
RADIODIAGNOSIS OF THE DISEASES AND ABNORMALITIES IN THE BRAIN COMMONLY FOUND IN THAILAND USING CT AND MRI.

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ABSTRACT

Radiodiagnosis of the diseases and abnormalities in the brain commonly found in Thailand using plain films, CT and MRI will be presented, in a series of papers according to the etiologies, caused by congenital, traumatic or diseases. It will be presented in 6 consecutive parts starting from introduction and followed by 5 main groups of abnormalities from different causes, abbreviated as "TICGO", T = trauma, I = infection, C = Congenital, G = Growth or Neoplasm, O = Obstruction and others or Miscellaneous.

Key words: CT and MRI. of diseases and abnormalities in the brain. General introduction and "TICGO"

INTRODUCTION

CT. and MRI. of the brain with or without contrast enhancement are the useful and most convenient methods to obtain the quick and accurate diagnosis of the abnormalities commonly found in the nervous system especially in the brain. The presentation will be done in 6 consecutive papers or chapters, according to the etiology, pathogenesis, diagnosis and treatment by X-ray or Ionizing radiation. The diagnosis will be done by CT and/or MRI or both modalities.

The first paper will be started by General Introduction, followed by the diagnosis of the diseases or abnormalities caused by "TICGO". We rank the priority to describe the Diagnosis of the Brain Disease or abnormalities of the brain that are commonly found in Thailand. "TICGO" means as followed; T = trauma, I = Infection, C = Congenital, G = Growth or Neoplasm, O = Obstruction and Others, miscellaneous.

1. TRAUMA

Head Injury will cause danger to the brain or

CNS. The causes of injury may be divided into two main groups.

1.1 External causes e.g. accidents in the traffic, along the roads, car accidents, boat accidents, air accidents. Another major causes of injury are violative crimes, by gun, explosive or injury from weapons, sharp or blunt. Most of these patients are surgical cases.

1.2 Internal causes. The Cerebral hemorrhage occurs secondary to the pre-existing diseases of the patients themselves. They are medical cases and are not caused by any injury from outside or accident. They are collectively called CVA or cerebrovascular accident, as colloquially called "stroke". These patient may have pre-existing diseases such as arterio-venous malformations (AVM), congenital aneurysm, Berry Aneurysm in the Circle of Willis, arteriosclerosis of old ages, V.D., diabetes mellitus (DM), hypertension and venous thrombosis from pre-existing diabetes mellitus.

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Whatever be the causes of trauma to the brain, CT. and MRI will greatly be beneficial for the doctors in making the decision what is the best way to save the life and not only the life but also to save the disability of the patients to the minimum when they recover. CT and MRI are the quick and best method to give us the quick and accurate diagnosis for planning the best management for the patients. CT. and MRI can tell us the site or sites of bleeding or brain injury and also the amount of bleeding so that the physician can make the choice of treatment. Not only to save the life, but also we have to make the patients and their relatives to lead the lives happily after survival.

2. INFECTION

Infection to the CNS including bacterial viruses, fungi or mixed infections. We may find inflammatory processes in the CNS causing abscess or abscesses and finally locally brain death. The infection may be direct infection from fracture skull and tearing of dura or direct spreading from infection of neighbouring organs or blood stream infection. The infection may directly spreading from Ca. Nasopharynx or Sinuses.

The infections commonly found are, TB., Mixed Infections, Rabies, Toxoplasmosis, cryptococcosis, HIV making the body resistance lower down and secondary infection into the CNS may be easier and wide spreading. The secondary infections, which may be found in the CSF mostly, are fungus, e.g. *Toxoplasma Capsulatum* or *Cryptococcus Neoforman*. In Thailand we may find people from the Northern part or the North-Eastern part who are fond of eating raw foods especially pork infested with parasitic larva, especially the larva of tape worm, *Cysticercus cellulose* which human-being is the intermediate host of *Taenia Solium*. In the X-ray film we may see many small round calcifications distributed around the cerebral cortex where the *Cryptococcus cellulose* are buried by calcification and cause convulsion or other symptoms according to the position in the brain where they are.

3. CONGENITAL

Malformation of the fetuses in Utero may be be genetical i.e. abnormal chromosomes from the maternal and paternal side, or drug intoxication from the mother during pregnancy. Sturg - Weber syndrome and congenital aneurysm of the Circle of Willis.

4. GROWTH or NEOPLASM

Intracranial tumours which may be found, are benign or malignant tumours, the same as in other organs of the body.

4.1. Meninges. The most common benign tumours found in the Meninges are Meningiomas. The common sites which may be found are at the Crista Galli, Sphenoidal ridge, Frontal, parasella and temporal region. The recommended treatment is excision with post-operative radiation therapy, at the tumours bed to prevent local recurrence. Eventhough they will not causing distant metastasis but they are notorious of local recurrence therefore local excision is indicated. It had been proved that for benign meningioma, local excision with post-operative radiation of tumour bed is the treatment of choice to prevent recurrence and repeated excision.

4.2 The brain cellular components consisted of 2 kinds of cells: one is the nerve cells and another is the glia cells. At present, we have not found tumour originated from nerve cell neither benign nor malignant. All brain tumours originated from Glia cells. There are two kinds of Glia cells namely, Astrocytoma and Oligodendroglioma. The difference between these two kinds of cells is the number of dendrites. Both Astrocyte and Oligodendroglioma have only one Axon, while Astrocyte having numerous dendrites, but Oligodendroglioma having only few dendrites. Both kinds of glia cells have only malignant tumours. There is no benign Glia cells tumour. Both kinds of Glia cells have 4 Grades malignancy. The most malignant Glia cell tumours is Grade 4 Astrocytoma which have a special name "Glioblastoma Multiforme" and have

been found most often among primary brain tumours. Glioblastoma Multiforme is the only malignant brain tumour which can infiltrate through the thick and tough fibrotic membrane preventing the malignant diseases spreading from one cerebral hemisphere to the opposite hemisphere. It is the "Falx Cerebri"

4.3 Tumours, which are found in the Ventricles of the brain, have the origin from the cells which are the embryonal content and anatomical contents in the Ventricles and can spread by seedling via the CSF. CSF. fill up the subdural spaces and all the ventricles acting as the shock absorber to the Central Nervous System. These tumours mostly originated from embryonic cells having all together 5 different kinds of cells. Tumours which have the origin from the Ventricular Contents are:

4.3.1. PNET or Primitive-Neuro-Ectodermal-Tumour. This kind of tumour have the origin from the cellular content of the Pineal Gland. They are composed of primitive nerve cells and ectodermal embryonal cells which were the content of the Pineal Gland and can spread by seedling through the CSF.

4.3.2. Choroid plexus tumour. Choroid plexus is a network of capillaries and blood vessels floating in the Ventricles of the brain. The embryonal cell rest which is poorly differentiatel may develop to be Choroid plexus tumour.

4.3.3. Medulloblastoma. Medulloblast are the embryonal rest cells which are at the Cerebello-Pontine they can become malignant in nature and seedling through the CSF.

4.3.4 Ependymoma. Ependymal cells are the cells lining of the ventricles, therefore they can float freely in ventricles and seedling at random in ventricles.

4.3.5 Leukaemia. Leukaemic cells which respond to a certain kind of chemotherapy at certain concentration in the blood, but the chemo-

therapy could not pass from the blood into the CSF. at a concentration which can eradicate the leukaemic cells, because the Blood-Barrier. After the chemotherapeutic agents have been excreted through the kidneys and/or detoxified by the liver, the leukaemic cells that survive in the CSF. can pass out from the CSF. into the blood circulation and produce the recurrent of Leukaemia. The ways to make a complete remission of Leukaemia are only either to inject chomotherapeutic agents intrathecally or to do the whole CNS irradiation with a special technique and precaution.

4.4 Brain is a special and important organ for life and daily performance so it needs high concentration of Oxygen in the blood. Brain is an organ with a specially rich in blood supply. There may be two kinds of **tumours of the blood vessels** in the brain, namely:

4.4.1 Haemangio-endothelioma- it is the tumour of the endothelial cell that form the wall of the blood vessels.

4.4.2 Haemangio-pericytoma- it is the tumour of the pericytes which make the wall of the blood vessels strong enough against the blood pressure in the lumen of vessels not to break through the wall.

4.4.3 Congenital hemangiomas.

4.5 Pituitary gland in the sella turcica. Tumours of Pituitary can be divided into 2 groups according to different functions, hormone producing and non-hormone producing. Tumour in the Pituitary can be diagnosed easily by lateral view of the skull, showing enlargement of sella turcica. **Non-hormone producing tumour;** This kind of tumour consisting of Chromophobe cells which can be seen in the microscope as pink cells, or neutrophilic. They are growing rather fast in comparison with the **hormone producing tumours**, which can be seen in the microscope as red cell, or Acidophilic and blue cells or basophilic.

The chromophobe cells cause symptoms by pressure effects with compression of the other two kinds of cells in the pituitary glands. The acidiphilic cells or the cells staining red, secrete Somatotrophin to stimulate the adrenal cortex to secrete growth hormone. If this tumour occurred before puberty and before the fusion of the epiphyses and metaphysis of long bones, the clinical symptom will be "Gigantism". But if the timing of occurrence of this tumour is after the fusion of epiphyses, the clinical symptom will be "Acromegaly".

The basophilic tumour secrete ACTH and over secreting of ACTH will cause Addison disease and Diabetes Mellitus. The hormone-producing adenomas having small size are called "microadenoma" and show clinical symptoms by producing excess of trophic hormones to affect the target organs such as the adrenal or thyroid gland. The Non-hormone producing tumours cause pressure symptoms to the neighbouring organs. The rapidly increasing number of chromophobes adenoma cells cause the pressure symptoms to the hormone producing cells with the clinical symptoms of deprivation of the trophic hormones to the adrenal, and the gonads of both sexes. In the male patients the complaint is the decrease in libido but rather please that they do not need to shave everyday. In the female, the complaint is amenorrhoea or the delay of secondary sex characteristics. If the tumour is growing very big, it will cause the pressure symptoms to the optic chiasma causing bilateral hemianopsia i.e. the lateral visual fields are narrowing or complete loss without limitation of eye movement as seen in the Ca. Nasopharynx.

In Ca. Nasopharynx, there is direct extension of the tumour into the skull and pressed on cranial Nerve IV and VI causing paresis or paralysis of lateral rectus and superior oblique muscles of the affected side causing internal squint and Ptosis of the eye of that side. In pituitary tumour, the Chromophobe adenoma, the loss of visual field are bilateral because the tumour press directly on optic nerves of both sides where the nerve fibers are crossing.

N.B.; Hints for remembering Pituitary tumours, different kinds and their effects.

1. Hormone producing tumours.

A= Acidophile, staining Red produce Somatophile, Clinical Symptoms, Acromegaly or Gigantism.

B= Basophilic, staining Blue produce ACTH, Cortisone, Cushing Syndrome

2. Non-hormone producing tumour.

C= Chromophobe, staining Pink, produce pressure symptoms. Apart from the brain tumours which have been described in 5 major groups, there may some other 5 small groups of tumours in the brain.

4.6 Optic Glioma derived from the optic nerves.

4.7 Acoustic. Swannoma derived from the nerve sheath of Acoustic N.

4.8 Craniopharyngioma derived from primitive cell around or above the sella turcica, parasella tumour.

4.9 Chordoma. Tumour of notochord which may be found at the cervical, thoracic or sacral region.

4.10 Retinoblastoma. Tumor originate from the retina cells of the eye.

Apart from Primary Tumours which have been described, there are also Metastatic tumours which have primary origin from other organs and spread to the brain by blood stream e.g. Bronchogenic Ca, Breast Cancer and Ca. Thyroid etc.

5. OBSTRUCTION

There is some obstruction of the flow of CSF. from all the causes which have been described such as Trauma. There may be either complete or partial obstruction of the flow of CSF. by blood clot, or

tumour or damaging tissues. Congenital cause of obstruction of CSF is Arnold Chiary Malformation.

DISCUSSION

In the old days before the development of CT. and MRI., the radiodiagnosis of the diseases and the abnormalities of the brain or the nervous system, can be done only by plain films and cerebral angiography using opaque media. The injection of opaque media into the carotid artery required a skillful hands and event more difficult if we want to do the vertebral artery angiograms. Anyhow after invention of CT and MRI, radiodiagnosis of the diseases, abnormalities either congenital or acquired can easily be visible, diagnosed by CT and MRI or both modalities in the diagnoses and proper treatment or management can be done. In traumatic or cerebro-vascular accidents, prompt and accurate diagnosis can be done and taking the least time by CT. or MRI. alone or both which are complimentary to each other. We can not only save the lives, but also save the deformities or sequelae affecting the patients after these unfortunate incidents.

The presentation of this subjects with be presented in a series of 6 consecutive papers in this journal. This is the introduction paper, another 5 papers will be followed.

CONCLUSION

6 consecutive papers about the radiodiagnosis of the diseases and abnormalities in the brain commonly found in Thailand using CT. and MRI. will be presented in this journals in 3 volumes, 2 in each volume.

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