بسم الله الرحمن الرحيم

Sudan University ofScience and Technology

{SUST}

Collage of Graduate Studies

Study of traumatic head injuries by using computerized tomography

دراسة اصابات الرأس باستخدام الأشعة المقطعية

A thesis submitted as partial fulfillment for the requirement of MSC in Diagnostic Radiology

by:

Dalia Osman Mohammed Alzain.

Supervisor by:

Dr.Mona Mohamed Ahmed.

November 2016

الآيـة

قال تعالى:

{قال رب اشرح لى صدري(25) ويسر لي أمري(26) واحلل عقدة من لساني(27)}

صدق الله العظيم

سورة طه

الآية 25-27

Dedication

TO SOUL OF MY FATHER........

MOTHER.......AND SISTERS

TO MY BROTHERS

TO MY

FRIENDS

TO MY TEACHERS.....

Acknowledgments

First of all I would like to thank my supervisor, Dr Mona Mohamed Ahmed, for guiding me, for all the endless hours of support and corrections of my paper and thesis. She is always encouraging me to maintain good spirits and hard work.My warmest thanks also to my colleges, who inspired me to go into the exciting field and his valuable advices.

Contents

List of tables

List of Figures

Abbreviations

ANS	Autonomic Nervous System
CNS	Central Nervous System
CSF	Cerebrospinal Fluid
C.T	Computerized Tomography
I.V	Intravenous
M.R.I	Magnetic Resonance Imaging
Pt	Patient
RTA	Road Traffic Accident
SDH	Subdural Hemorrhage
SPSS	Statistical Package for Social Sciences
TBI	Traumatic Brain Injury

Abstract

The computerized tomography have a role in diagnosing head injuries .Objective of this study was to studyhead injuries by using Computerized   tomography .This study is done in Khartoum state in C.T department in Ibrahim Malik teaching hospital study was carried out in 54 Pts males and females aged (1-80 years) during January - March 2016, The study is concerning patients with head injuries the incidence of the head injuries is higher in males rather than females, and the occurrence had been at the age less than 25 years (24 cases-44.4%). Most of the head injuries were caused by road traffic accidents (RTA) (33 cases – 61.1%), The types of fracture as follow as linear fracture (50.1%- 27 cases) , multiple skull fracture (20.4%- 11 cases) and depress fracture with percent (13%-7 cases) According to C.T findings the study showed that head injuries were subdural hemorrhage more common with percent (29.6%- 16 cases) , hemorrhagic contusion with percent (18.5%-10 cases) ,Epidural hemorrhage with percent (18.5% -10 cases) , Epidural hemorrhage with contusion with percent (11.1 % - 6 cases) , mid line shift with percent(3.7% - 2cases), intra cerebral hemorrhage and intra ventricular hemorrhage as same percent(1.9%- one case) and normal finding with percent (9.3% - 5 cases).

C.T is ideal method for the initial examination of patients sustaining traumatic head injuries.

الملخص

تهدفهذهالدراسةاليدراسةتشخيصأصاباتالرأسبواسطة الأشعةالمقطعية.
تمتهذهالدراسةفيولايةالخرطومفيمستشفيإبراهيممالكالتعليمي (قسمالأشعةالمقطعية) تمأختيار 54 مريضمنالرجالوالنساءتتراوحاعمارهممابينسنةالي 80 سنةفيالفترةمنيناير اليمارس 2016.
تمأخذاسبابالاصابةونتيجةالاشعةالمقطعيةفكانتنتيجةهذهالدراسةحالاتالاصابةلديالرجالاعليمنالنساءفيالاعمارالاقلمن 25 سنة (24 حالةبنسبة 44.4%) ومعظمحالاتاصاباتالرأسكانتبسبب الحوادث

المرورية (33حالةبنسبة 61.1%) فيهذهالدراسةانواعالكسورعلىالنحوالتالي:-
الكسرالخطي (50.1٪ - 27 حالة)،كسرفيالجمجمةمتعددة (20.4٪ - 11 حالة) وكسرمنخفضبنسبةالمائة (13٪ -7 الحالات)
ووفقالنتائجالتصويرالمقطعيفيهذهالدراسةأظهرتأنإصاباتالرأسكانتالنزفتحتالجافيةأكثرشيوعامع فيالمئة (29.6٪ - 16 حالة)،النزفيةكدمةمعفيالمئة (18.5٪ -10 الحالات) ،برنامجالتحصينالموسعنزيفمعفيالمئة (18.5٪ -10 الحالات)،برنامجالتحصينالموسعمكدمةمعفيالمئة (11.1٪ - 6 حالات)،وتحولخطمنتصفمعفيالمئة (3.7٪ - 2cases)،والنزفالدماغيداخلوداخلالنزفالبطينيكمانفسالنسبة (1.9 ٪ - حالةواحدة) والنتيجةطبيعيةمعفيالمئة (9.3٪ - 5 حالات)
الأشعةالمقطعيةهيالأسلوبالأمثللإجراءالفحصالأوليللمرضىالمصابينبجروحفيالرأس.

Chapter one

1-1INTRODUCTION:

Any injury that results in trauma to the skull or brain can be classified as a headinjury. The terms traumatic brain injury and head injury are often used interchangeably in the medical literature. This broad classification includes neuronal injuries, hemorrhages, vascular injuries, cranial nerve injuries, and subdural heammorhage, among many others. These classifications can be further categorized as open (penetrating) or closed head injuries. This depends on if the skull was broken or not. Because head injuries cover such a broad scope of injuries, there are many causes—including accidents, falls, physical assault, or traffic. Adults suffer head injuries more frequently than any age group. Their injuries tend to be due to falls, motor vehicle crashes, colliding or being struck by an object, and assaults. Children, however, tend to experience head injuries due to accidental falls and intentional causes (such as being struck or shaken). Head injury often occurs in toddlers as they learn to walk. Head trauma is a common cause of childhood hospitalization. Brain injury can be at the site of impact, but can also be at the opposite side of the skull due to a contrecoup effect (the impact to the head can cause the brain to move within the skull, causing the brain to impact the interior of the skull opposite the head-impact).If the impact causes the head to move, the injury may be worsened, because the brain may ricochet inside the skull causing additional impacts, or the brain may stay relatively still (due to inertia) but be hit by the moving skull (both are contrecoup injuries).https://en.wikipedia.org/wiki/Traumatic_brain_injury.

1.2 Objectives of the study:

to study head injury by Computerized tomography.

1.2.1 Specific objectives:

1-Todetermine the incidence of head injuries in Khartoum state..

2-To identify the main types of head injuries.

3-To highlight the role of C.T in head injuries.

1.3Hypothesis:

C.T is more efficient method than conventional X-ray in diagnosing head injury.

1.4 Problem of study:

Most pts with head injuries diagnosed firstly by conventional X-ray which does not show intra cranial hemorrhage.C.T scan is more accurate than conventional X-ray.

1.5 overview of the study:

The research contains five chapters:

Chapter one: include introduction, objectives, Hypothesis, problem of study, sample size, area of the study and overview of the study,

Chapter two: include brain anatomy, pathology, and previous study.

Chapter three: include material and method.

Chapter four: include the results of the study.

Chapter five: include discussion, conclusion and recommendation, references and appendix.

Chapter Two

2.1 Anatomy:

2.1.1 Skull:

The skull or bony skeleton of the head is divided into two main sets of bares the 8 cranial bones and 14 facial bones cranial bones are divided into the clavaria " skull cap" and floor .

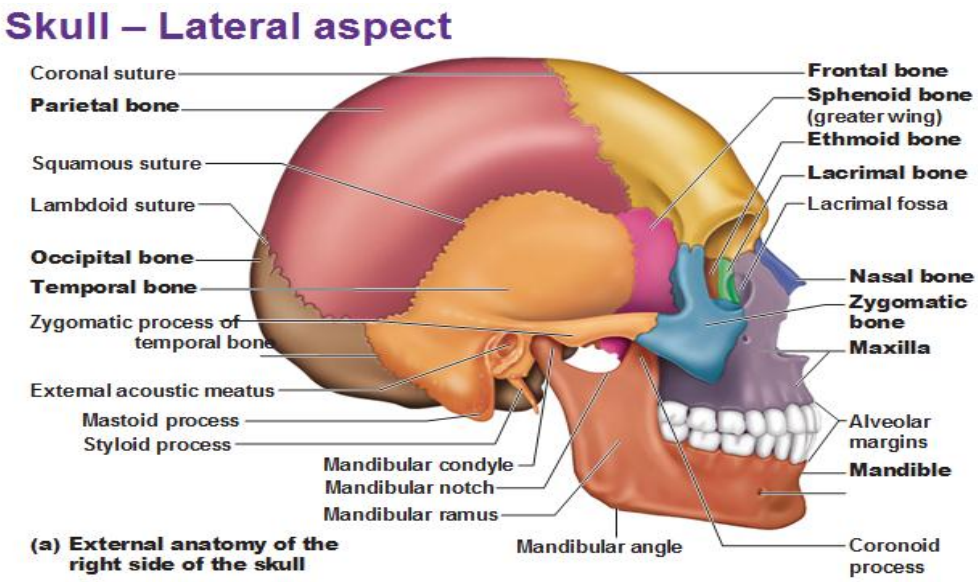


Figure (2-1):the skull anatomy (lateral view), (Antranik et al 2011).

2.1.1.1 Cranium: The cranium is composed of eight bones that surround and protect the brain. These bones include the occipital, 2 temporal, sphenoid 1, ethmoid 1, parietal 2, and frontal1.(Kelley,1997)

2.1.1.2Occipital bone: forms the inferior posterior portion of the cranium and the posterior cranial Fossa, on the inferior portion of the occipital bone is a large oval aperture called the foramen magnum. This opening allow the brain stem to continue as the spinal cord , the occipital bone can be divided into four portions lateral condyles 2 , basilar portion 1 , and squamous portion.(Kelley,1997)

2.1.1.3Temporal bone: the two temporal bones contain many complex and important structures. They form part of the sides and base of the cranium and together with sphenoid bone, create the middle cranial Fossa. The temporal bone can be divided into four portions squamous, tympanic, mastoid and petrous.(Kelley,1997)

2.1.1.4Sphenoid bone: the butterfly-Shaped sphenoid bone extends completely across the floor of the middle cranial Fossa. This bone forms the majority of the base of the skull and articulates with the occipital, temporal, parietal, frontal and ethmoid bones, the main ports of the sphenoid bone are the body, lesser wings 2 and greater wings 2 located within the body of the sphenoid bone is a deep depression called the sella turcica which houses the hypothesis (pituitary gland).

2.1.1.5Ethomoid bone: is the smallest of the cranial bones and is situated in the anterior cranial Fossa, this cube – shaped bone can be divided into four parts: horizontal portion, vertical portion and two lateral masses (labyrinths). The horizontal portion called the cribriform plate, articulates with the frontal bone this plate contains many foramina for the passage of olfactory nerves.(Kelley,1997)

2.1.1.6Frontal bone: the frontal bone consists of a vertical and a horizontal portion. The vertical or squamous portion forms the forehead and anterior vault of the cranium (Kelley, 1997)

2.1.1.7Parietal bone: the two parietal bones form a large portion of the sides of the cranium the parietal bones articulate with the frontal , occipital , temporal and sphenoid bones. The superior point between the parietal bones is the vertex, which is the highest point of cranium. (Kelley, 1997).

2.1.1.8Facial bones:

The face is made up of fourteen facial bones , the facial bones can be difficult to differentiate because of their relatively small size and irregular shape they consist of nasal2 , lacrimal 2 , maxilla2, zygoma 2, palatine 2, inferior nasal conches 2, vomer 1 and mandible 1 (Kelley,1997).

2.1.2 Brain:

Meaningsare the membranes which cover the brain and spinal cord. They are the outer duramater, the middle machnial mater and the inner pia maters:

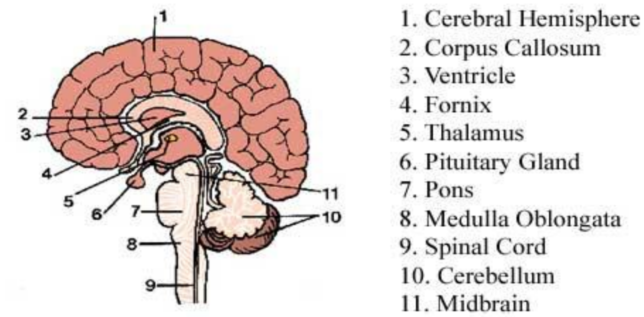


Figure (2.2): Anatomy of Brain, (http://mybrainnotes.com)

2.1.2.1 Dura mater:

This has two layers, an outer, endosteal layer, which consists of the endosteum (periosteum) of the inner surface of the skull bones, and an inner, meningeal layer. The tub layers are indistinguishable from each other except where they separate to enclose the dural venous sinuses. The endosteal layer fuses with the periosteum of the margins of the forming and sutures. It remains adherent to the bones. The meninged layer is dense strong fibrous membrane which forms the proper Dura mater covering the brain, and continuous with the Dura mater of the spinal cord. This layer ensheaths the cranial nerves, at the foramina, as they leave the cranial cavity. (Qurashi, 1998).

2.1.2.2Dural septa:

The Dura mater also sends four income plate septa which divide the cranial cavity into communicating comportments lodging the various parts of the brain, these are the: the falx cerebri, tentorium cerebella, falx cerebella and diaphragm sellae. There important function is to restrict displacement of the brain during sudden movement. (Qurashi, 1998).

2.1.2.3 The falx cerebral: is a sickle shaped fold of meningeal layer of Dura mater which occupies the median longitudinal fissure between the cerebral hemispheres. It's anterior and is attached to the frontal crest and crista galli, its posterior end reaches the internal occipital protuberance and joins the highest points in the tentorium cerebella. The superior sagittal sinus runs in its upper convex edge, between the crista galli and the internal occipital protuberance.

The inferior sagittal sinus runs in its inferior concave free margin. The straight sinus occupies the line of the attachment of the falx cerebral with the tentorium cerebella. . (Qurashi, 1998).

2.1.2.4The tentorium cerbeli: is ten-like roof for the posterior cranial Fossa, which separates the cerebrum from the cerebellum. It has a convex superior surface which supports the occipital lobes of the cerebella hemispheres. It has free anterior edge that surrounds an opening, the tentorial notch. The edge is attached to the anterior and posterior clinoid processes. The notch is occupied by the midbrain. Anterolaterally, the tentorium is attached to the superior petrosal sinus. Posterior and laterally, it is attached to the edges of the groove for the transverse sinus on each side of the occipital bone. The falx cerebra and Falx cerebella are attached to the superior and inferior surfaces of the tentorium cerebella respectively. The lower layer of the tentorium cerebella pouches for wards near the apex of the petrous temporal bone below the superior petrosal sinus to form recess between the endosteal and meningeal layers of the middle cranial Fossa. The recess is called trigeminal (cavum trigeminal). It covers the roots of the nerve and the proximal art of the ganglion of the trigeminal nerve. . (Qurashi, 1998).

2.1.2.5The Falx cerebella:is a small sickle. Shaped Dural fold in the sagittal plane between the two tube cerebella hemispheres. It extends along the occipital crest from the inferior surface of the tentorium. Its anterior edge is free and its posterior fixed margin contains the occipital sinus. (James, 2002).

2.1.2.6 The diaphragm sellae: is a small circular dural sheath which roofs the sella turcica. It covers the pituitary gland, hypothesiscerebral. It contains a central hale for the stalk of the pituitary gland.

Blood supply and innervations of Dura mater the arterial supply comes from meningeal branches of the arterial carotid artery for the anterior Fossa, maxillary artery for the middle Fossa, and vertebral, ascending pharyngeal.

And occipital arteries for the posterior Fossa. The largest of these branches is the middle meningeal artery. The arteries lie in the extra Dural space. The veins follow the arteries the middle meningeal veins drain to the ptrygoid venous plexus.

The Dura mater is innervated by bronchus from the trigeminal, vagus, upper three cervical nerves and the sympathetic system. The Dura mater of the anterior and middle Fossa is supplied by branches from the divisions of the trigeminal nerve. Meningeal nerves to the posterior Fossa are derived from the upper three cervical, vagus and hypoglossal nerves. (James, 2002).

Due to the presence of numerous nerves ending the Dura matter is sensitive to stretch which produces headache pain from the Dura above the tentorium is referred to the same side of the head while that from the infra-tentorial regions is referred to the back of the head and neck (distribution of the greater occipital nerve). (Qurashi, 1998).

2.1.2.7 Arachnoids matter:

This is the middle layer it is thin delicate imtermede membrane which is closely related to the Dura mater externally the space between the Dura and arachnoids, subdural space, is a site where hemorrhage may occur, subdural hemorrhage. The space between the Dura and arachnoids, subdural space, is a site where hemorrhage may occur, subdural hemorrhage. The space between the arachnoids and pia, sub arachnoids space, is filled with C.S.F, blood ,blood vessels and fine strands which traverse the space, the arachnoids bridges the sulci of the brain in which the pia dips allowing the subarachnoid pia are widely separated to form cisterns. The largest of these is the cerebellomeduallary cistern (cistern magna) between the inferior surface of the cerebellum and posterior surface of the medulla oblongata. The interpeduncular and pontine cisterns lie between the cerebral peduncles and the ventral surface of the pons, respectively. The cisterns communicate freely with each other and with the remainder of the subarachnoid space.The arachnoids mater forms small finger. Like processes which protect into the venous sinuses to form arachnoids villi which are most numerous along the superior sagittal sinus. The villi aggregate to form arachnoids granulations. The Dura is pushes into the venous sinus by villi and fuses with the endothelial lining of the sinus. The arachnoids villi are the main sites at which the CSF returns to the circulation.Structures leaving or entering the brain pass through the subarachnoid space. These include the cerebral arteries and cranial nerves. The arachnoids mater fuses with the epineurium of the nerves of the point of their exit from the skull. The arachnid around the optic nerve extends to be attached to the sclera allowing the space to reach the eyeball. This allows easy detection of intracranial pressure by examination of retina.The C.S.F which is produced by the choroid plexus of the lateral, third and fourth ventricles of the brain escapes from the ventricular system by three foramina in the roof of the fourth ventricle. The CSF enters the subarachnoid space and circulates around the brain and spinal cord down to the second sacral vertebra, where the space ends. (James, 2002).

2.1.2.8 Pia mater:

This is a thin vascular connective tissue sheet which covers the gyri and dips into the sulci of both the cerebrum and cerebellum. It extends on the cranial nerves and fuses with their epinurium. It ensheaths the blood vessels as they enter the substance of the brain. The cella choroidea of the third and fourth ventricles if formed by the Pia and ependyma fused around the choroid plexus. (James, 2002).

2.1.2.9 The cerebrum:

The cerebrum consists of two symmetrical hemispheres, the outer layer of the cerebrum is known as the cortex and this is arranged in connections, that is deep irregularly shaped fissures or indentations. This is the gray matter of the brain.Under Neath the cortex lies nerve fiber or whit matter the function of the cerebrum is to control voluntary movement and to receive and interpret conscious sensations. It is the seat of the higher functions such as the senses, memories, reasoning, intelligence and moral sense. (James, 2002).

2.1.2.10 the medulla oblongata:

The medulla oblongata is about 3 cm long and connecting the rest of the brain with the spinal cord with which it is continuous. it is made up of interspersed white and grey matter, the medulla oblongata not only acts as the linked between the brain and the CNS of the body but it is also the centre of those parts of the ANS which control the heart , lungs , processes of digestion , etc . (James, 2002).

2.1.2.11 The Pons varoli:

Is bridge of nerve fibers linking the right and left hemispheres and also the cerebellum with the cerebrum above and the medulla oblongata below all impulses which pass between the brain and the spinal cord traverse the Pons varoli(James, 2002).

2.1.2.12 the pituitary gland:

Or hypothesis is a small gland about the size of a pea and lies in the pituitary Fossa in the space of the Skull. Its Function is control other endocrine glands in the body, it secretes hormones that control sexual development, promote bone and muscle growth and respond to stress and fight disease. (James, 2002).

2.1.2.13 the hypothalamus:

Is situated in the area of the floor of the third ventricle of the brain and it exercise an influence over the autonomic nervous system. It contains the heat regulating centre and is generally believed to be involved with appetite. (James, 2002).

2.2 Pathology of TBI:

Cerebral Trauma is most frequent in young males who may then survive with varying degrees of incapacity for many years .Injuries affecting the brain fall into three groups:

2.2.1 Epidural hematoma:

Develop after rupture of one of the meningeal arteries, usually the middle meningeal, that run between the drug and the skull. Since the drug is in part, the periossteum of the skull and is therefore firmly attached to it,a skull fracturesis usually present. Because they are a product of arterial bleeding. Epidural hematomas accumulate quickly and cause rapid and progressive rise in intracranial pressure, which usually develops within minutes to a few hours of the trauma typically; patients recover from the initial trauma. If not immediately drained it will produce brain herniation, medullary compression leads to respiratory. (Robbins, 1987).

Fig (2.3): CT Brain Epidural Hematoma, (medmnemonics.wordpress.com)

2.2.2Subdural Hematoma:

Occur after rupture of some of the bridging veins that connect the renous system of the brain with the large venous sinuses that are enclosed within the dura.

Since the brain in its both or C.S.F can move, where as the verous sinuses are fixed, the displacements of the brain that occur in trauma can tear some of these deticate veins at the point where they penetrate the durra, with subsequent bleeding into the subdural space, SDH occur most frequently over the convexities of the hemispheres , where the freedom of movement of the brain is greatest, and are brain that occur in trauma can tear some of these dedicated veins at the point where they penetrate the dura, with subsequent bleeding into the subdural space, SDH occur most frequently over the convexities of the hemispheres , where the freedom of movement of the brain is greatest, and are Relatively infrequent in locations such as the Posterior fossa, where little movement is possible , they may be either acute or chronic.(Robbins, 1987).

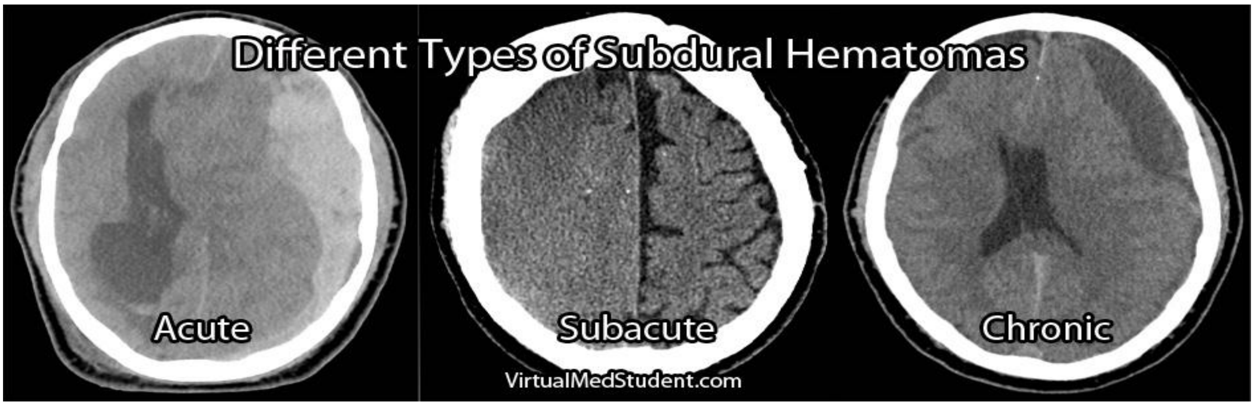


Figure (2.4): CT Brain Subdural Hematoma, **(www.virtualmedstudent.com).**

2.2.2.1A cute subdural hematoma:

Brain disorder involving a collection of blood in the space between the inner and the outer membranes covering the brain where symptoms usually develop within a short time after a headinjury. (Robbins, 1987).

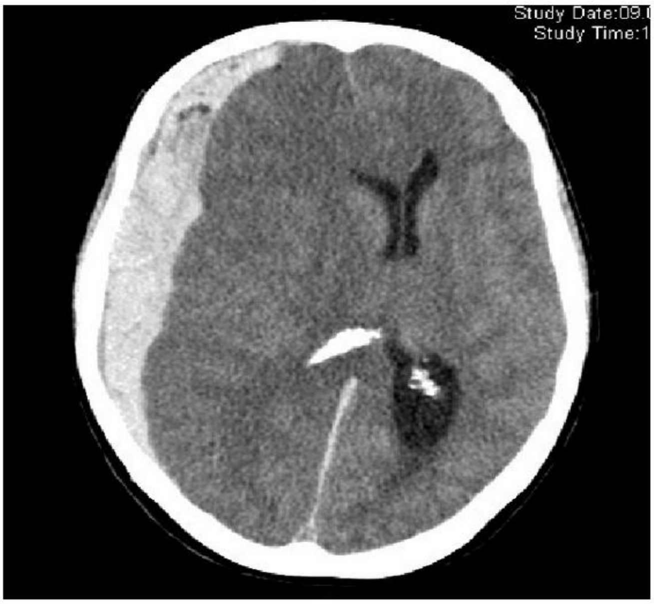


Figure (2.5): CT Brain Acute Subdural hematoma, (Robbins, 1987).

2.2.2.2 Chronic subdural hematoma:

A brain disorder involving a collection of blood in the space between the inner membranes that cover the brain and the outer membrane covering the membranes of the brain with symptoms occurring 2 weeks or move after the causative injury . (Robbins, 1987).

Figure (2.6): CT Brain Chronic Subdural hematoma, (Robbins, 1987).

2.2.3 Parenchyma injuries:

Trauma to brain itself can be grouped under five headings:

2.2.3.1Concussion: is a transient loss of consciousness following head trauma. The duration of unconsciousness is usually short but may last for some hours. (Robbins, 1987).

2.2.3.2Contusions: blunt trauma crushes or bruises brain tissue without rupturing the Pia. The most common sites of contusions are directly related to trauma, in which case they may be at the site of impact coup lesions) or at a point opposite(countercouplesions). Where the brain in motion strikes against the inner surface of the skull. (Robbins, 1987).

Figure (2.7): Left temporal hemorrhagic contusion, (Robbins, 1987).

2.2.3.3Lacerations: are tears produced by severe blunt trauma sometimes with an associated fracture followed by hemorrhage and necrosis. Resolution of lacerations is similar to that of contusions, except that is resulting in an irregular, yellow brown, gliotic scar that in valve not only cortex but also the deep underlying structures. (Robbins, 1987).

2.2.3.4Diffuse axonal injury: it occurs in patients who have severe neurologic impairment but do not have massive grossly visible brain damage. Microscopically there is diffuse damage to white matter in the form of ruptured axon; the patient is comatose complication of trauma. It occursin patients who have severed neurologic impairment but do not have massive grossly visible brain damage.Microscopically there is diffuse damage to white matter in the form of ruptured axons, the patient is comatose. (Robbins, 1987).

2.2.3.5Complication of trauma: Brainedema brains her nation, brain stem compression infections hydrocephalus, epilepsy. (Robbins, 1987).

2.2.4 Fractures:

Fracture or break in the cranial (skull “ bones) fractures of the skull are common complications of trauma to the head , these fractures may be closed or open, linear or comminuted and may or may not be depressed. They may be occult or evident from the presence of blood or CSF draining from the nose or ears. (Robbins, 1987).

2.2.4.1Linear skull fracture:

Does a break in cranial bone resembleat inline, without depression or distortion of bone (Robbins, 1987).

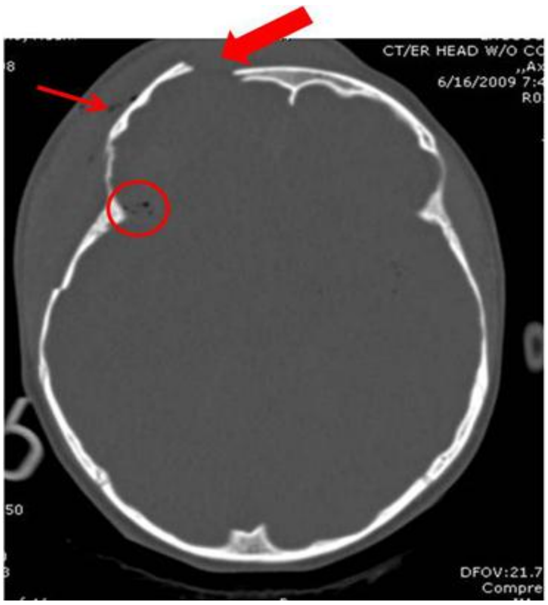


Figure (2.8): CT Brain Linear Skull Fracture, (Robbins, 1987).

2.2.4.2Depressed skull fracture:

Is a break (in a cranial bone) or crushed, portion of skull) with depression of the bone in toward the brain. (Robbins, 1987).

Figure (2.9): CT Brain Depressed Skull Fracture, (Robbins, 1987).

2.2.4.3 Compound fracture:

Involvesbreak in or loss of skin and splintering of the bone. (Robbins, 1987).

2.3 Previous study:

Study done by Abd Elrahim et al in emergency neurosurgery department of Teaching Khartoum Hospital, is the only specialized department in Sudan, which deals with the management of head injury patients. The objective of the study is to maintain the efficiency of CT in diagnosing head injuries as a first accurate radiological Investigation in emergency department. This study is descriptive case study concerning patients with head injuries in order to compare between CT and conventional skull x-ray investigations. The incidence of the head injuries is Higher in males rather than females, and the occurrence had been at the age of 16-30 years. Most of the head injuries were caused by road traffic accidents (RTA) (158 cases – 63.2%). No difference between the CT scanning and the Conventional skull x-ray in demonstrating the linear fractures of the skull (100% to 98.7%). The incidence of the head injuries is higher in males rather than females, and the occurrence had been at the age of 16-30 years. Most of the head injuries were caused by road traffic accidents (RTA) (158 cases – 63.2%).

Second study INTERNATIONAL STUDY done by Dr.Broder JS 2010that showed Non contrast computed tomography (CT) provides important diagnostic information for patients with traumatic brain injury. A systematic approach to image interpretation optimizes detection of pathologic air, fractures, hemorrhagic lesions, brain parenchyma injury, and abnormal cerebrospinal fluid spaces. Bone and brain windows should be reviewed to enhance injury detection. Findings of midline shift and mass effect should be noted as well as findings of increased intracranial pressure such as hydrocephalus and cerebral edema, because these may immediately influence management. Compared with CT, magnetic resonance imaging may provide more sensitive detection of diffuse axonal injury but has no proven improvement in clinical outcomes. This article discusses key CT interpretation skills and reviews important traumatic brain injuries that can be discerned on head CT. It focuses on imaging findings that may deserve immediate surgical intervention. In addition, the article reviews the limits of non contrast CT and discusses some advanced imaging modalities that may reveal subtle injury patterns not seen with CT scan.

Study done by Gallagher CN 2010 CT and MRI are now the imaging techniques for acute and subacute brain injury, respectively. Diffusion tensor imaging is being developed to provide more information on structural damage in brain injury. There are several research techniques available for brain injury, particularly relating to cerebral blood flow and metabolism

Last study done by Brody DL et al 2015 Brain imaging plays a key role in the assessment of traumatic brain injury. In this review, we present our perspectives on the use of computed tomography (CT), conventional magnetic resonance imaging (MRI), and newer advanced modalities such as diffusion tensor imaging. Specifically, we address assessment for immediately life-threatening intracranial lesions (non contrast head CT), assessment of progression of intracranial lesions (noncontrast head CT), documenting intracranial abnormalities for medicolegal reasons (conventional MRI with blood-sensitive sequences), presurgical planning for post-traumatic epilepsy (high spatial resolution conventional MRI).

Chapter Three

3-Material and Methods

3.1 Material:

3.1.1Patients: males and females with different age from 1 year to 80 years.

3.1.2Machine used: Conventional C.T (Toshiba), 16 slices.

Computed tomography (CT or CAT scan) is a noninvasive diagnostic imaging procedure that uses a combination of X-rays and computer technology to produce horizontal, or axial, images (often called slices) of the body. A CT scan shows detailed images of any part of the body, including the bones, muscles, fat, and organs. CT scans are more detailed than standard X-rays.

In standard X-rays, a beam of energy is aimed at the body part being studied. A plate behind the body part captures the variations of the energy beam after it passes through skin, bone, muscle, and other tissue. While much information can be obtained from a standard X-ray, a lot of detail about internal organs and other structures is not available.

In computed tomography, the X-ray beam moves in a circle around the body. This allows many different views of the same organ or structure. The X-ray information is sent to a computer that interprets the X-ray data and displays it in a two-dimensional (2D) form on a monitor.CT scans may be done with or without "contrast." Contrast refers to a substance taken by mouth or injected into an intravenous (IV) line that causes the particular organ or tissue under study to be seen more clearly. Contrast examinations may require you to fast for a certain period of time before the procedure. Your physician will notify you of this prior to the procedure. CT scans of the brain can provide more detailed information about brain tissue and brain structures than standard X-rays of the head, thus providing more information related to injuries and/or diseases of the brain.

3.2 Methods of data collection:

3.2.1data collection

Data collected by applied questionnaire in duration from January-march2016..

3.2.2 Patient preparation:

Pt should be empty the bladder before scan is done because use of I.V contrast medium cause the bladder to fill rapidly and the scan should not be interrupted for a bath room break .All metallic objects should be removed from the head to be studied (earning, pins and necklaces), no patient motion.

3.2.3Patient position:

The pt is placed supine on the C.T table without rotation or tilt of head for good image quality, Head is rest on the head holder, axial scan started from the base of skull to vertex, Slice thickness 10mm, spacing 10mm.

3.2.4C.T parameters:

KVP 120

MAS 320

Slice thickness 5 mm

gantry tilt zero degree.

3.2.4 Image interpretation:

Head C.T images are viewed with two sets of window settings.One set allows optimal visualization of the brain (brain windows) with lower contrast, the other set display optimal bony detail (Bone windows) with higher contrast.

3.2.5 Data analysis:

Data analyzed by SPSS program.

Chapter Four

4-Result

Table (4.1): Study group gender distribution:-

Sex		
Frequency		Percent
Male	35	64.8
Female	19	35.2
Total	54	100.0

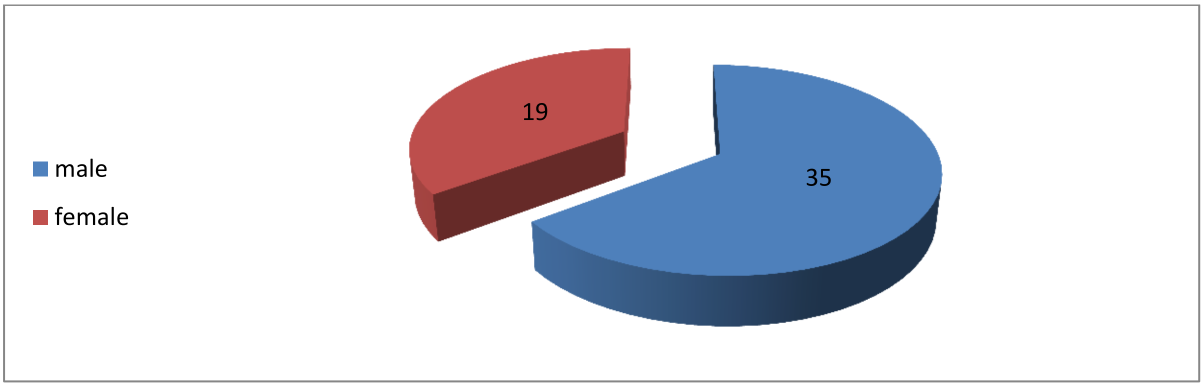


Figure (4.1): Study group gender distribution

Table (4.2):Study group age distribution:

age		
	Frequency	**Percent**
less than 25	24	44.4
From 25-35	14	26
From 36-45	5	9.3
From 46-56	8	14.8
more than 57	3	5.6
Total	53	98.1
Total	54	100.0

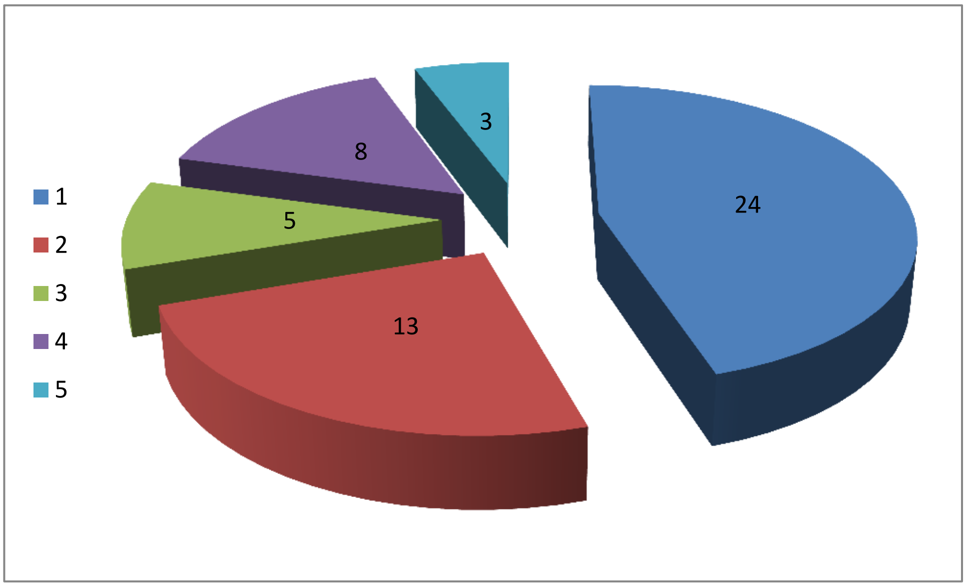


Figure (4.2): Study group age distribution

Table (4.3):study groups frequency causes of head injuries:

cause of trauma		
	Frequency	**Percent**
RTA	33	61.1
kicked by stone	3	5.6
Assaulted by stick	7	13
Assaulted by iron	7	13.0
fall down	2	3.7
gun shot	2	3.7
Total	54	100.0

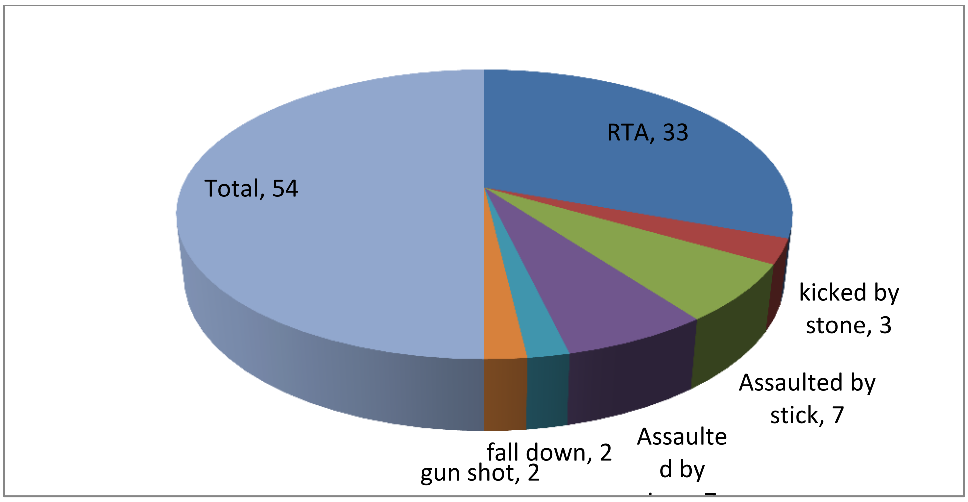


Figure (4.3): study groups frequency causes of head injuries

Table (4.4): tstudy groups frequency types of Skull Fractures:

Fracture			
	Frequency		**Percent**
Depress	7		13.0
Multiple skull	11		20.4
Linear	27		50.1
Total	45		83.3
Missing	System	10	18.6
Total	54		100.0

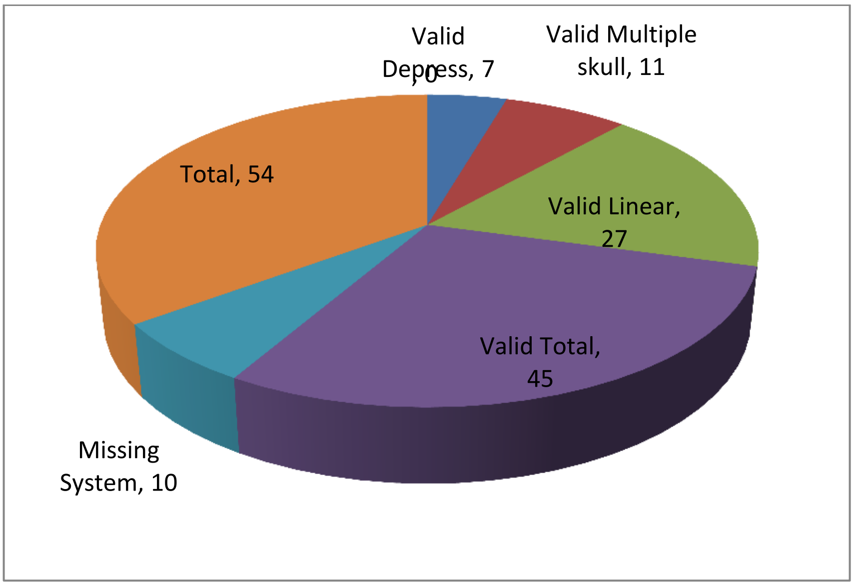


Figure (4.4):study groups frequency type of Skull Fracture.

Table (4.5): Study of CT finding:

CT finding		
	Frequency	**Percent**
Hemorrhagic contusion	10	18.5
subdural Hemorrhage	16	29.6
Epidural Hemorrhage EPI	10	18.5
EPI + Contusion	6	11.1
SAH Midline shift	2	3.7
Normal	5	9.3
chronic subdural hemorrhage	3	5.6
intra cerebral	1	1.9
shifted of ventricle IVH	1	1.9
Total	54	100.0

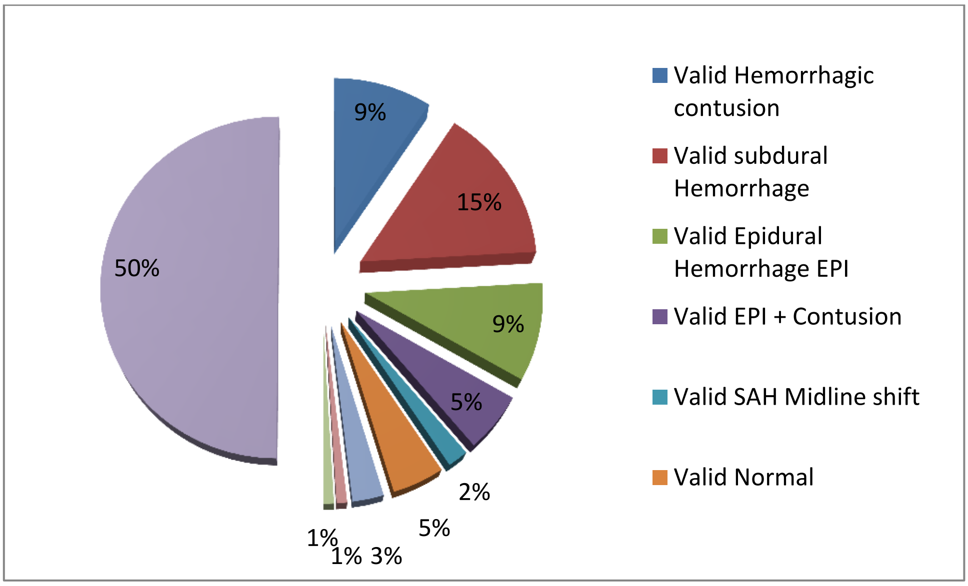


Figure (4.5): Study of CT finding

Chapter Five

5-Discussion, Conclusion, Recommendation

5.1 Discussion:

This study done in Khartoum state were54 patients come to Ibrahim Malik Teaching hospital C.T department with head trauma where found that 35 male and 19 female with percentages 64.8% and 35.2% from total sample which expressed in table (4-1) and graph (4-1) with deferent age from 1-80 yrs old agree with Abd Alrahim et al in Sudan 2014, but most of these sample in range less than 25 yrs most facing RTA because the activity and movement table and graph (4-2). In this study the cause of TBI were as follow RTA 61.1% this agree with Abd Alrahim et al ,assaulted by stick 13%, assaulted by iron 13%, kicked by stone 5.6%,fall down 3.7% and gun shot 3.7% which expressed in table and graph (4-3). According to C.T findings in this study showed that head injuries were hemorrhage, contusion and shift agree with Dr.Broder JS 2010 but subdural hemorrhage more common with percent 29.6% , contusion with percent 18.5% ,EPI hemorrhage with percent 18.5% and normal finding with percent 9.3% table and graph (4-4) Agree with Gallagher CN . In this study the types of fracture as follow as linear fracture 50.1% , multiple skull fracture 20.4% and depress fracture with percent 13% as expressed in table and graph (4-5).

5.2 Conclusion:

C.T is ideal method for the initial examination of patients sustaining head trauma or presenting with acute neurologic deficit compared with conventional X-ray and MRI because it take short scan time. And image not need for C.M injection and can be taken by two window bony window and brain window to diagnose the hemorrhage and types.

5.3 Recommendation:

According to the study:

Its recommend that C.T scan should be available in inside teaching hospitals.

Decentralization of c.t scan

Its recommend that physician should request C.T brain in case of TBI to save the time.

It is recommend that to reduce the incidence of TBI in RTA by use seat belts, motor cycle helmets, speed limits in high way road.

For future study we advice to make a wide study on this topic in other parameter and other states.

References

1. Basic Pathology: Stanley L. Robbins Vinay Kumar, Fourth edition, 1987. By W.B Saunders, Library of Congress.
2. Functional Human Anatomy: Qurashi M.Ali Taher Osman Ali, First edition, 1998.
3. https://en.pubmed .com.
4. https://en.wikipedia.org/wiki/Traumatic_brain_injury
5. Neuroanatomy, 3rd edition, James D.Fix, PHD, Professor Emeritus of Anatomy. Marshal University School of Medicine Huntington, West Virginia. 2002 Lippincott Williams & Wilkins.
6. **Abd Elrahim E *et al.*, Sch. J. App. Med. Sci., 2014,** Scholars Journal of Applied Medical Sciences (SJAMS)
7. Sectional Anatomy for Imaging Professionals: Lorrie L.Kelley, Connie M.Petersen 1997 by Mosby Library of Congress.

Appendix

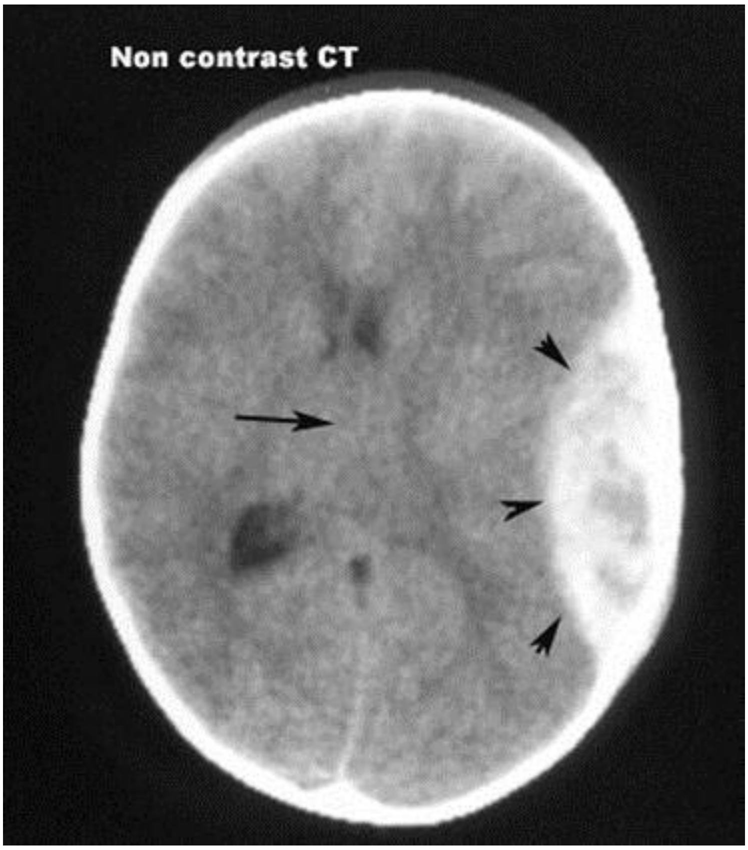
Appendix

DATA COLLECTIN SHEET

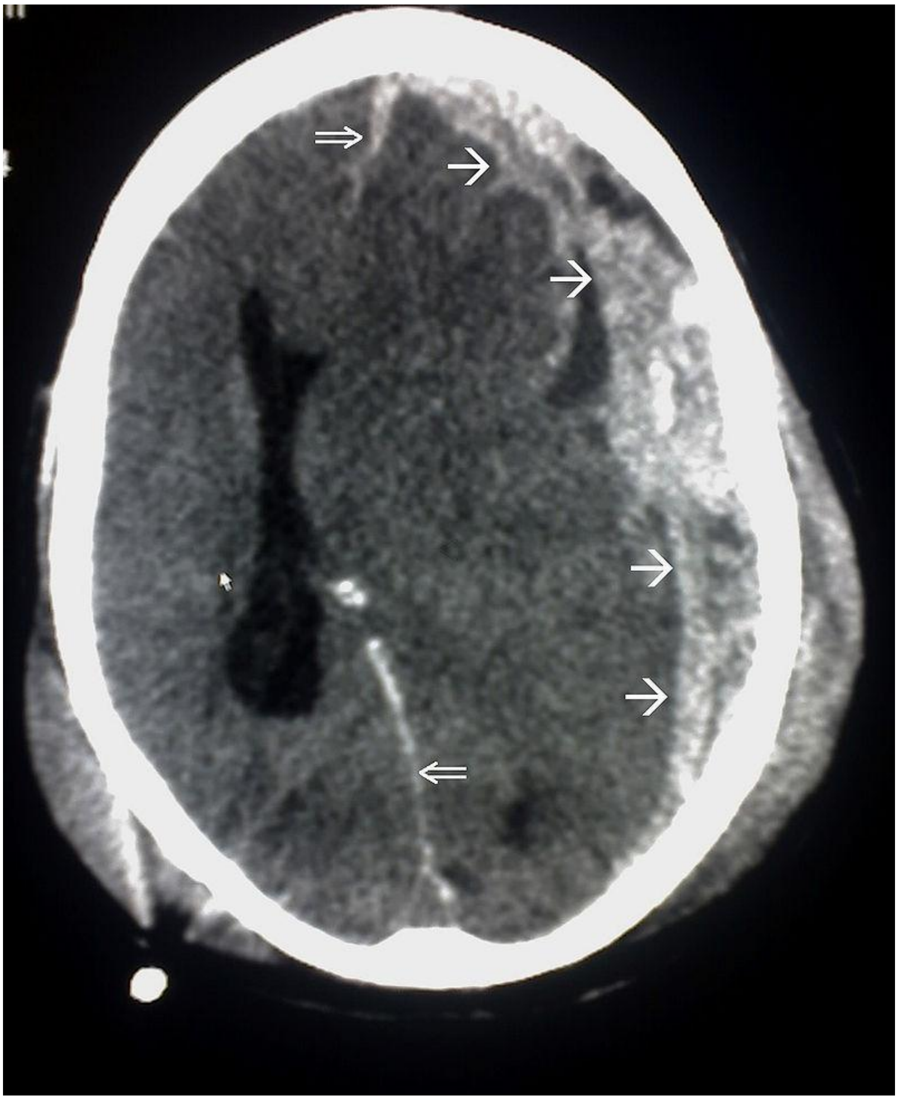
NO	sex	Age	Causes of trauma	C.T findings	Type of fracture	Type of hemorrhage

Appendix 2

CT scan of an 38-year-old male status of RTA showing Brain contusion

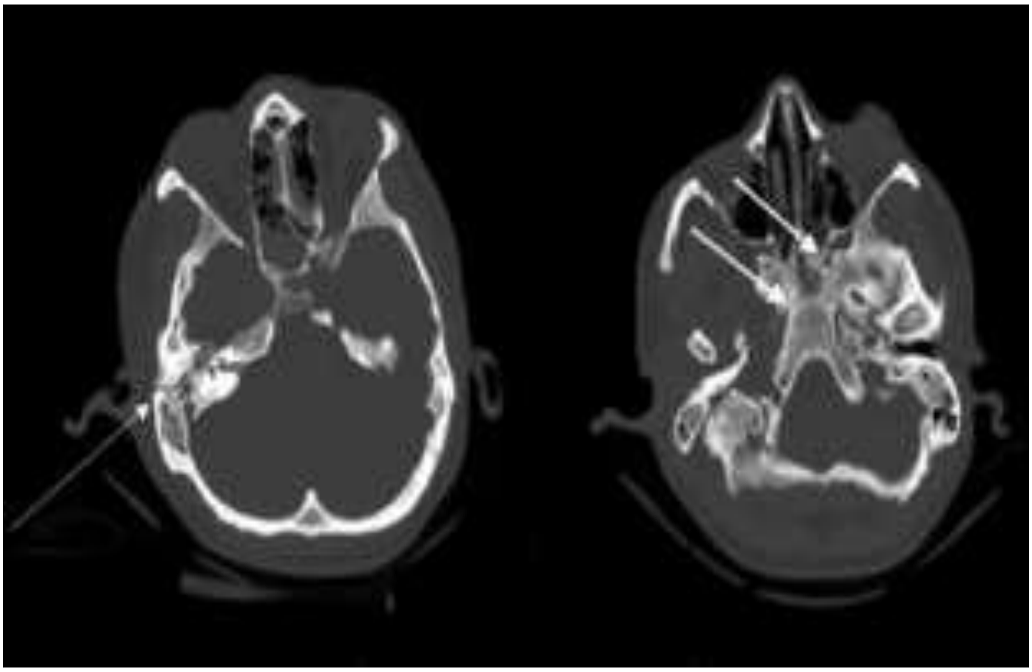


CT scan of an 46-year-old male status of RTA showing Hemorrhagic stroke



CT scan of an 19-year-old female status of RTA showing aspread of the subdural hematoma (single arrows), midline shift (double arrows)

CT of an 87-year-old female status fall down showing a large subdural hematoma along the left cerebral convexity with significant midline shift .



CT scan of 35-year-old male with recent motor vehicle accident demonstrating longitudinal fracture of the right petrous bone (thin arrow) that extends into the skull base (thick arrow)