TRAUMATIC LESIONS AND HEMORRHAGES OR HEMATOMA IN THE BRAIN, DIAGNOSED BY CT. AND MRI.

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ABSTRACT

CT and MRI with or without contrast media, are the most convenient and quickest way of investigation to diagnose and demonstrate to the surgeons or physicians, to visualize the lesions in the brain after having traumatic lesions or cerebrovascular accidents.

Hemorrhages and Hematomas may occur in different layers of the skull and brain are:

1. **Epidural hematoma:** The bleeding or the hematoma is outside the dura, which is thick and tough layer of fibrous tissue sheath covering the brain tissues. The inner outline of the mass or hematoma pressing on the brain will be smooth.
2. **Subdural:** The bleeding is inside the dura, the pia and arachnoid may be or may be not intact. The outer layer of the lesion will be smooth but the inner layer will be undulating, but not scattering into the brain tissues, if the pia and the arachnoid are intact.
3. **Subarachnoid:** The bleeding and hematoma will be scattering freely inside the brain tissues, more on the side with direct trauma. The opposite side will be damaged by **"contra coup".**
4. **Diffuse axonal injury (DAI):** The bleeding go inside the brain along the nerve sheath of the axon.
5. **Cortical Contusion** or **Haemorrhagic Contusion:** The hemorrhages are spreading and confined in the cerebral cortex.

SYMPTOMS FROM CLOSED BRAIN INJURY MAY BE CLASSIFIED INTO 3 DIFFERENT LEVELS ACCORDING TO RESIDUAL DAMAGES.

1. CEREBRAL CONCUSSION. The symptoms of brain injury may persist for few days and having remission without residual deficit of brain functions and complete recovery. The organic lesions cannot be detected by any means but the symptoms and signs can be detected only by physical examinations.

2. CEREBRAL CONTUSION. The organic lesions can be detected by CT and /or MRI.

3. CEREBRAL LACERATION. The victims may die or alive with residual deficit or deficits of the brain functions the patients.

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1.1.1. EPIDURAL HEMATOMA

Clinical: Male, age 28 years. Car accident with head injury.

CT. shows Epidural Hematoma at Lt. Frontal region, lentiform or biconvex shape. The density of hematoma is hyperdense, pressing on the frontal lobe of brain, right side.

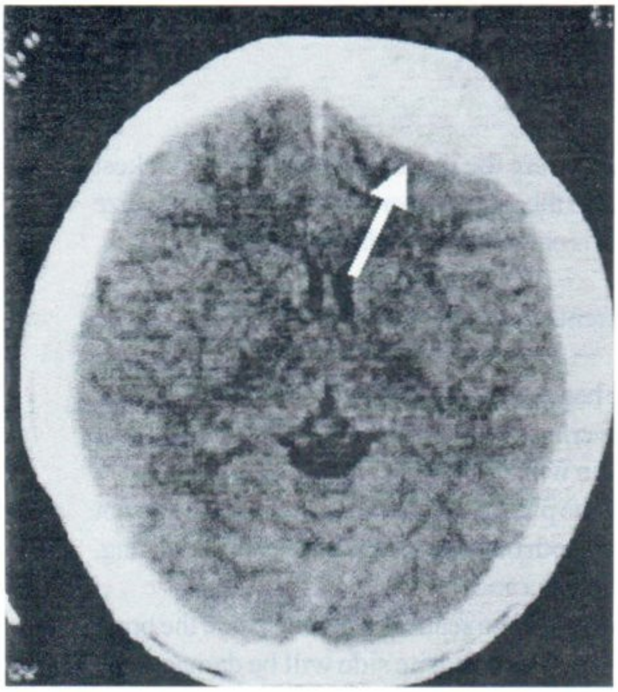


Fig. A Epidural Hematoma, Lentiform or biconvex shape.

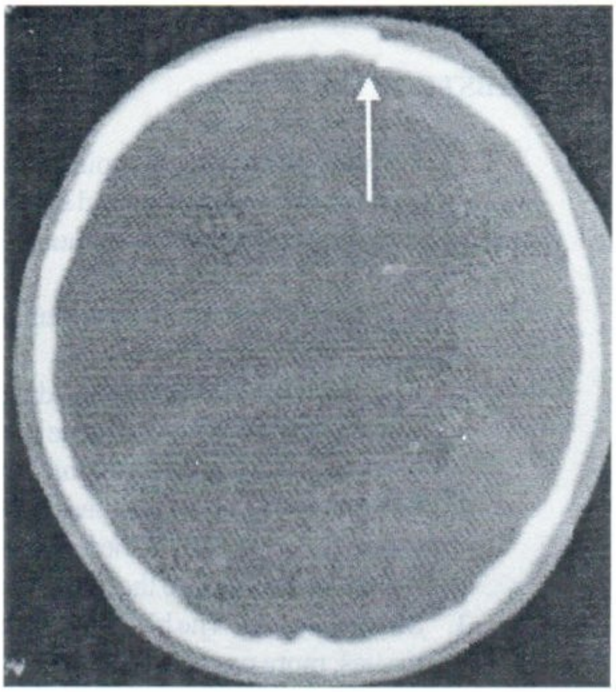
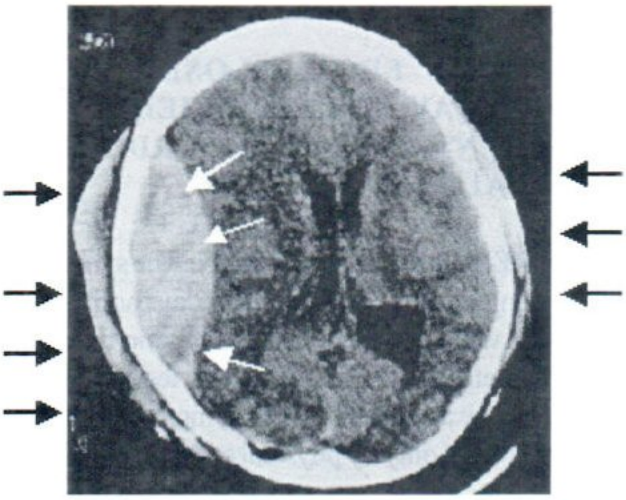


Fig. B Frecture skull, with extracranium hemorrhage around the peri-cranium spaces both side.

1.1.2. Male, age 21 years, car accident.
Epidural Hematoma, lentiform shape or biconvex shape. (White arrows)

Density: Hyperdense temporal region, Lt.
Hematoma outside skull,
Rt. from direct trauma.
Lt. from "contra coup"
Hematoma outside skull
Irregular shape, and thickness
(Black arrows)



1.1.3. EPIDURAL HEMATOMA, The blood could not pass through the dura into the brain.

Clinical: Male, 48 years, car accident, not fasten the seat belt, forehead and wind shield collision.

MRI; T_1W_1 and T_2W_1 show both frontal epidural hematomas.

Signal intensity shows hyperintensity, which can be seen, whiter than, the brain showing that Hematoma is in the subacute stage.

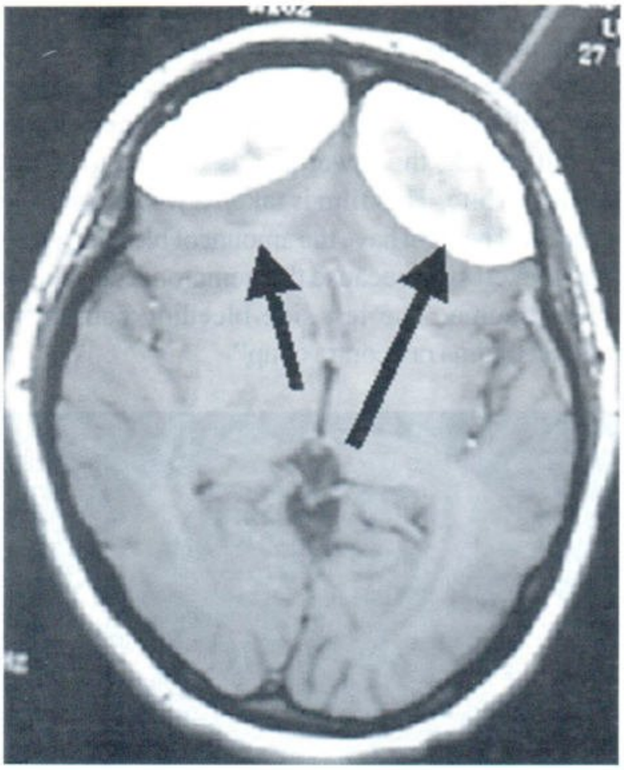


Fig. A MRI T_1W_1

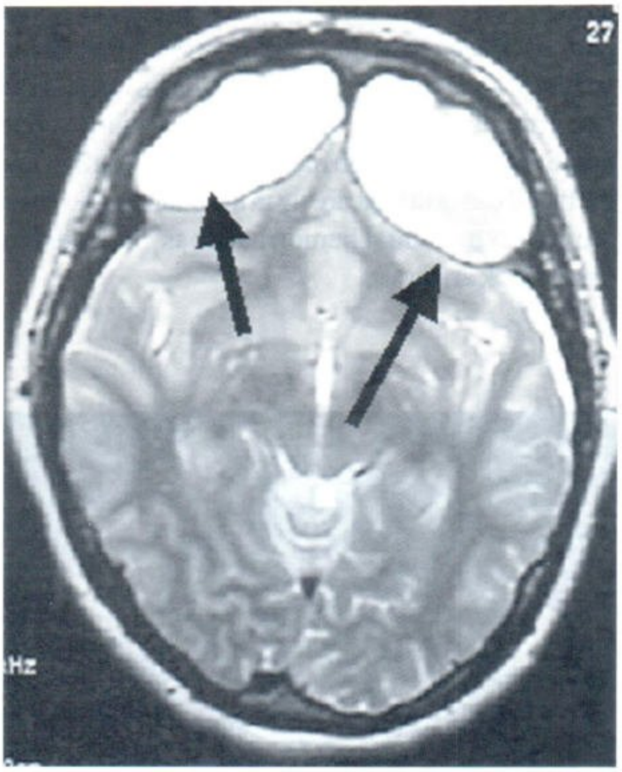
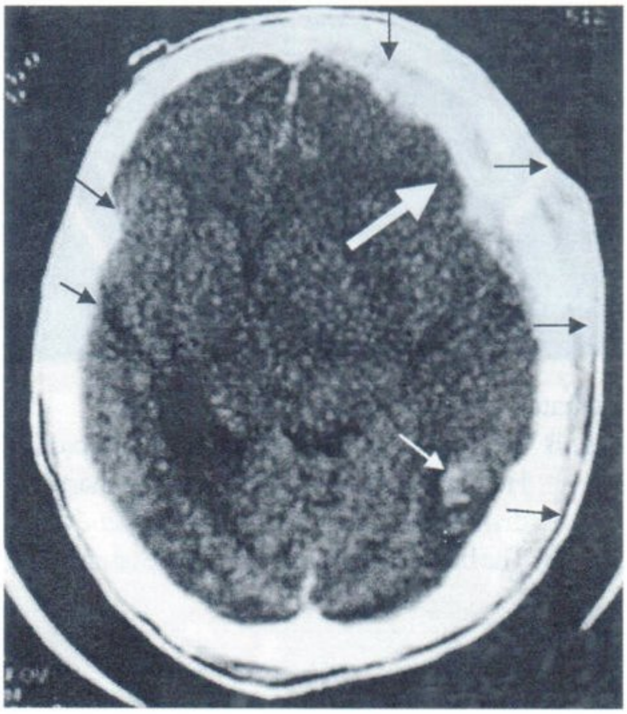


Fig. B MRI T_2W_1. The inner edge of the Epidural Hematoma is smooth. It is clearly sharp and distinct because the dura is tough and thick. The blood can not passed into the brain tissue.

1.1.4. SUBDURAL HEMATOMA

Clinical: Male, age 45 years, car accident, head on collision.

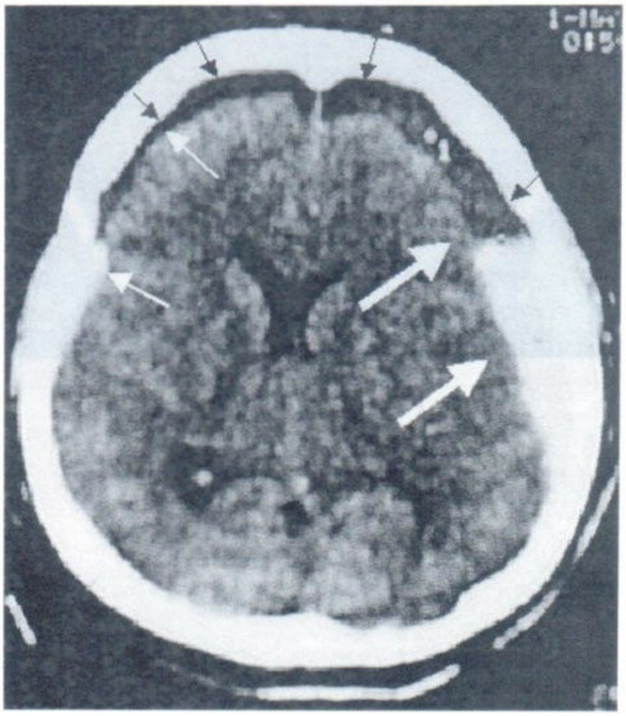
CT. shows subdural hematoma Rt. Frontal Region, and subdural hematoma, small size in the Lt. fronto-temporal region. Intracerebral hematoma, small amounts also seen in the temporal region, posterior part, as pointed by small white arrow. The edge of subdural and intracerebral hematoma is not smooth and irregular because the blood can pass into brain tissue without any tough membrane as the barrier, and the blood can distribute freely in the brain tissue. There are also extracranial hemorrhages as indicated by small black arrows.



1.1.5. SUBDURAL HEMATOMA

Clinical: Male, age 31 years car accident 2 weeks ago.

CT. shows bilateral hemorrhages. The brain material is separated from the inner wall of the skull both sides by black areas indicated by small black arrows. The lower parts, of the black areas are white triangular areas. This is due to the liquidify of the Hematomas. The patient lying on his back on bed, so the liquidify hematoma is sedimenting. The upper part become black, the lower part is opaque to X-ray become white. This film is taken 2 weeks after the accident. The right have the amount of bleeding more than the left side because the hematoma caused by direct trauma. The left side bleeding caused by indirect trauma or "contra coup"



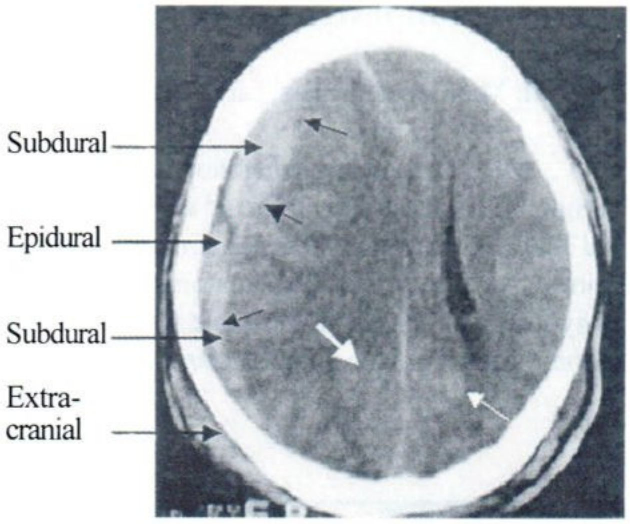
1.1.6. SUBDURAL HEMATOMA

Clinical: Male, age 23 years, car accident.

CT. of this case shows subdural hematoma. The white area of the left frontal lobe is not regularly white and uniform may indicate that the bleeding is still active. The brain was compressed, so only the lateral ventricle of the right side is clearly seen.

In this case there are, epidural, subdural, intracerebral and extracranial hematoma.

The newly formed hematoma will appear as hyperdense.



Intracerebral white arrows

1.1.7. SUBDURAL HEMATOMA

Clinical: Male, age 58 years, car accident 2.5 months ago.

(A.) CT. without contrast **(B)** contrast enhancement CT. Subdural hematoma presented as cresent shape density and will liquidify after one week and sediment to the lower part of the hematoma. The upper part will become hypodense when the times pass by. The Subdural hematoma presses on the lateral ventricle right side, as seen in the CT, the right ventricle is narrowing and small. The whole brain is shifting to the left.

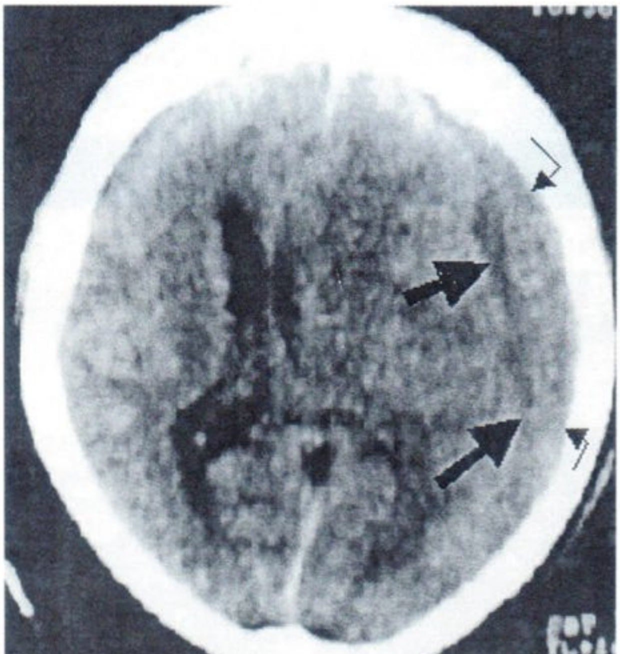


Fig. A Non-contrast CT

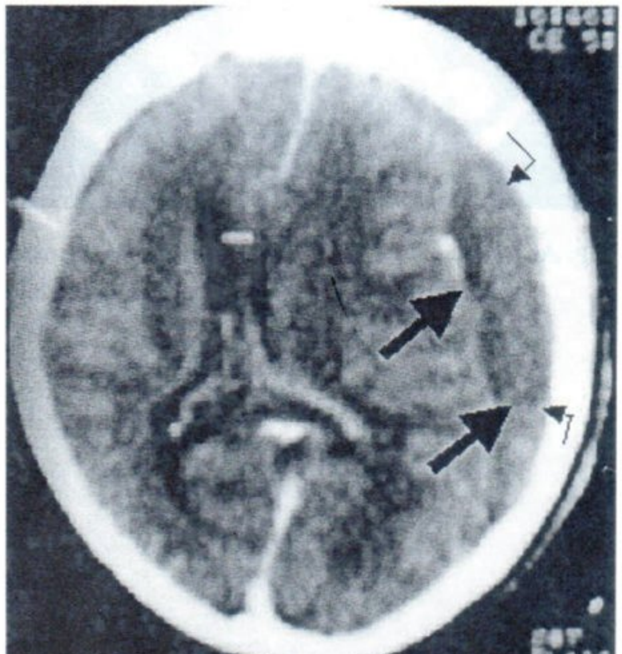


Fig. B Contrast enhanced CT.

1.1.8. SUBDURAL HEMATOMA

Clinical: Male, age 60 years, car accident.

MRI. The patient having subdural hematoma Lt. side with brain atrophy from old age. MRI, T_1W_1 and T_2W_1 show subdural hematoma, crescent shape, pointed by white arrow. The hematoma will present as hypersignal density in the acute stage and will become isosignal in the subacute stage.

The outer edge of the white crescent shadow separated the brain and the skull and is smooth because is being covered by the dura which is thick and tough. The inner edge is undulated because it is covered by thin arachnoid and pie mater, indicative that it is the subdural hematoma. The left lateral ventricle is obliterated indicative there in also intracerebral hemorrhage.

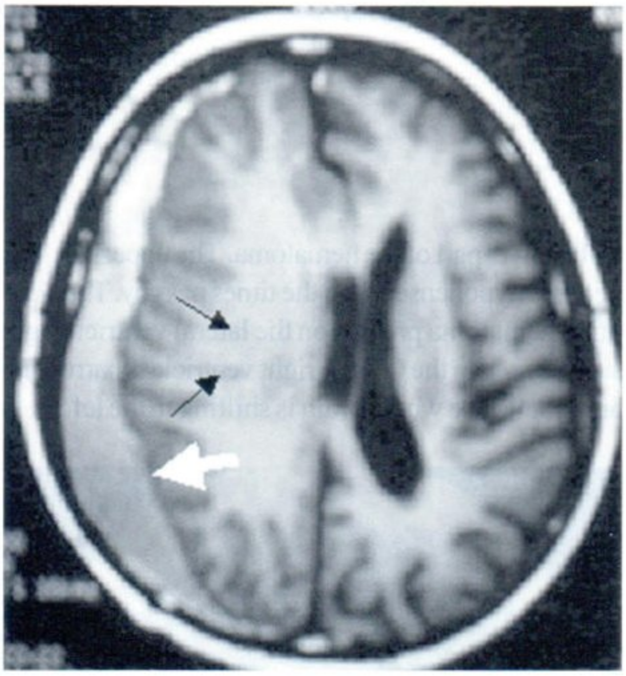


Fig. A MRI, T_1W_1 Black arrows indicating intracerebral hematoma filling up the left ventricle.

Fig. B MRI, T_2W_1

1.1.9. SUBDURAL HEMATOMA

Clinical: Female, age 54 years, hemiparalysis, drowsiness and progressive loss of conious-ness for 1 week with a history of head injury from accident in the bath room for 1 month.

CT. (A.) before opaque media injection (B.) after opaque media injection. The pictures in the CT. films showed crescent shape density in the left side of the cerebral cortex displacing the lateral ventricles to the right side. There is also a smaller crescent shape abnormal shadow in the frontal region of cerebral hemisphere, right side. The upper parts of the abnormal shadow in both sides are black, the lower parts are white suggestive of subdural hematoma, in both frontal lobes, more marked on the left side. The left side hematoma caused by direct brain injury, right side by "contra coup"

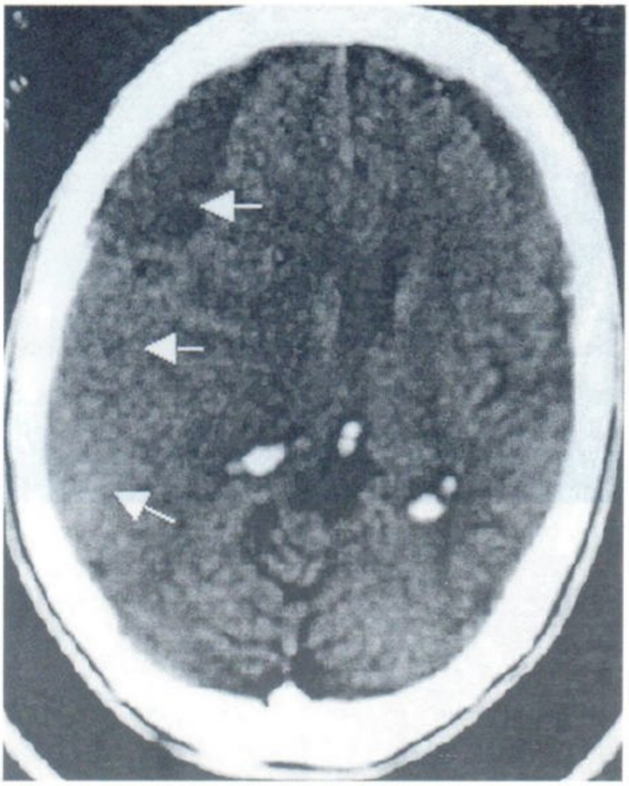


Fig. A Subdural hematoma CT before contrast media injection.

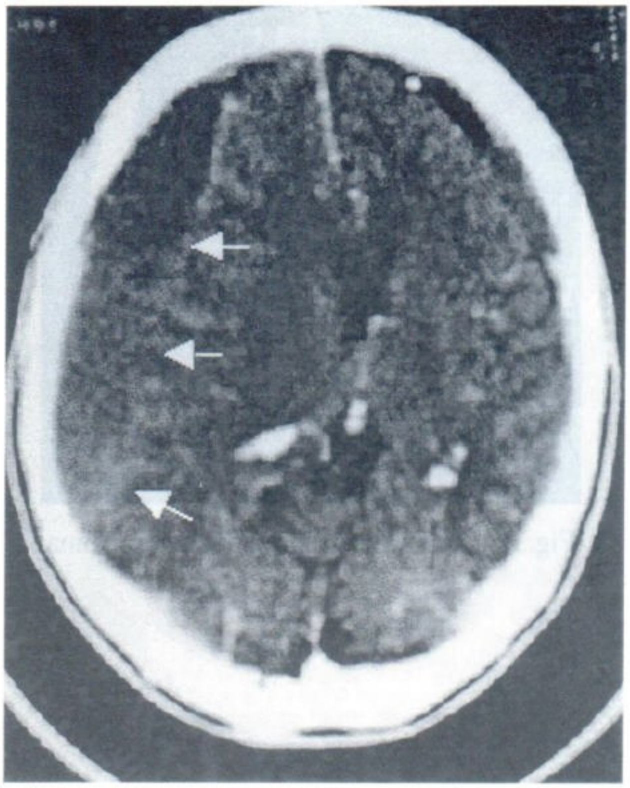


Fig. B Contrast Enhancement CT of the same patient.

1.1.10. SUBDURAL HEMATOMA

Clinical: Male, age 80 years, brain atrophy and head injury in the bathroom.

A. Axial projection T_1W_1 MRI., black space between skull and brain showed brain atrophy.

B. Coronal projection T_1W_1 MRI., hematoma in both projection shown in white areas. Hematoma will show hyper signal intensity in acute and subacute phases.

Fig. A Coronal section subdural hematoma.

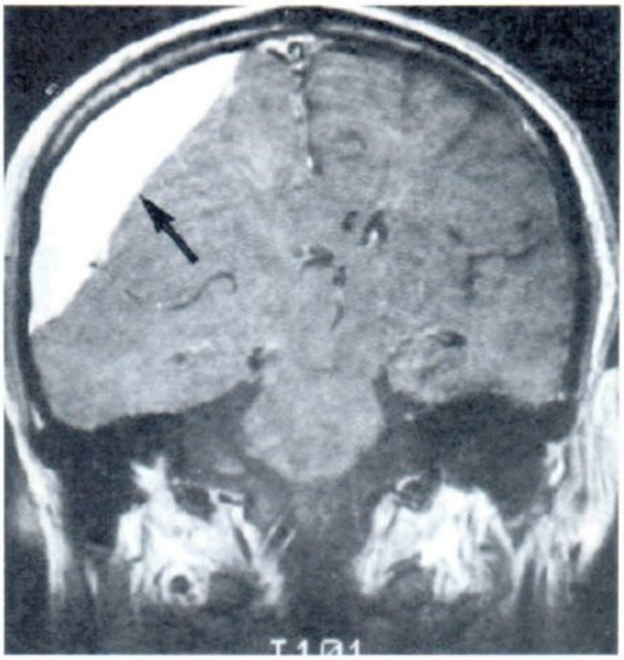


Fig. B Sagital section.

1.1.11. SUBDURAL HEMATOMA

Clinical: Male, age 18 years, car accident with hematoma at the tentorial area. The shape of hematoma needs not be crescent as in the pervious examples. Fig. A. Film taken in axial projection, MRI. T_1W_1. Fig B. Coronal projection CT. Coronal projection MRI T_1W_1 thin black arrow showed hematoma at the tentorial area left side, thick black arrow showed extracranial hematoma.

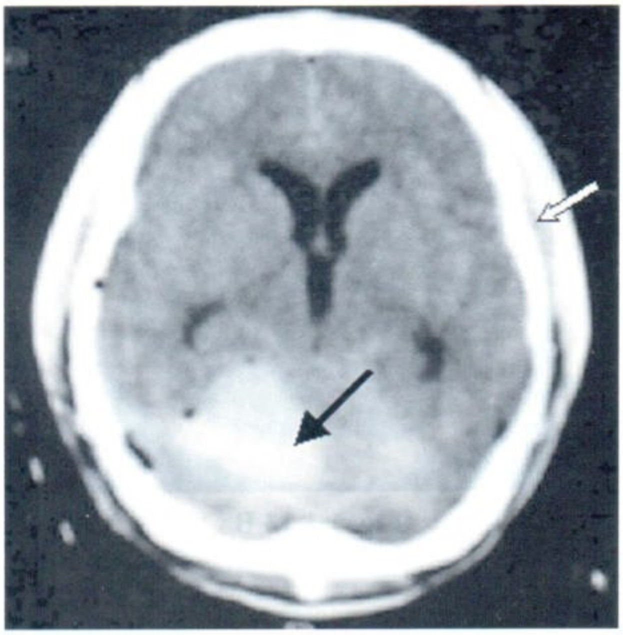


Fig. A MRI, T_1W_1 Coronal projection

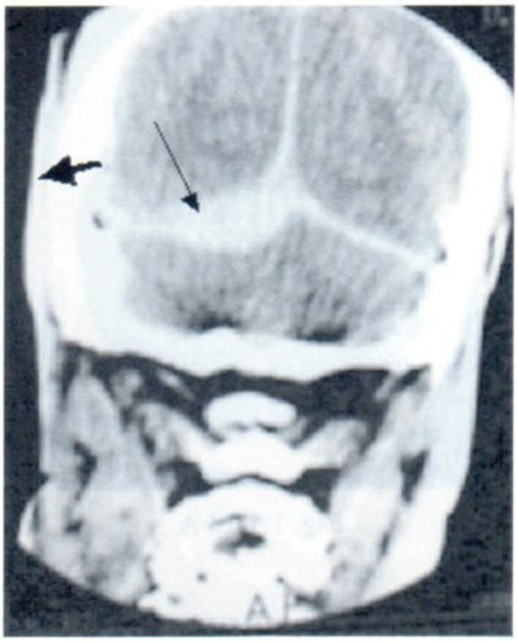


Fig. B MRI, T_1W_1 Sagital projection

1.1.12. SUBARACHNOID HEMORRHAGE

Clinical: Male, age 43 years, car accident and unconscious.

CT. Scan showed bleeding in the subarachonid space. In the film, white area as pointed by the black arrow, were the subarachnoid hemorrhage which was seen in the suprasellar cistern, in normal individual, black area of CSF will be visualized.

Fig.1.1.12 Subarachnoid hemorrhage at the basal cistern

1.1.13. HEAD INJURY, DIFFUSE AXONAL INJURY (DAI)

CT. showed hemorrhagic diffuse axonal injury showing general brain edema and hemorrhagic spots at basal ganglia. The patient was in coma stage. The bleeding diffused along the axon of nerve cells showing small white spots surrounding the axon of nerve cells.

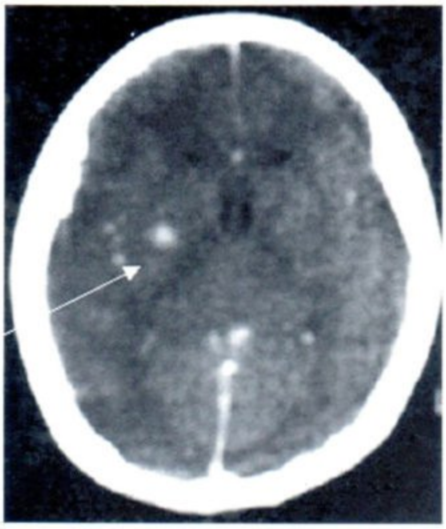


Fig. 1.1.13 A

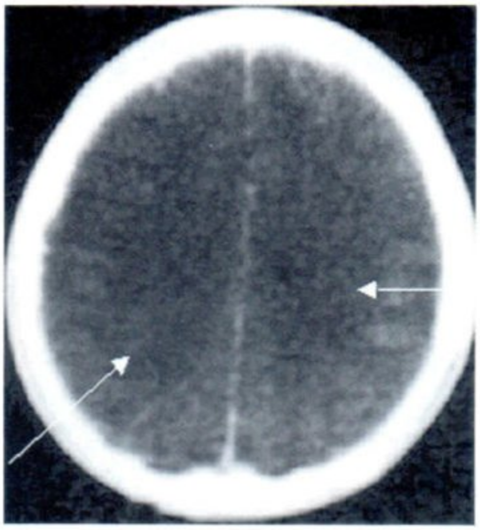


Fig. 1.1.13 B

1.1.14. FOREIGN BODY, BROKEN END OF THE STABBING KNIFE.

Clinical: Male age 27 years, stabbed by knife at fronto-temporal region.

Fig. A Showing the broken end of the stabbing knife (black arrow).

Fig .B Showing bones window after removing the broken end of the knife (white arrow).

(A)

(B)

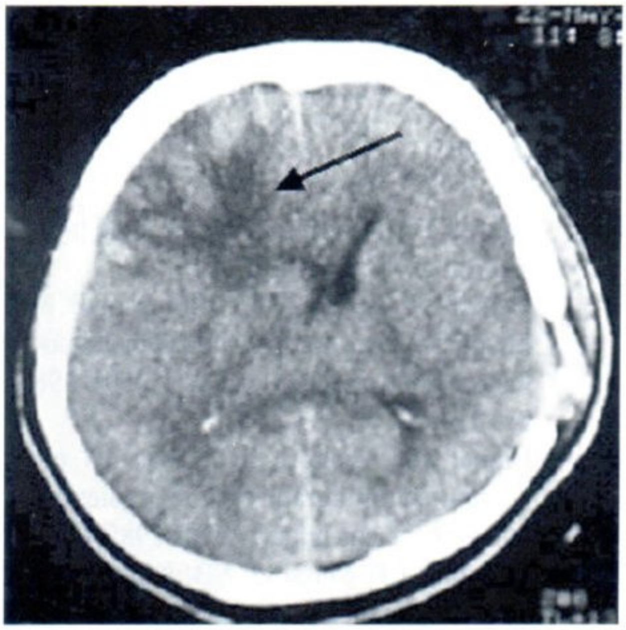
CT. skull Fig. 1.1.14 A and B

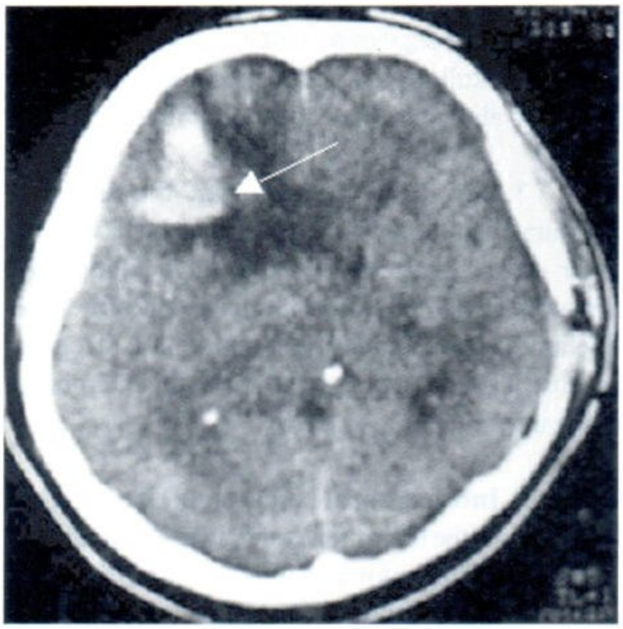
1.1.15. CORTICAL CONTUSION

Clinical: Male, age 21 years, head on collision car accident, semi-conscious,

Non-contrast CT. shows hemorrhagic cortical contusion at Lt. Frontal lobe.

NC.CT. Haemorrhagic area is black at Lt. frontal lobe. CE.CT. Haemorrhagic area is white at the area of contusion.





DISCUSSION

Traumatic lesions and hemorrhage or hematoma in the brain, prompt and accurate diagnosis about the position, the number of the lesions, the extent of the hemorrhage or hematoma, are the primary important data for the doctor in charge of the Accident and Emergency Department of a hospital in deciding to give the appropriate management, not only to save the life of the patient but also to preserve the brain functions both the sensory and motor, as much as possible. It is useless to be alive with unconsciousness and become to be the burden of the family. It is very critical to choose or to make a prompt decision to use surgical or medical treatment. Only CT. and MRI with or without the contrast enhancement can help the expert team in making the decision to give the right management at the right time. There should be a team which should be composed of experts in different specialties, or subspecialties, namely, neurologists, neurosurgeons, neuro-radiologist, anesthetist, experts in ICU or Intensive care unit, etc.

CONCLUSION

The roentgen diagnosis in this paper, we have shown the few examples of extra, and intracranial hemorrhages, which we can show the site or sites of the lesions, the number of lesions, the extent of the lesions in order to give the right treatment at the right time. By CT and MRI with or without contrast we can devide the lesions, hemorrhage or hematoma into 6 different levels, namely as

1. Extra-or peri-cranium. We can see the shadow of hematoma outside the skull bone shadow, with irregular shape and thickness. The site of direct trauma may also has fracture of the skull. We can see the hemorrhagic shadows in both sides of the skull, more marked at the site of trauma, the opposite side also had a thinner shadow of hemorrhage or hematoma caused by **"Contra coup"**

2. Epidural hematoma: the shape is lentiform, the outer edge of hematoma is along the inner table of the skull, the inner edge of hematoma is smooth and sharp along the thick and tough fibers of dura.

3. Subdural hematoma: the shape of Subdural hematoma is characterized by having the inner edge irregular, but the outer edge of the hematoma will be merged with the shadow of the skull. The inner edge of subdural hematoma is irregular because it is covered by the softened thin membrane of Pie and arachnoid and CSF.

4. Intracerebral hematoma: There may be bleeding into the brain tissues and fill up the ventricles. The shape of hematoma is indefinite the blood can distribute freely in the brain tissues.

5. Diffused axonal injury (DAI): Intracerebral hemorrhage may be found in the form of diffused axonal injury showing general brain edema and hemorrhagic spots at the basal ganglion. The patient will be in the coma stage. The bleeding diffused along the axon of nerve cells showing small white spots surrounding the axon of nerve cells.

6. Foreign body remaining in skull or brain tissue such as the part of the knife or the bullet may be shown and located by CT.

7. Cerebral concussion can be detected only by physical examination. Only cerebral contusion and cerebral laceration can be detected by CT. and MRI or both with or without contrast. The contusion and lacerated lesion will be hypotense and appeared as black area with plain CT. without contrast. The contusion and the lacerated areas will be shown by CT. or MRI with contrast enhancement as the white areas by the enhancement of the contrast, the same as the hemorrhagic area.

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