INFECTIONS OF THE BRAIN AND NERVOUS SYSTEM AS DIAGNOSED BY CT. AND MRI.

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ABSTRACT

Common Infections of the brain and nervous system found and diagnosed by CT. and MRI. or both, in the faculty of Medicine and Srinakarin hospital, Khon Kaen University will be presented and discussed as examples for their rontgenologic findings by CT, and/or MRI.

Category I	**Brain Abcess,** 2 cases
Category II	Inflammatory processes (involving) brain from pre-existing **pulmonary TB.** 1 case, **Cerebritis** and **Subdural Empyema.**
Category III	**Melioidosis** cerebral abscesses 1 case. (Bacteria: Pseudomonas Pseudomallei) **Melioidosis, Cerebritis and Subdural Empyema** 1 case
Category IV	**CNS, TB.: TB. Meningitis:** **TB. Meningitis** at **Basal Cistern** 3 cases. CNS, TB.: Tuberculoma, Rt. Occipital lobe. 1 case
Category V	**Cysticercosis**: **Calcified cerebral parenchyma** 6 cases.Cysticercus cellulose, larva of tape worm, calcified larva of tape worm in both cerebral hemispheres.
Category VI	**Virus Infection, Rabies.** 2 cases.
Category VII	**Protozoa,** Secondary to HIV Infection, **Toxoplasma Capsulatum.,** Toxoplasmosis 1case.
Category VIII	**HIV with Cryptococcosis.** **Cryptococcus neoforman** (Fungus infection)

CATEGORY I: Brain abscess or Abscesses with congenital anormally as underlying factor.

Brain abscess. Case I

Clinical: Female, girl age 4 years, having underlying **congenital anormaly, Tetralogy of Fallot**, with a present history of having high fever, 4 days before admission, he had a complaint of headache and projectile vomiting, blood culture showed mixed infections. CT. scan of the brain was done, both without contrast and with contrast enhancement.

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CATEGORY I: Case I

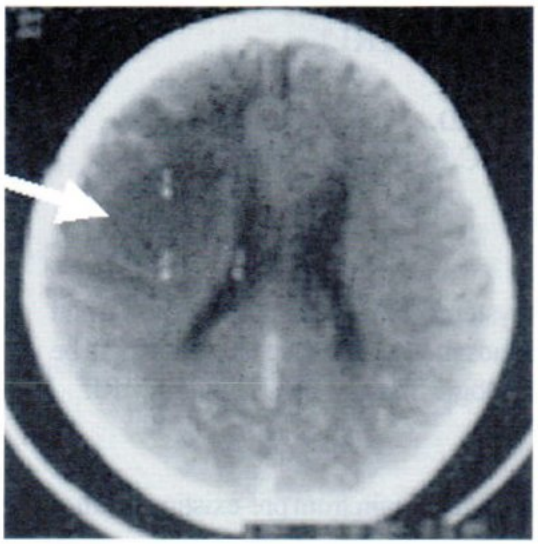


Fig. A NC.CT. (NON-CONTRAST CT.) an abcess can be seen in the frontal lobe Rt. side.

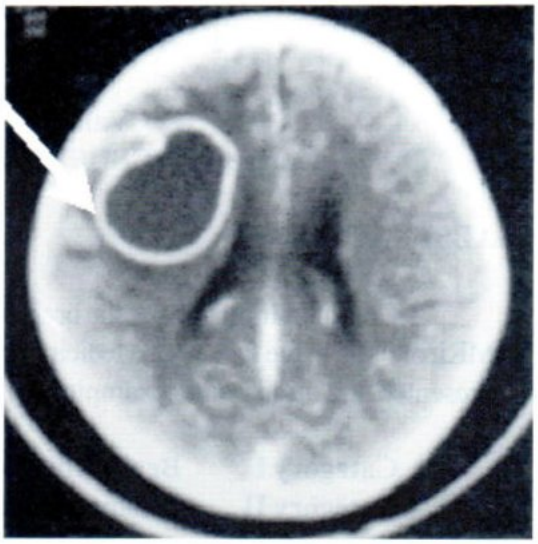


Fig.B CE.CT. (CONTRAST ENHANCEMENT CT.) rim ring enhanced wall.

Brain Abscess. Case II

Clinical: Male, boy 6 years, having **underlying Tetralogy of Fallot**, 7 days, before coming to the hospital, he had fever, headache, projectile vomiting, convulsion and periodic spasm of muscles of mouth and face, left side, with weakness of right, leg. CSF. culture. Anaerobes+ve

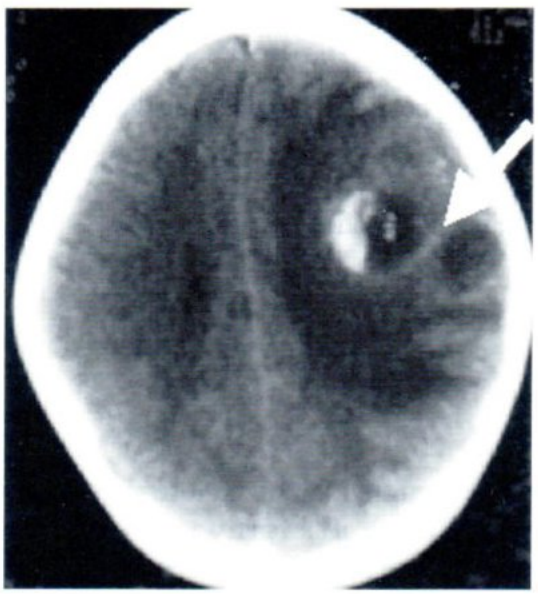


Fig A NC.CT.

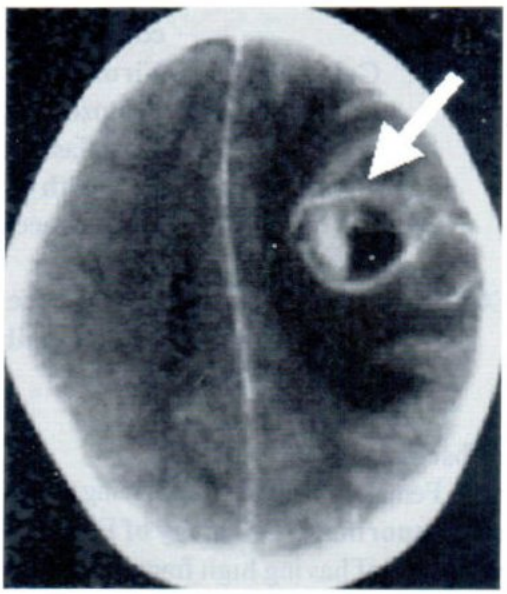


Fig B CE.CT. showed multiple rim ring enhanced wall abscesses at left frontal lobe. The walls of the abscesses are more obvious with contrast enhancement.

CATEGORY II: Cerebritis. **Inflammatory processes involving brain from pre-exsisting pulmonary TB.**

Clinical: Male, age 18 years with underlying pulm. TB. under treatment by anti. TB. drugs but stop treatment without permission from his doctor, for a year. Four days before admission, he had fever, headache, somnolence with worsen signs and symptoms of CNS. involvement. CT. of the brain was done with and without contrast.

Both **Fig A.** NC.CT. and **Fig B.** CE.CT. showed irregular border low density areas in both sides of the cerebral hemispheres. The bigger was in the right temporal lobe. No definite abcess walls were visualized. He improved after anti-tuberculous drugs treatment, both parenteral and intrathecally.

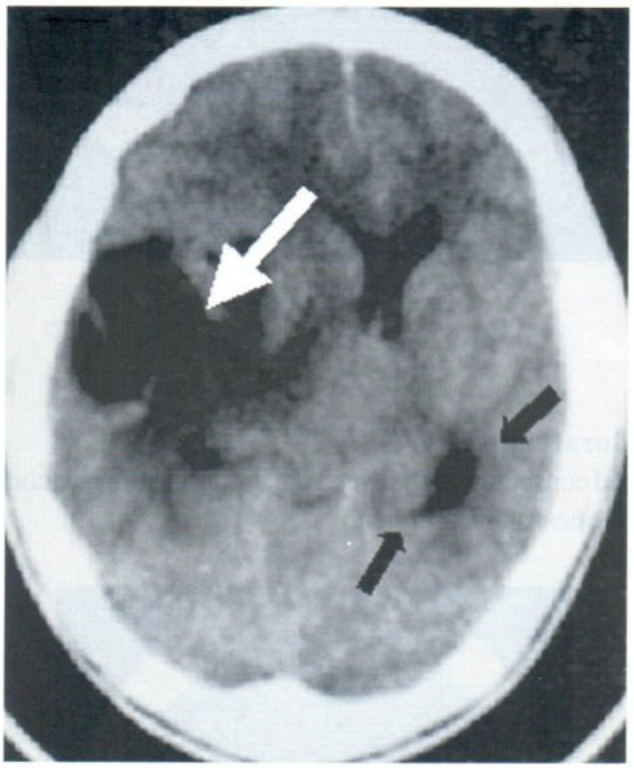


Fig A NC.CT.

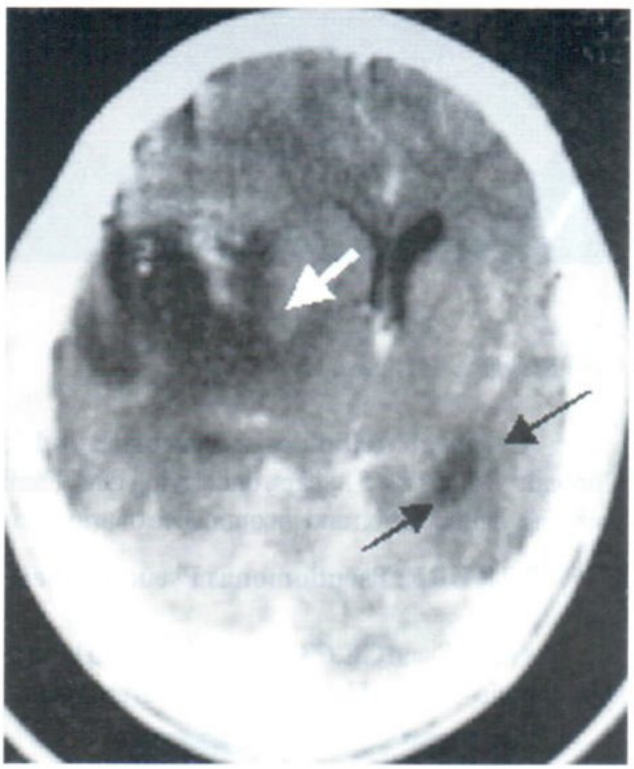


Fig B CE.CT.

CATEGORY III: **Inflammatory processes involving CNS. by specific infection, Melioidosis.**

Brain Abscesses: Melioidosis **case I**
Clinical: Male, age 18 years, high fever with chill on and off for 1 month, headache, projectile vomiting, weakness of left arm and leg. CSF. Culture: Pseudomonas Pseudomallei.

A. Non-contrast media CT.

B. Contrast enhancement CT.

Rim Ring Enhanced wall abscesses at both cerebral hemispheres showing by contrast media. (Pseudomonas Pseudomallei, Pyogenic bacteria)

CATEGORY III: case I

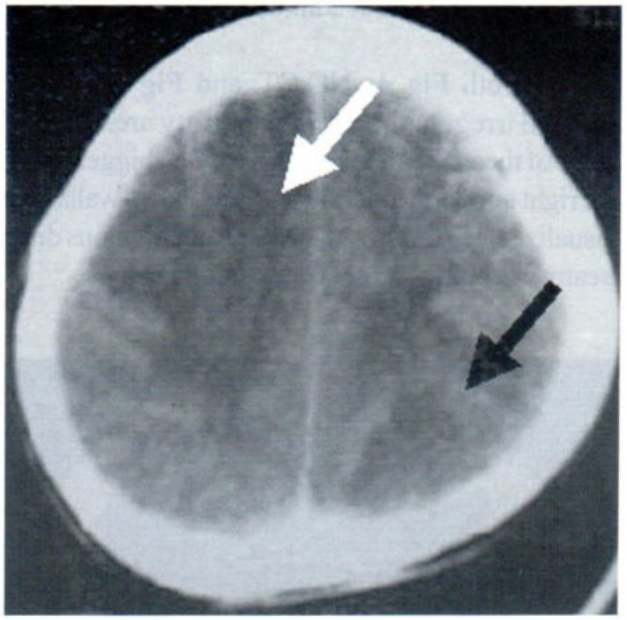


Fig A NC.CT.

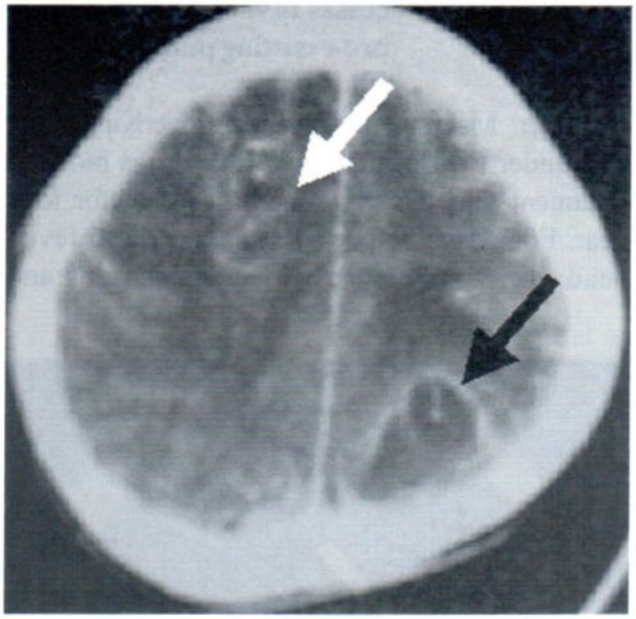


Fig A CE.CT.

CATEGORY III: case II:

Cerebral Mellioidosis: Cerebritis and Subdural empyema.

Clinical: Male, age 51 years, underlying DM. Diminished conscious, high fever 3 days, confused, headache, vomiting, hallucination and incontinence of urine, no definite neurological deficit.

CSF. CULTURE: Pseudomonas Pseudomallei

NC.CT. and **CE.CT.** (Fig.1, 2) showed lesions at Lt. Parieto-occipital lobe with subdural empyema.

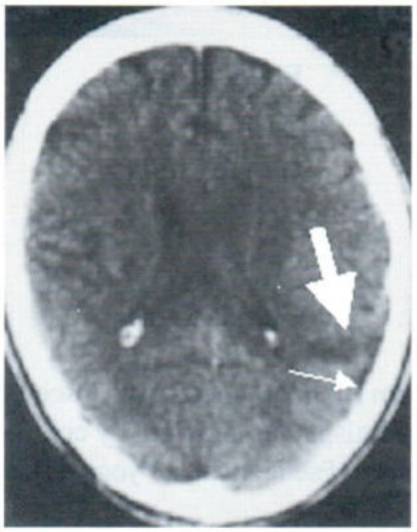


Fig.1 NC.CT.

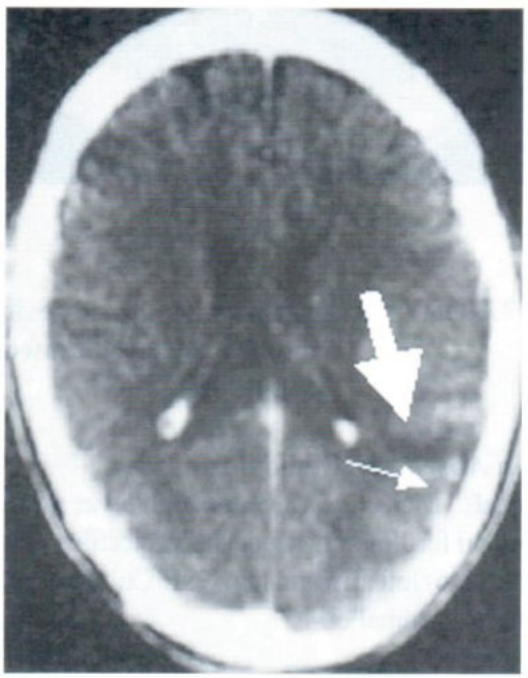


Fig. 2 CE.CT.

Fig. 3,4,5 MRI.

Fig. 3 MRI: T_1W_1

Fig. 4 MRI: T_1W_1 with contrast media, Gad. DTPA.

Fig. 5 MRI: T_2W_1 with contrast media, Gad, DTPA.

Subdural empyema was clearly demonstrated.

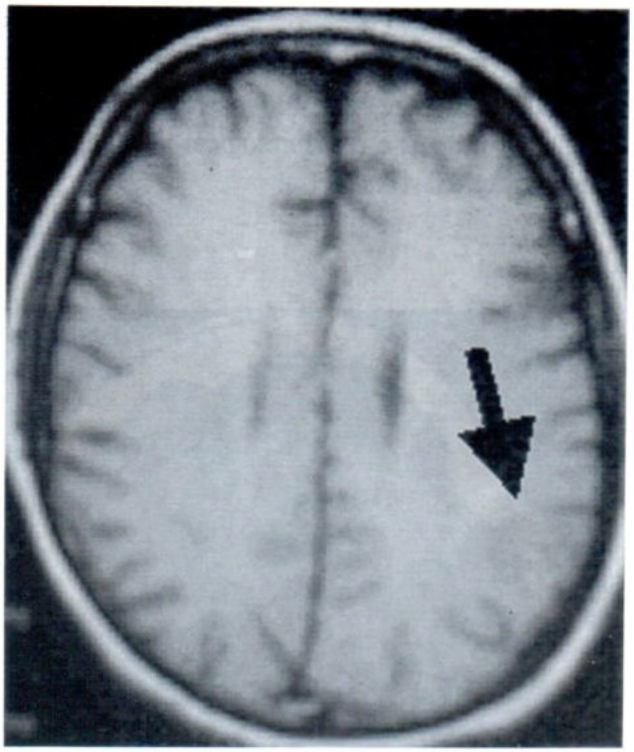


Fig. 3 MRI. T_1W_1

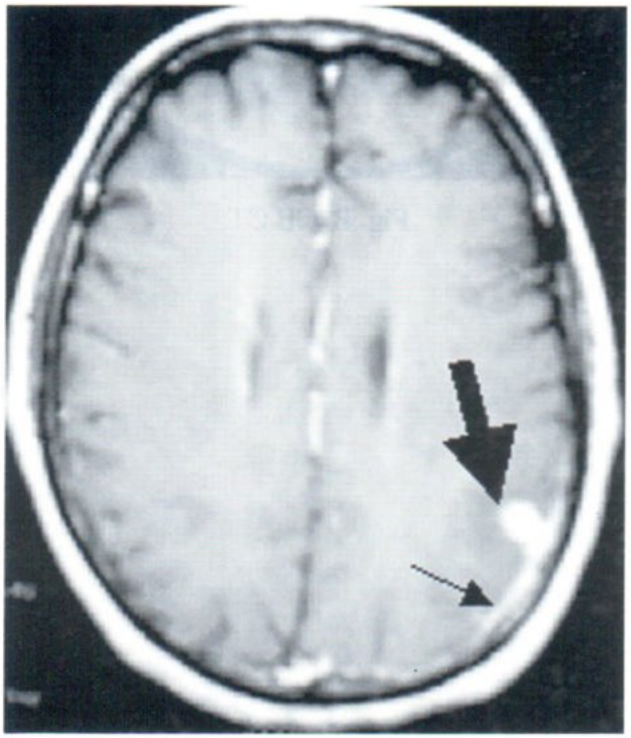


Fig. 4 T_1W_1 with Gad. DTPA.

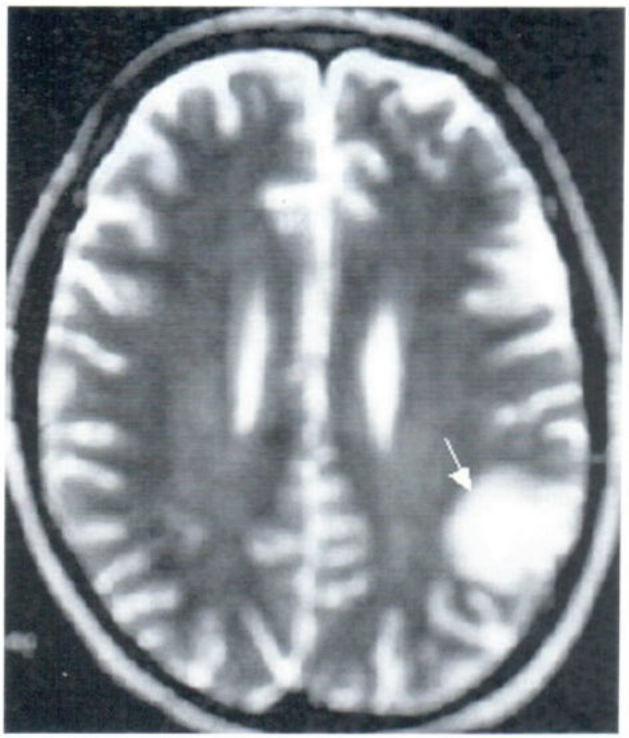


Fig. 5 T_2W_1 with contrast Gad. DTPA.

CATEGORY IV: Specific Infection, Tuberculosis.

Case I: TB. Meningitis

Clinical: Male, age 29 years, Underlying Pulmonary TB., severe headache, no neurological deficit. Lumbar puncture: Acid fast bacilli+ve

Fig.A NC.CT.

Fig.B CE.CT. Marked Enhancement at basal cistern.

Fig. A NC.CT.

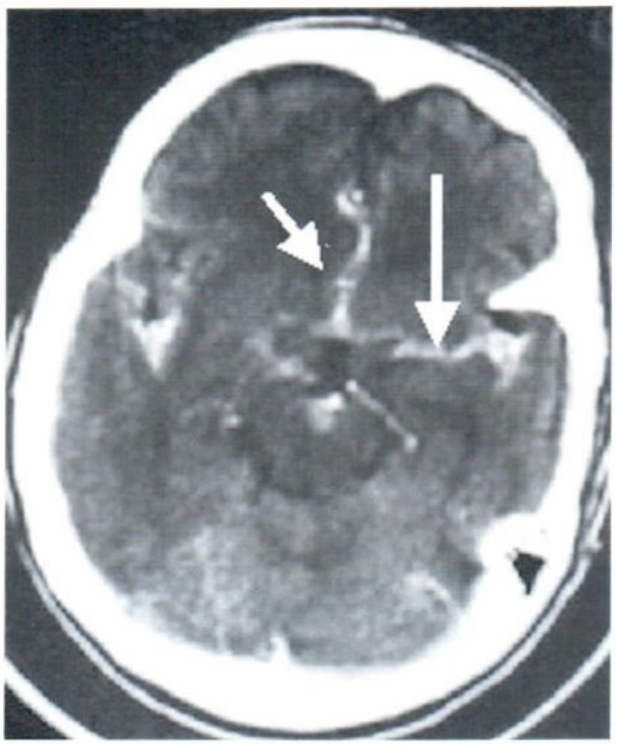


Fig. B CE.CT.

CATEGORY IV: Specific Infection, Tuberculosis

Case II: TB. meningitis

Clinical: Female, age 19 years, chief complaints, headache, vomiting frequently for 2 weeks. Tuberculosis at basal cistern.

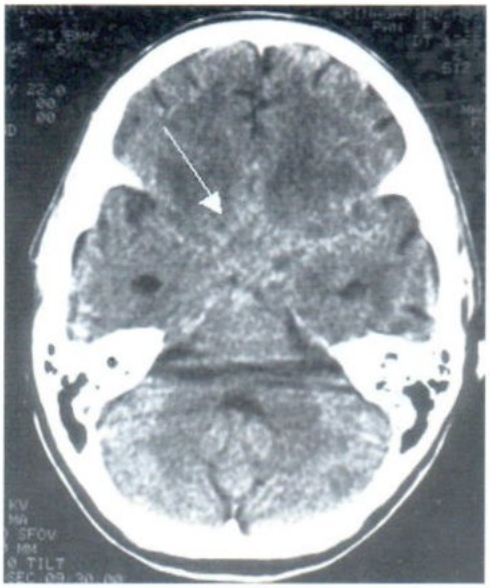


Fig. A Tuberculous lesions at basal cistern in not detectable (NC.CT.)

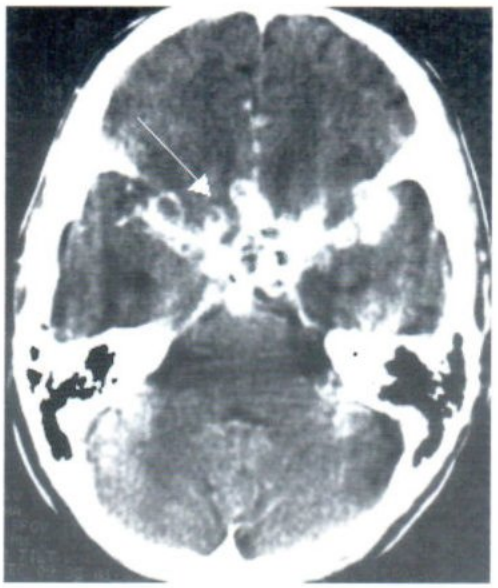


Fig. B Shows nodular enhancement at Basal cistern (CE.CT.)

CATEGORY IV: Specific Infection, Tuberculosis

Case III: TB. Meningitis: Enhancing Plaque at Rt. Basal cistern. Black arrow.

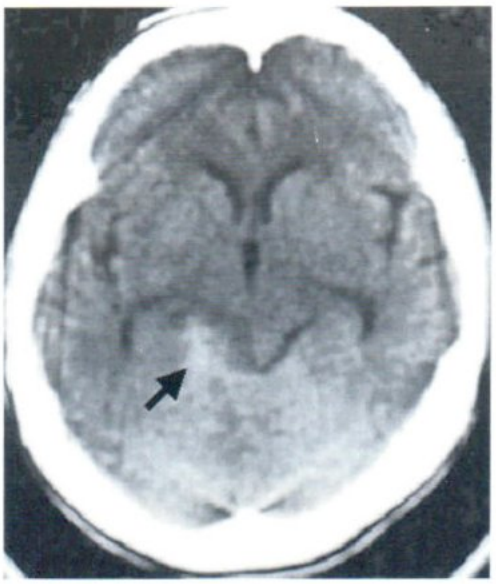


Fig. A NC.CT.

Fig. B CE.CT.

CATEGORY IV: CNS. TB.: Tuberculoma.

Clinical: Male, 23 years, Underlying Pulmonary TB. Severe Headache, Bilateral Papilledema, stiff neck; Lumbar puncture. Tubercle bacilli+ve

Case IV: Tuberculoma Rt., occipital lobe The Tuberculoma at Rt. Occipital lobe having enhancement of the lesion obviously.

Fig. A NC.CT.

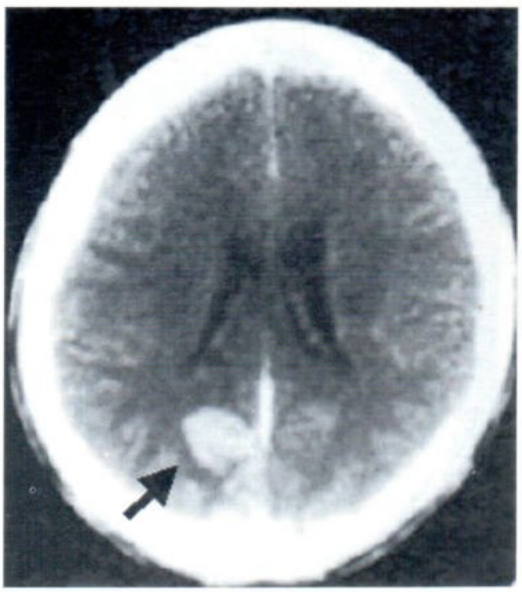
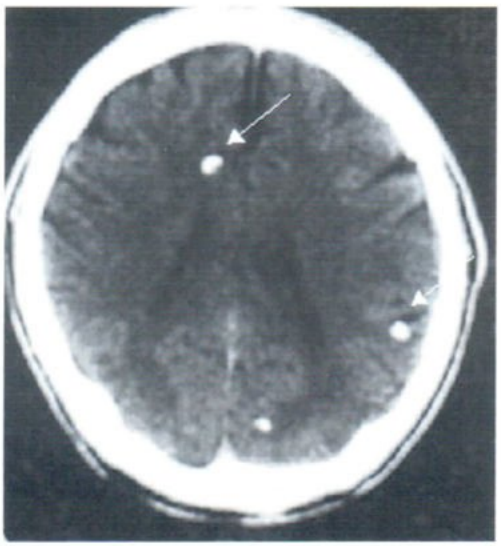


Fig. B CE.CT. showing Tuberculoma Rt. Occipital-lobe with enhancement of the lesion.

CATEGORY V:

Case I CNS.Cysticercosis: Calcified parenchyma
Clinical: Male, age 18 years, CT. shows calcified Cysticercosis in both cerebral hemispheres.

Note: **Cysticercus Cellulose is** the larva of tapeworm which **human is the intermediate host.**



CATEGORY V:

Case II

Clinical: Male, age 38 years, severe headache, convulsion

Fig.A NC.CT.,

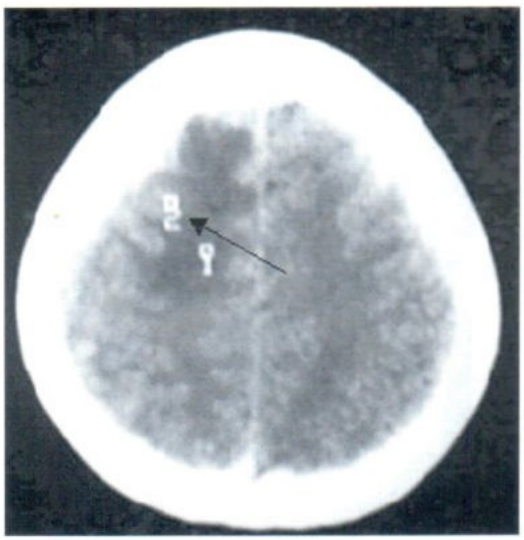


Fig.A NC.CT.

Fig.B CE.CT. Enhancing nodule of Cysticercosis in right frontal lobe with marked perifocal edema.

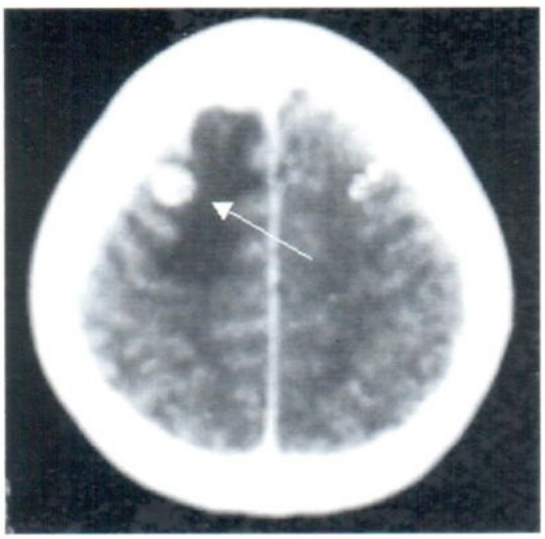


Fig.B CE.CT.

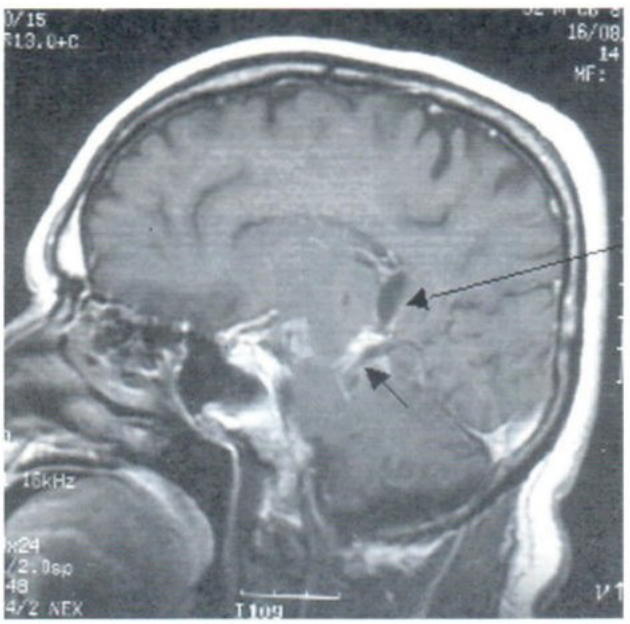
CATEGORY V:

Case III: CNS. Cysticercosis: Intraventricular

Clinical: Male, age 52 years, known case of Intraventricular Cysticercosis post ventriculo-peritoneal shunt.

Sagittal MRI. $T_1 W_1$ after contrast media injection show cyst and point of obstruction after ventriculo-peritoneal shunt.

Upper black arrow shows cysts, lower black arrow shows point of obstruction after having ventriculo-peritoneal shunt.



CATEGORY V:

Case IV: CNS. Cysticercosis: Intraventricular.
Clinical: Male, age 38 years, headache, convulsion,
Operation: 4th Ventricular Cysticercosis.

Fig.A. NC.CT.

Fig.B CE.CT., enhancing nodule of cysticercosis in 4th ventricle

Note: Fourth ventricle is irregular shape cavity in Rhombencephalon, between medulla oblongata, pons, where isthmus is in front and cerebellum is behind. It is connected to central canal of spinal cord below and cerebral aqueduct above. It is connected to the subarachnoidal space through the lateral and median apertures.

Fig. A

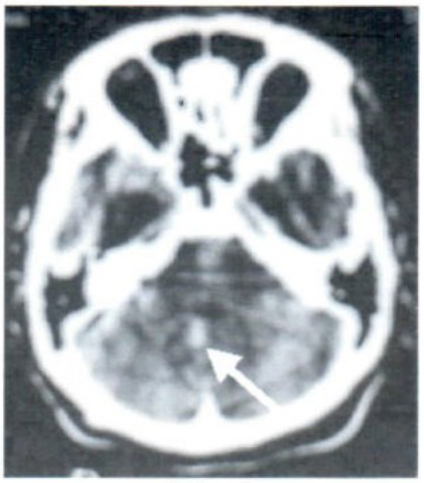


Fig. B

CATEGORY V:

Case V: CNS. Cysticercosis: Leptomeninges
Clinical: Male, age 46 years, severe headache, convulsion.

Fig.A T_1W_1

Fig.B T_1W_1 MRI with Gad. DTPA. Enhancement.

Enhancement of basal cistern, cisterna interpedun- cularis. Leptomeninges consisted of piamater and arachnoid.

Fig.A T_1W_1 MRI

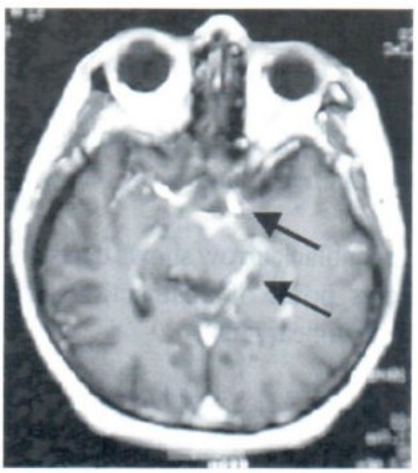


Fig.B T_1W_1 with Gad. DTPA

CATEGORY V:

Case VI: CNS. Cysticercosis: Racemose Pattern (clump of shrubs)

Clinical: Male, age 54 years, Severe headache, convulsion.

Operative findings: Cysticercosis at Rt. Parieto-occipital lobe with calcifications.

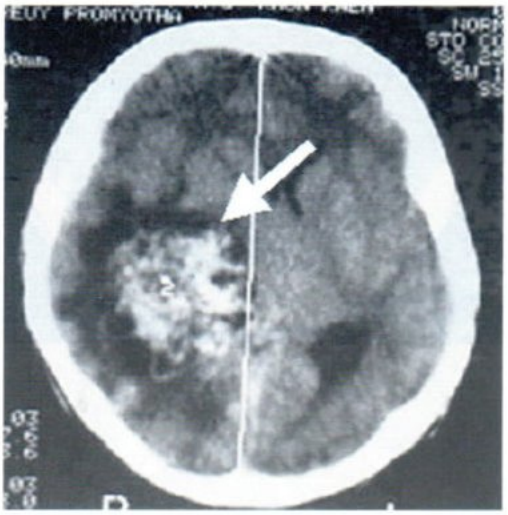


Fig.A Calcified racemose cysticercosis at Rt. parieto-occipital lobe.

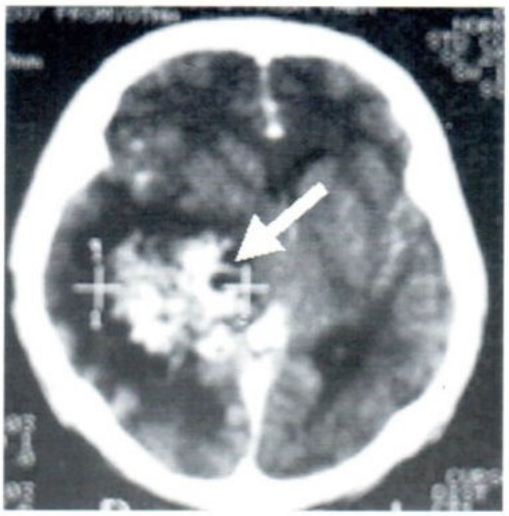


Fig. B Contrast enhancing racemose cysticercosis.

CATEGORY VI: Virus infection

Rabies infection:

Case 1: CT. of the patient with rabies encephalitis **(A.)** before and **(B.)** after injection of contrast media.

Clinical: Male, age 4 years, was bitten by a stray dog. After a few weeks he had symptoms compatible with rabies.

Fig. A NC.CT.

Fig. B CE.CT. The areas of encephalitis are blackening with contrast enhancement.

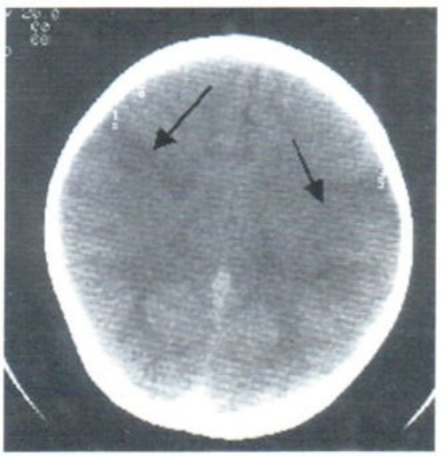


Fig. A NC.CT.

Fig. B CE.CT.

CATEGORY VI:

Virus infection: Case II

Clinical: Male, age 26 years. Heterosexual HIV+ ve, fever, he can not walk for 10 days. Clinical diagnosis. Brain atrophy was diagnosed. CT. scan shows general brain atrophy with enlargement of cerebral sulci the basal cisterns are enlarged.

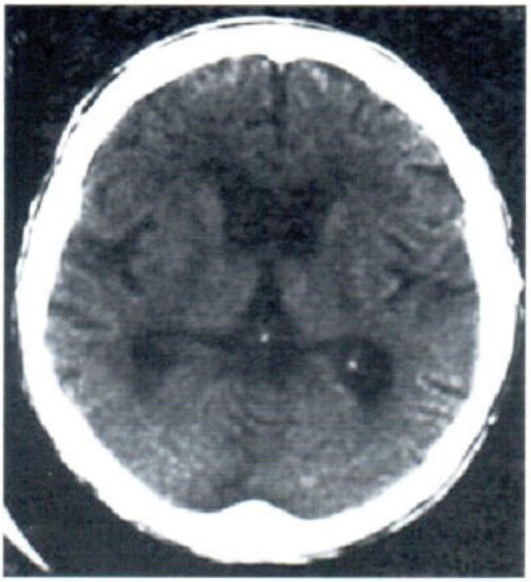


Fig. A Case II

CATEGORY VII: Protozoa secondary to HIV infection.

Case I: Toxoplasmosis, Toxoplasma Capsulatum, HIV+ve

Clinical: Male, age 29 years, severe headache for 1 week. Eye ground showed bilateral papilledema.

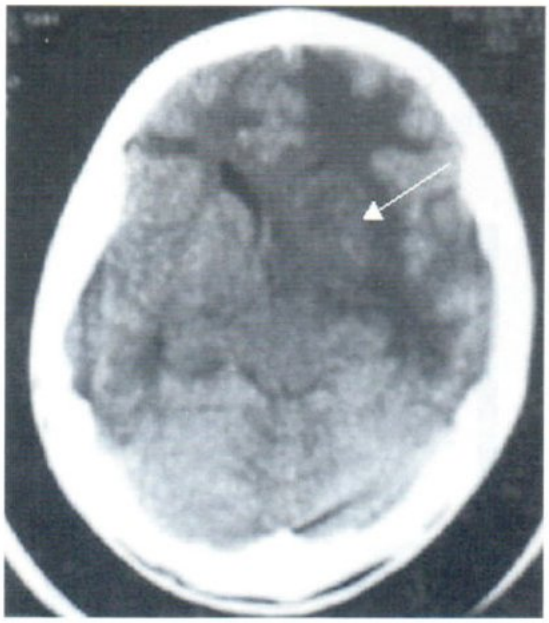


Fig. A NC.CT.

Fig. B CE.CT. show enhancing masses target lesions in the Basal Ganglia are seen.

CATEGORY VII: Protozoa, secondary to HIV infection Case II

Clinical: Male, age 32 years, severe headache for 2 weeks, bilateral papilledema., **HIV with Toxoplasma capsulatum.**

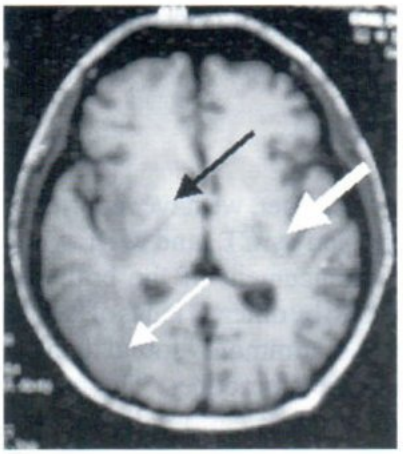


Fig. A T_1W_1 without contrast. No obvious lesions are seen.

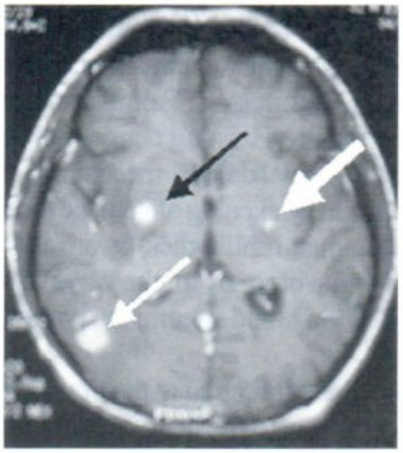


Fig. B T_1W_1 with Gad-DTPA enhancement many enhancing lesions in both cerebral hemi spheres are seen.

CATEGORY VIII: Fungi, secondary to HIV infection.

Case I: HIV with Cryptococcus neoforman.
Clinical: Male, age 26 years severe headache, stiff neck for 6 days.

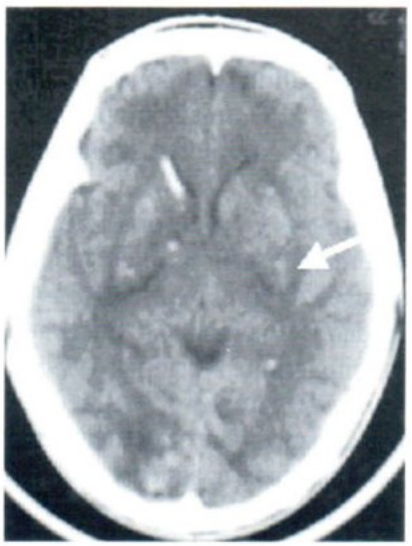


Fig. A NC.CT. small Cryptococcomas in basal ganglia, both sides.

Fig. A Small Cryptococcomas in basal ganglia, both sides are found.

Fig. B CE.CT. enhancing cryptococcomas in basal ganglia both sides.

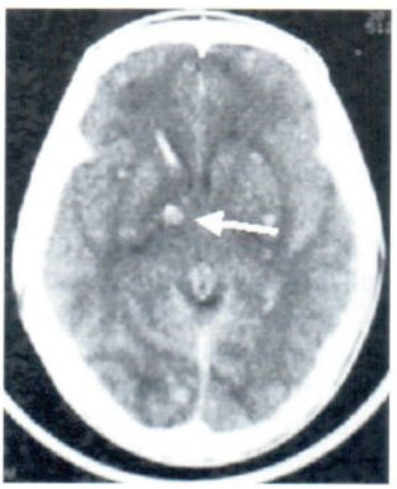


Fig. B CE.CT. enhancing Cryptococcomas in basal ganglia both sides.

DISCUSSION

Common Infections of the brain are usually spreading from neighbouring structures such as respiratory tract infections, e.g. nose, nasopharynx and the other structures around the skull. Apart from that, it may be infected by blood stream spreading from the pre-existing congenital anormally such as congenital heart diseases, Tetralogy of Fallot, or other valvular diseases. These Pre-Existing congenital defect may weakening the normal defense mechanism of the body which resulted in weakening of both the local, general, cellular and humeral antibodies, by primary infection and spread to the brain by all the ways of spreading such as, local, via blood stream, via lymphatic, etc.

The direct infection to the brain is obviously from direct trauma to the head causing damages to the skull, dura mater and Pia, arachnoid. The infected agents may be mixed pyogenic bacterial and specific infection, e.g. tuberculous, spreading from pre-existing pulmonary TB.. The melioidosis, caused by specific infection by bacteria pseudomonas pseudo mallei which has a sporadic spread in the north eastern part of Thailand. Melioidosis may cause cerebritis and subdural empyema which is blood born infection. Cysticercosis caused by cysticercus cellulose, larva of the tape worm. Cysticercosis cerebralis is often found in the north eastern and the northern parts of Thailand because the people in these two provinces are fond of eating raw fermented pork. The tape worms of this species are the intestinal parasites in pigs, human are the intermediate host. People eating raw pork will be infested by the larva of this worm and one or a certain numbers of larva may migrate to the brain and can be calcified in cerebral hemisphere in one or both sides.

Viruses such as Rabies may attack the brain and nearly all the victims are infected by dog bitten. Those who had not been vaccinated by rabies vaccine are mostly fatal. The protozoa are not usually infect the brain as well as the fungus. In this report, we reported one case of protozoa infection secondary to HIV infection, toxoplasmosis, infected by toxoplasma capsulatum. The other case infected by fungus, the cryptococcus neoforman, secondary to HIV infection has been reported. All cases reported here had been reported with pictures of CT with or with out contrast enhancement. T_1W_1, T_2W_1 or T_1W_1 and T_1W_1 with or without Gad-DTPA enhancement. All diagnoses of CT. and MRI. film are confirmed by pathologic sections, autopsy, micro-biological cultures, and, or microscopic slides.

CONCLUSION

In this paper, we have reported the findings of films studied by CT., and MRI. with or without contrast enhancement of the brain and nervous system infected by different kinds of Pathogenic agents from the most commonly found to the most rarely found in clinical practices. The number of cases presented in each categories depend on the number of cases found in each categories. Some are primary infection and some are secondary infection after the immunological mechanism of the victims had been destroyed or weakening by other factors or agents, such as debilitating or chronic progressive diseases, such as old ages, TB. and HIV infection.

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