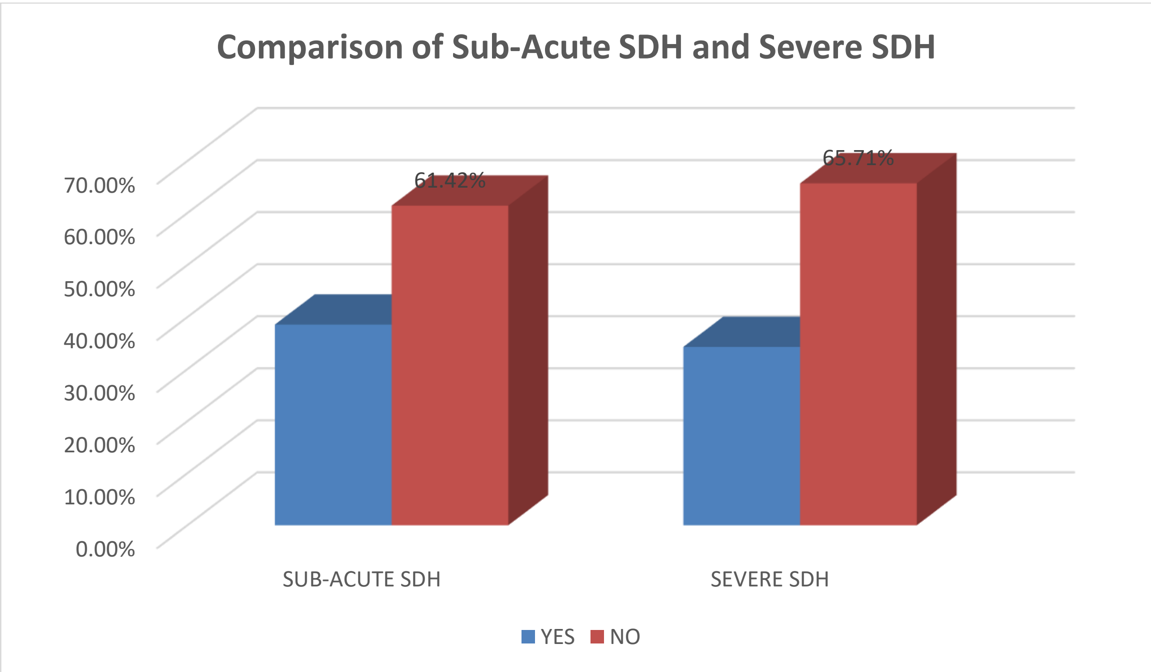
PIE CHART – Represents Sub acute SDH



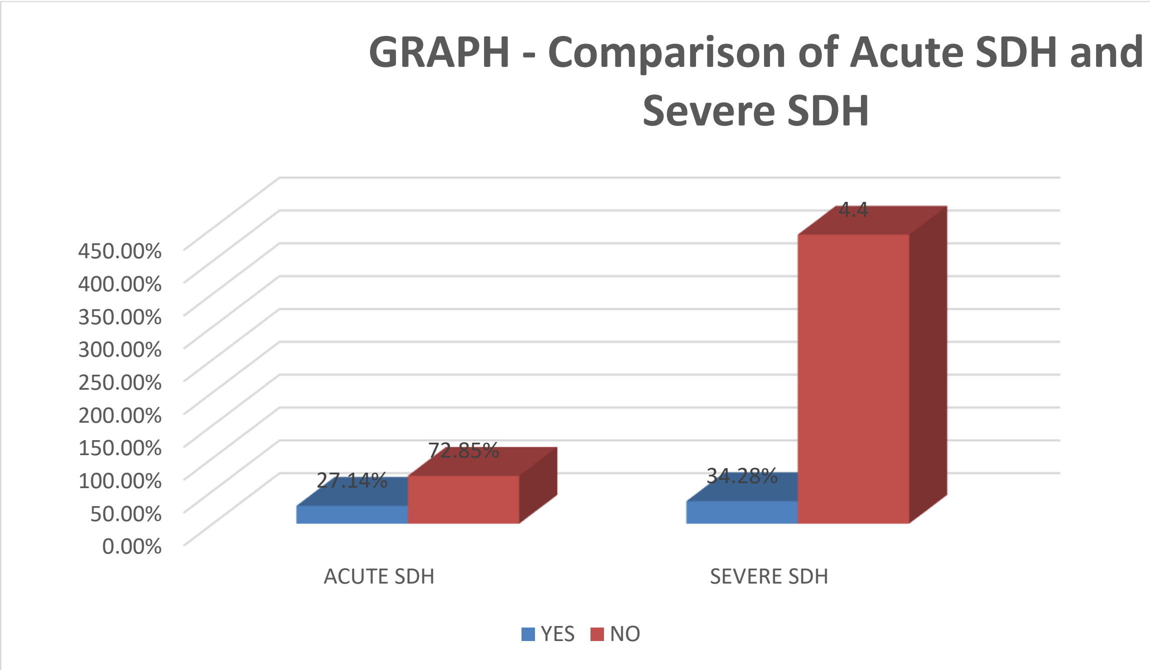
PIE CHART – Represents Severe SDH



GRAPH - Comparison of Acute and Subacute SDH



GRAPH - Comparison of Sub-Acute SDH and Severe SDH



GRAPH - Comparison of Sub-Acute SDH and Severe SDH

CHAPTER V: DISCUSSION

MAJOR FINDINGS OF THE STUDY

The study on subdural hematoma in traumatic brain injury patients using multi-detector computed tomography (MDCT) revealed several major findings. Firstly, the MDCT scans accurately depicted the location, size, shape, and density of the subdural hematomas. This information is crucial for understanding the extent of the hematoma and its potential impact on the surrounding brain structures. Secondly, the study highlighted the association between subdural hematomas and other traumatic brain injuries. The MDCT findings revealed important co-existing pathologies, such as midline shift and brain edema. These findings underscore the significance of assessing the overall brain injury burden in patients with subdural hematomas and may influence treatment decisions. Additionally, the study identified the potential of MDCT to aid in the quantification of subdural hematomas and midline shift. Accurate measurements of hematoma thickness and midline shift can provide valuable information for clinical decision-making, including the need for surgical intervention or monitoring. Furthermore, the study discussed the differential diagnosis of subdural hematomas, considering other conditions that may present with similar radiological features. This information is crucial for avoiding misdiagnosis and ensuring appropriate management. Overall, the major findings of the study underscore the importance of MDCT in the evaluation of subdural hematomas in traumatic brain injury patients. The technique provides detailed visualization and quantification of hematomas, helps identify associated brain injuries, and aids in accurate diagnosis and treatment planning. These findings contribute to the growing body of knowledge regarding subdural hematomas and may have implications for improving patient outcomes in clinical practice.

CONCLUSION DRAWN FROM THE STUDY

In conclusion, the study on subdural hematoma in traumatic brain injury patients using multi-detector computed tomography (MDCT) provides valuable insights into the diagnosis and assessment of this condition. The findings demonstrate the effectiveness of MDCT in accurately visualizing and characterizing subdural hematomas, including their location, size, shape, and density. The ability to quantify hematoma thickness and assess midline shift using MDCT measurements further enhances its clinical utility. The study also highlights the importance of considering associated traumatic brain injuries when evaluating subdural hematomas. The identification of midline shift and brain edema through MDCT can help clinicians better understand the overall impact of the hematoma on the surrounding brain structures, aiding in treatment decision-making and patient management. Furthermore, the study emphasizes the significance of differential diagnosis in cases of subdural hematoma. By considering other conditions that may mimic subdural hematomas, clinicians can avoid misdiagnosis and ensure appropriate interventions are implemented. Overall, the findings of this study support the use of MDCT as a valuable imaging modality in the evaluation of subdural hematomas in traumatic brain injury patients. The accurate visualization, quantification, and assessment of associated injuries provided by MDCT contribute to improved diagnostic accuracy and potentially enhance patient outcomes. These findings underscore the importance of incorporating MDCT into the clinical management of subdural hematomas, aiding in optimal patient care and treatment planning.

DISCUSSION

The discussion of the study on subdural hematoma in traumatic brain injury patients using multi-detector computed tomography (MDCT) revolves around several key points. Firstly, MDCT has proven to be a valuable imaging modality for evaluating subdural hematomas. Its ability to provide high-resolution images with multi-planar reconstructions allows for detailed visualization and characterization of the hematoma. The precise determination of location, size, shape, and density aids in accurate diagnosis and treatment planning. The association between subdural hematomas and other traumatic brain injuries is an important aspect discussed in the study. The identification of midline shift and brain edema through MDCT provides valuable information about the overall impact of the hematoma on brain structures. This knowledge is crucial for understanding the severity of the injury and making appropriate management decisions. The study also highlights the significance of accurate measurements obtained from MDCT in assessing subdural hematomas. The ability to quantify hematoma thickness and midline shift provides objective data that can guide treatment decisions, such as the need for surgical intervention or ongoing monitoring. Furthermore, the discussion touches upon the differential diagnosis of subdural hematomas. MDCT plays a crucial role in distinguishing subdural hematomas from other intracranial hemorrhages or lesions, such as epidural hematomas or contusions. This differentiation is vital for determining the appropriate course of treatment. Limitations of the study may also be discussed in this section. Factors such as potential observer variability, selection bias, or the need for further validation studies can be addressed to provide a comprehensive view of the study's findings. In conclusion, the discussion highlights the strengths of MDCT in evaluating subdural hematomas in traumatic brain injury patients. It emphasizes the role of MDCT in providing detailed anatomical information, assessing associated brain injuries, and aiding in accurate diagnosis and treatment planning. The discussion also acknowledges any limitations and areas for further research, contributing to the overall understanding and advancement of the field.

In addition to the points mentioned earlier, the discussion on subdural hematoma in traumatic brain injury patients with multi-detector computed tomography (MDCT) can cover the following aspects:

1. Comparison with other imaging modalities: The discussion may explore how MDCT compares with other imaging techniques, such as magnetic resonance imaging (MRI) or single-photon emission

computed tomography (SPECT), in the evaluation of subdural hematomas. This can include a comparison of diagnostic accuracy, sensitivity, and specificity, as well as considerations regarding availability, cost, and patient suitability.
2. Clinical implications and management decisions: The discussion can delve into how the findings from MDCT influence clinical decision-making and patient management. For example, it can highlight how the accurate characterization of subdural hematomas and associated brain injuries helps in determining the appropriate treatment approach, such as surgical evacuation, conservative management, or close monitoring.
3. Prognostic significance: The discussion may touch upon the prognostic implications of MDCT findings in subdural hematomas. This can involve exploring the relationship between hematoma characteristics (e.g., size, location) identified through MDCT and clinical outcomes, such as mortality, functional disability, or long-term cognitive impairment.
4. Radiological follow-up and treatment response: The discussion can address the role of MDCT in serial imaging to monitor the progression or resolution of subdural hematomas over time. This includes assessing the effectiveness of treatment interventions, such as surgical evacuation or medical management, by comparing pre- and post-treatment MDCT scans.
5. Future directions and advancements: The discussion may present potential areas of future research and technological advancements related to MDCT imaging of subdural hematomas. This can include emerging techniques like dual-energy CT, advanced image post-processing algorithms, or the integration of artificial intelligence for automated analysis and quantification.

It is important to support the discussion with relevant studies, literature, and clinical guidelines to provide a comprehensive and evidence-based perspective on the topic.

IMPLICATION OF THE STUDY

The implications of the study on subdural hematoma in traumatic brain injury patients with multi-detector computed tomography (MDCT) are significant for clinical practice and patient management.

Firstly, the study highlights the crucial role of MDCT in accurately diagnosing and characterizing subdural hematomas. The ability to visualize the hematoma location, size, shape, and density aids in precise diagnosis and classification of the injury. This information is valuable for determining the appropriate treatment approach, whether it involves surgical intervention, conservative management, or close monitoring.

Secondly, the association between subdural hematomas and other traumatic brain injuries identified through MDCT has important implications for patient outcomes. By detecting midline shift and brain edema, clinicians can better understand the overall impact of the hematoma on brain structures and assess the severity of the injury. This information helps guide treatment decisions, predict prognosis, and tailor management strategies to optimize patient care.

The study also underscores the utility of MDCT in providing quantitative measurements of subdural hematomas and midline shift. Accurate and objective measurements obtained through MDCT assist in clinical decision-making, including the selection of appropriate surgical candidates and the determination of treatment urgency. This improves the precision and efficiency of patient management, potentially leading to better outcomes.

Moreover, the study's findings regarding differential diagnosis contribute to reducing the risk of misdiagnosis and inappropriate management. MDCT aids in distinguishing subdural hematomas from other intracranial lesions, enabling clinicians to initiate timely and targeted interventions specific to the patient's condition.

Overall, the implications of this study highlight the invaluable role of MDCT in the evaluation and management of subdural hematomas in traumatic brain injury patients. By providing accurate visualization, quantitative measurements, and valuable diagnostic information, MDCT enhances clinical decision-making, improves patient outcomes, and contributes to the advancement of evidence-based practices in the field of traumatic brain injury management.

LIMITATIONS

Despite its significant benefits, the use of multi-detector computed tomography (MDCT) in subdural hematoma of traumatic brain injury patients has some limitations that should be acknowledged:

1. Radiation exposure: MDCT involves the use of ionizing radiation, which carries a potential risk, particularly in cases where multiple scans are required. This is a concern, especially in pediatric patients and individuals who require repeated imaging over time.
2. False negatives: MDCT may fail to detect small or subtle subdural hematomas, leading to false-negative results. This can occur if the hematoma is located in an atypical or difficult-to-detect location or if the scan is performed during the early stages of hematoma formation when it may not be clearly visible.
3. Image artifacts: MDCT images can be affected by artifacts, which may arise due to patient movement, metal implants, or other technical factors. These artifacts can degrade image quality and potentially obscure or distort the visualization of the subdural hematoma.
4. Limited soft tissue detail: While MDCT provides excellent visualization of bony structures, it may have limitations in assessing subtle soft tissue injuries or associated brain parenchymal injuries. Magnetic resonance imaging (MRI) is often considered complementary to MDCT in providing more detailed soft tissue evaluation.
5. Invasive nature: MDCT requires the administration of intravenous contrast agents in some cases, which carries a risk of allergic reactions and potential kidney damage, particularly in patients with underlying renal impairment or allergies to contrast agents.
6. Operator dependence: The interpretation of MDCT images requires expertise and experience. Variations in interpreting radiological findings among different radiologists may lead to inconsistencies in diagnosis and treatment decisions.

It is important for healthcare professionals to be aware of these limitations and consider them in the context of individual patient characteristics and clinical presentations. In some cases, additional imaging modalities or clinical assessment may be necessary to complement the information obtained from MDCT.

RECOMMDATIONS

Based on the study's findings on subdural hematoma in traumatic brain injury patients with multi-detector computed tomography (MDCT), several recommendations can be made to enhance clinical practice:

1. Integration of MDCT as a routine imaging modality: The study highlights the value of MDCT in accurately diagnosing and characterizing subdural hematomas. Therefore, it is recommended that MDCT be integrated into routine imaging protocols for traumatic brain injury patients suspected of having a subdural hematoma. This would ensure comprehensive evaluation and aid in appropriate treatment planning.

2. Standardized reporting and measurement guidelines: To improve consistency and facilitate effective communication among healthcare providers, it is recommended to establish standardized reporting guidelines for MDCT findings in subdural hematomas. This includes consistent terminology, measurement techniques, and anatomical reference points for reporting hematoma size, midline shift, and associated findings. Standardization would enhance the accuracy and reliability of MDCT interpretations and promote better interdisciplinary collaboration.
3. Training and expertise in MDCT interpretation: Given the diagnostic and prognostic implications of MDCT findings in subdural hematomas, it is essential for radiologists and clinicians to receive specialized training in MDCT interpretation. Continued education and training programs can help enhance the skills necessary for accurate diagnosis, quantification, and assessment of subdural hematomas. This would ultimately improve patient care and outcomes.
4. Multidisciplinary collaboration: Subdural hematomas in traumatic brain injury patients often require a multidisciplinary approach to management. Close collaboration between radiologists, neurosurgeons, neurologists, and intensivists is crucial for optimizing patient care. Regular multidisciplinary meetings and discussions can help facilitate the integration of MDCT findings into comprehensive treatment plans, leading to improved patient outcomes.
5. Further research and validation studies: The study highlights the potential for further research and validation studies to explore the use of MDCT in subdural hematoma evaluation. These studies could focus on larger patient populations, comparative analyses with other imaging modalities, and long-term follow-up to assess the impact of MDCT findings on patient prognosis and treatment outcomes. This would help strengthen the evidence base and guide future advancements in the field.

Implementing these recommendations would enhance the role of MDCT in the evaluation and management of subdural hematomas, ultimately leading to improved patient care, standardized reporting, and informed treatment decisions.

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