THE DIAGNOSIS OF BRAIN TUMOUR

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It has been long realised that the diagnosis of an intra-cerebral tumour is a very difficult one from the point of exact localisation. In fact, Cushing mentions specifically that to rely on clinical examination alone, the localisation of a cerebral tumour would be erroneous in about half of the cases. That this is so is because of the fact, that an intra-cerebral tumour is capable of producing three kinds of effects: firstly the local effect where the tumour by infiltration and destruction, or by pressure and nutritional deprivation causes some neurological deficit incidentally indicating the site of the primary lesion; secondly, the tumour may by its presence occupy space meriting the name, space-occupying lesion in the head, leading to increased intra-cranial pressure, resulting in what is known very well as the triad of increased intra-cranial pressure, namely papilloedema, headache, and vomiting; and, thirdly, the tumor may by its presence produce shift and interference with the circulatory dynamics in the brain of the blood and CSF, resulting in what is known as false localising signs, best illustrated by the frequent presence of pyramidal release, and by sixth nerve palsy. Whereas it is common knowledge that there can be three different kinds of aetiologies of neurological deficit following the presence of a tumour, it is however extremely difficult when dealing with a case to differentiate one from the other, and frequently localisation of a tumour depending on clinical examination alone comes to grief because of this difficulty. However, it is essential that for the purpose of treatment especially of a definitive nature, exact localisation is necessary. This is so because it is known to be a very dangerous procedure to open the skull on the side opposite to the tumour, and also it is not really possible to have very large exposures in the skull and hence, to have an inexact localisation will render operation or treatment by deep xrays irradiation extremely hazardous and ineffective.

The advent of new diagnostic techniques has been of considerable importance to the neurologists in that, whereas, clinical localisation is difficult even to the expert, with the use of these new techniques, the localisation can be exact and in fact very frequently accurate. In all neurological clinics, the common techniques in use are air and contrast studies. (Dandy 1918; Moniz, 1927). Air studies have now been in use for a period of well over 30 years, and they have proved to be of consistent value both in showing the midline shifts and in localising pressure effects that lead to the deformation of one or more of the ventricular chambers of the brain. It is also of some value in cases of superficial atrophies, and also in showing up the presence of abnormal spaces in the brain, where air may gain entrance such as in porencephaly where the cystic lesions are in communication with the ventricles. However, this has certain limitations in that it is not without danger if it is done thoroughly, and a thorough air study will require almost the complete replacement of the cerebral spinal fluid with air. This complete replacement with air particularly in the presence of increased intra-cranial pressure, and when done by the lumbar route, is in fact a very hazardous procedure. On the other hand, complete replacement with air through the ventricular route at an operation is not entirely satisfactory, because of the leakage of air, and the difficulty in positioning. In addition, it requires a surgical operation, and is therefore not a routine investigation or procedure. Partial replacement by air is safer, but is not as informative, and attempts have been made to introduce small quantities of radio-opaque substances together with air in order to obviate this difficulty, and also to help to outline the smaller passages in the ventricular system such as the aqueduct, where the small amount of air will sometimes make it difficult to be visualised in xray film.

Dye studies on the other hand has a more recent history, but it has definite advantages in that it displays the arterial and the venous system effectively in good quality arteriograms. This will mean that any displacement of vessels or abnormal vascularity inside the skull will be easily displayed. Since most intra-cranial tumours will do one or the other, then the display of the presence of a tumour by dye studies can be very satisfactory indeed. Further, the exact anatomy of intra-cranial vessels has been studied very intensively, so much so that it is now known that the variations of these vessels are

much less than in fact the variations of the ventricular system as far as asymmetry between the two sides is concerned. It means that from the point of localisation, especially in smaller lesions, dye studies will be superior to ventriculogram. On the other hand, certain lesions may display no displacement of blood vessels such as an intra-ventricular space occupying lesion e.g. papilloma of the choroid plexus, or areas where there are no big vessels either in the way of arteries and veins, since the capillary formation of the brain is such that it is not possible to tell from the general appearence of capillaries whether it is normal or abnormal, especially when the definitions of capillary phase in most cerebral arteriograms are such as not to have distinctive features. Dye studies are however, infinitely superior to ventriculography when one comes to study blood vessel malformations, and vascular tumours, because the localisation will be extremely accurate and the nature of the lesion sometimes definitive. Hence it is that these two techniques constitute the sheet anchor of neurological diagnosis, and with their combination, the diagnosis of intracranial tumour has become a matter of every day routine, so much so that many neurosurgeons, and in fact, even general surgeons, resort to neuro-surgical work without having to seek the assistance of the neurologists.

Other techniques include electro-encephalogram, ultra-sonic echo-encephalography and radio-isotope scanning of the brain. It has been a general impression that the echograph is of value only in displaying the shift of midline structures and as such, its value in exact diagnosis is limited. However, it has the distinctive value in that it is non-traumatizing as far as we know of the intensity of ultra-sonic waves that we use in diagnosis; and it is easy to carry out, hence repeated examinations can be done. Because of these points, echo-encephalogram will definitely have value in that it can be used as a screening method in diagnosis prior to the employment of other techniques which are not without danger and difficulty. Electro-encephalogram has the same advantage as the echo-encephalogram in that it is also non-traumatic and capable of indefinite repetition, but however it is handicapped in that it is more time consuming, is difficult to do in a restless patient, and also the interpretation of electro-encephalography is much more difficult for many reasons amongst which may be mentioned the presence of more than one discharging foci in the brain, and secondly, the picture being a summation effect of the voltage changes of many active foci within the skull. Radio-isotopic studies on the other hand seem to be simpler to apply, but the safety from radiation is still to be evaluated, and its value is just beginning to be reported and assessed. Thus it seems generally accepted, that it is useful if there is a change in the vascularity of the tumour area or if there is abnormal take up of the radio-isotope by the tumour tissue, and that the lesion is at least two centimetres in diameter, and also not near the base of the skull where there are many structures so as to produce confusion in scanning.

These considerations will in fact vary with the position of the tumour inside the head, and by and large, it is accepted that for supra-tentorial tumours, air and dye studies are of great value, EEG is of little value other than helping in deciding the laterality of the tumour much as the echo-encephalogram, and radio isotope investigation is of value in some cases but not in others. The following case is reported because it shows an exception to the rule in that the case was clinically suspected to have a tumour and the air and dye studies were unable to substantiate the clinical impression, but the electro-encephalogram was indicative of a definite lesion at a definite site, and subsequently at post-mortem, it was found that the EEG indication was correct.

The patient was a Chinese merchant 52 years of age admitted on 21.6.66. He had a history of epigastric discomfort for 8 years and was taking alkalis regularly. For two months prior to admission, he felt unsteady with no definite vertigo, or incoordination, and a month later, he also noted some episodic frontal headache, which was constrictive in nature but not disabling, and usually relieved by massaging the head. He also noticed that his tongue felt stiff and clumsy, and he could not talk well, and his memory for recent events showed deterioration to such an extent that he frequently misplaced articles.

There was no past history of mental and physical illness, or trauma to the head, and all his personal and family history was not relevant.

Examination showed that he had a B.P. of 140/80, and was physically normal except in the nervous system. He had bilateral early papilloedema, no visual field defect. and no other cranial nerve disturbance that was detectable. There was a generalised increase of reflexes

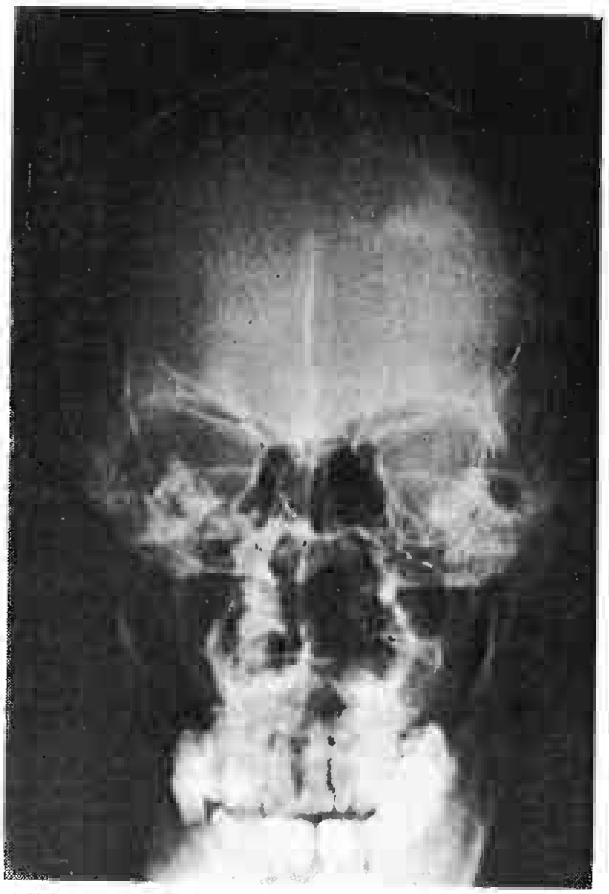


Fig. 1. Straight X-ray skull.

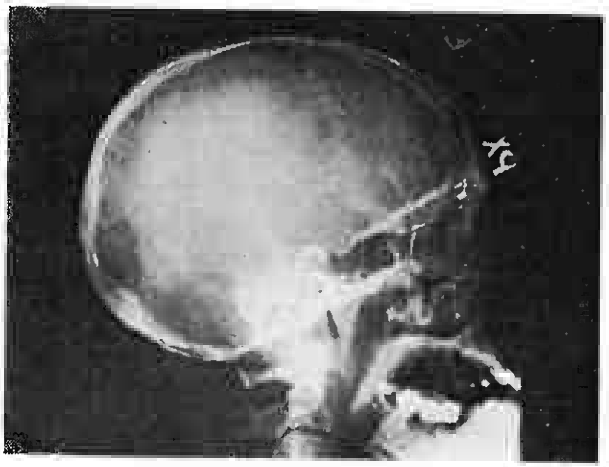
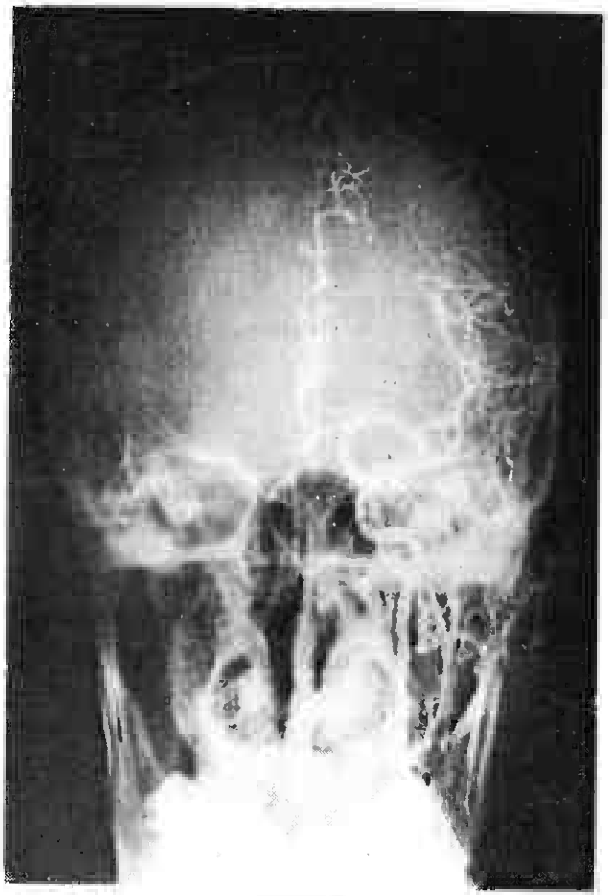


Fig. 2. Straight X-ray skull.



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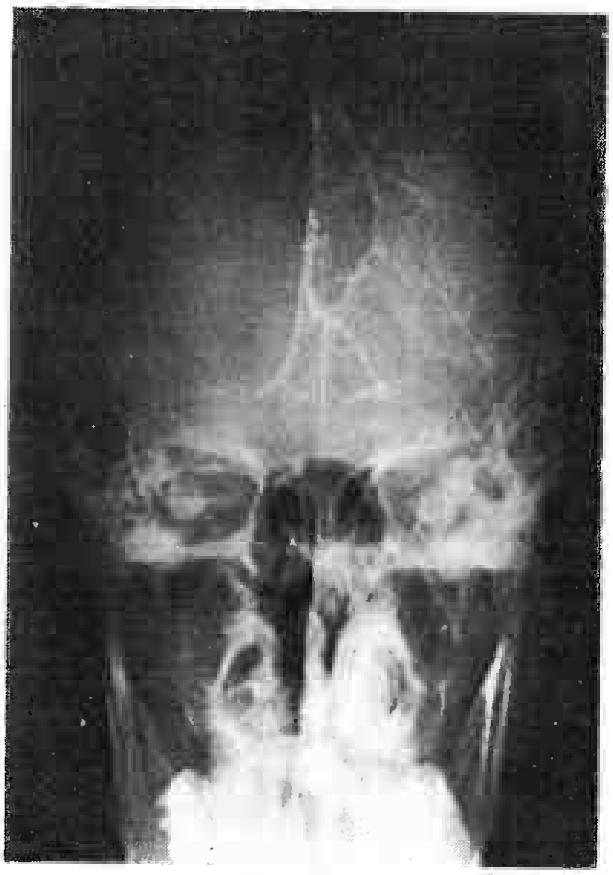


Figure 4.

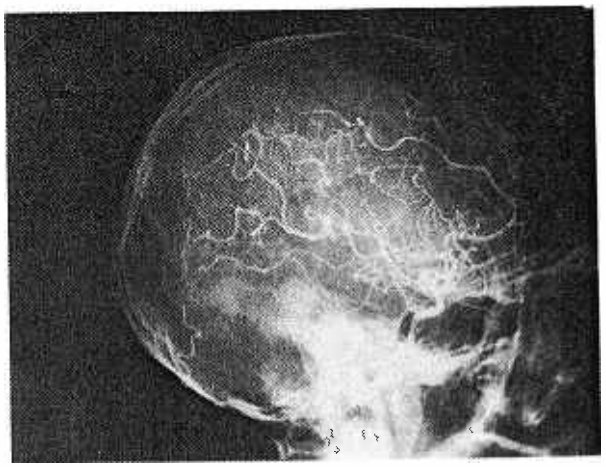
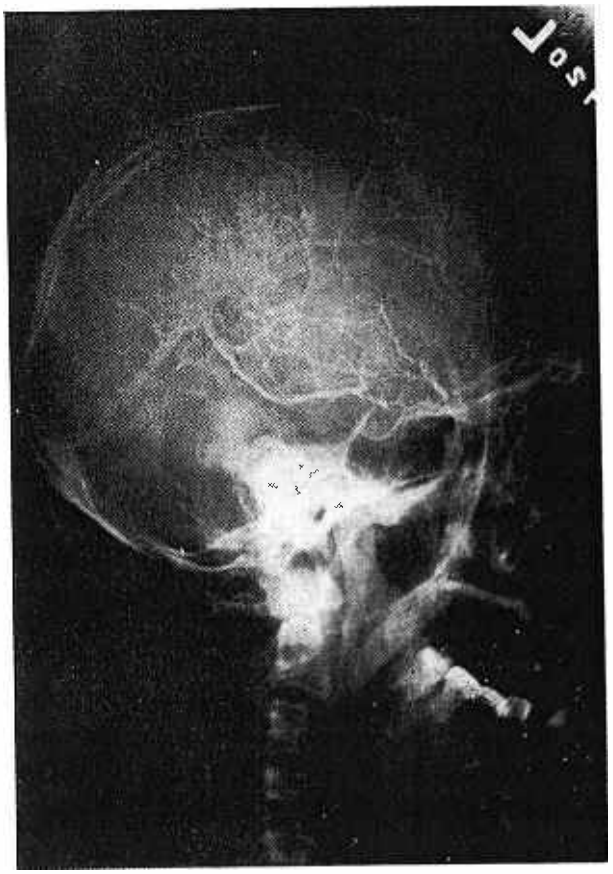


Figure 5.



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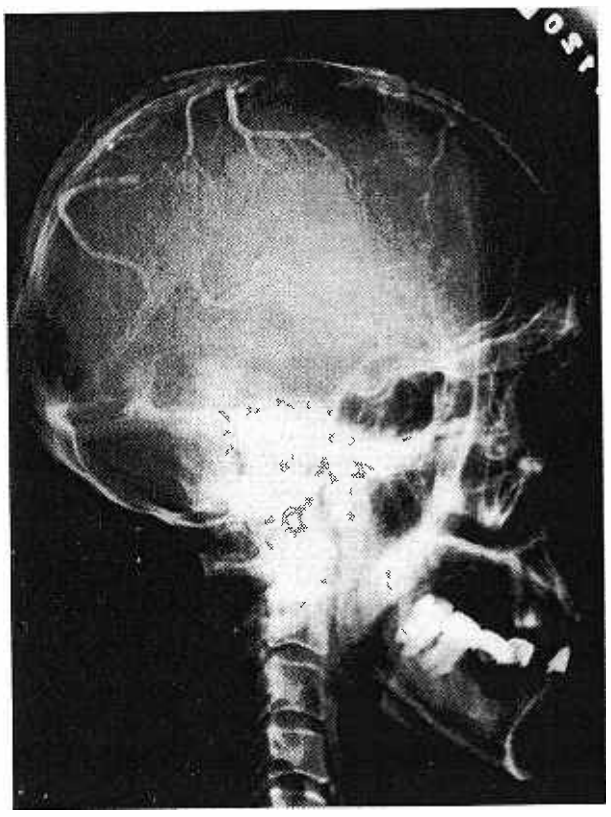
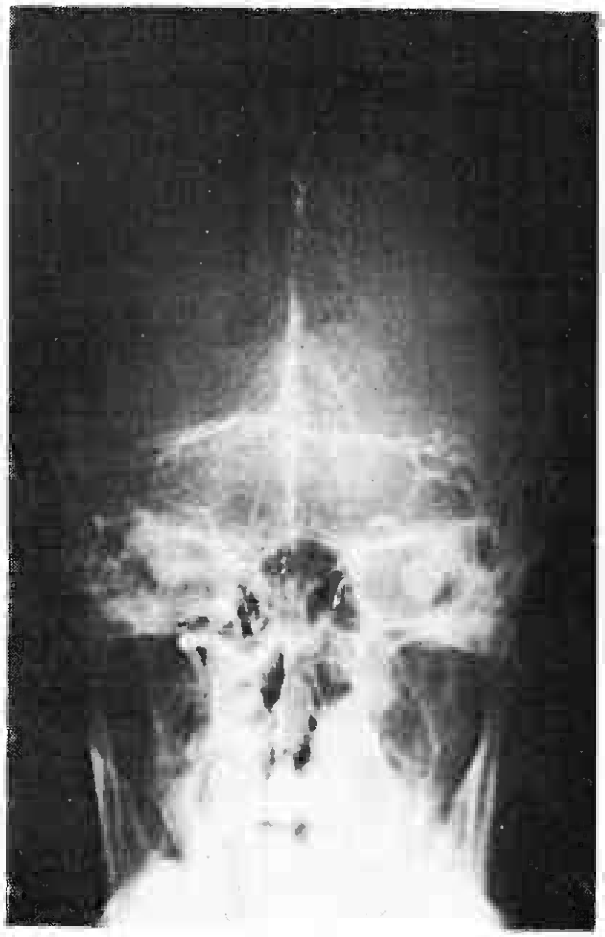


Figure 7.

Figs. 3 - 7. Left Carotid Arteriogram.

Figure 8.



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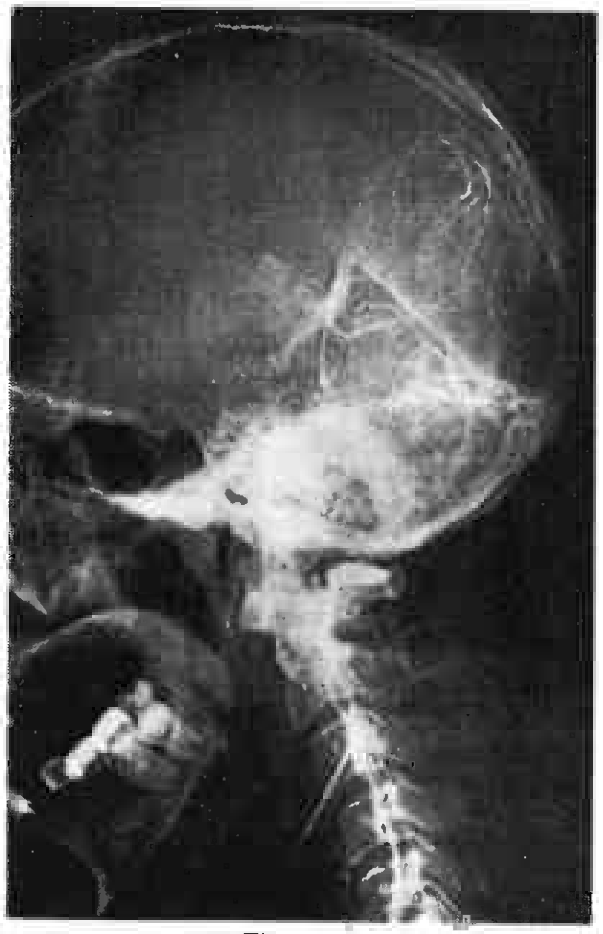


Figure 10.

Figure 11.

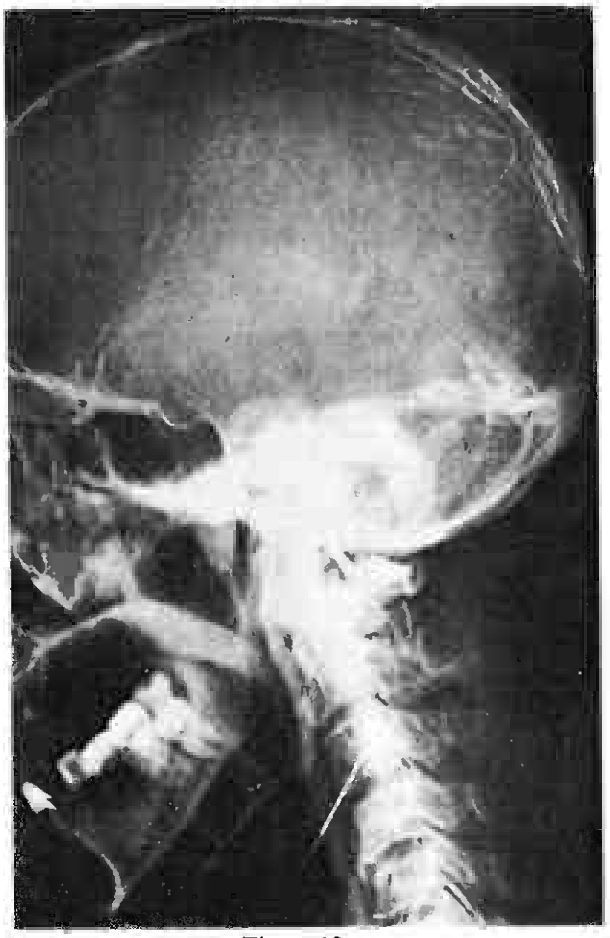
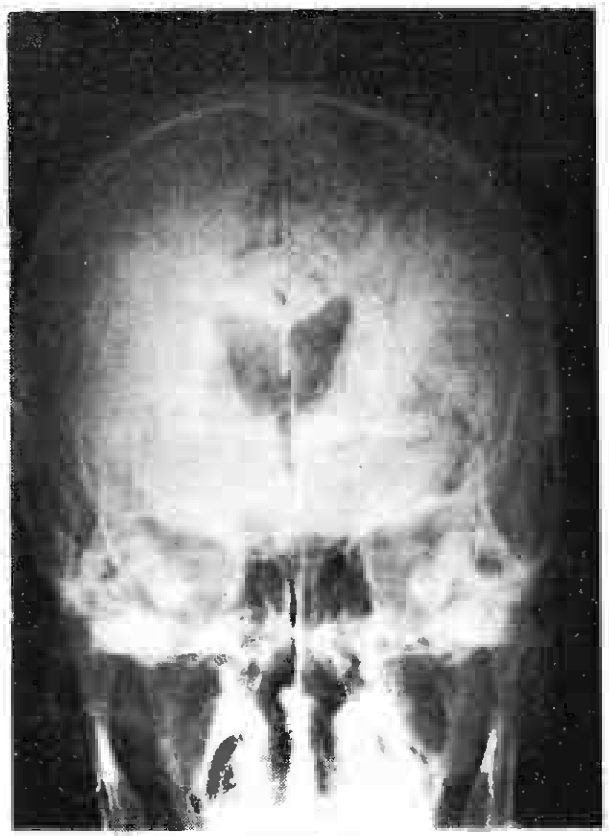


Figure 12.

Figs. 8 - 12. Vertebral Arteriogram.



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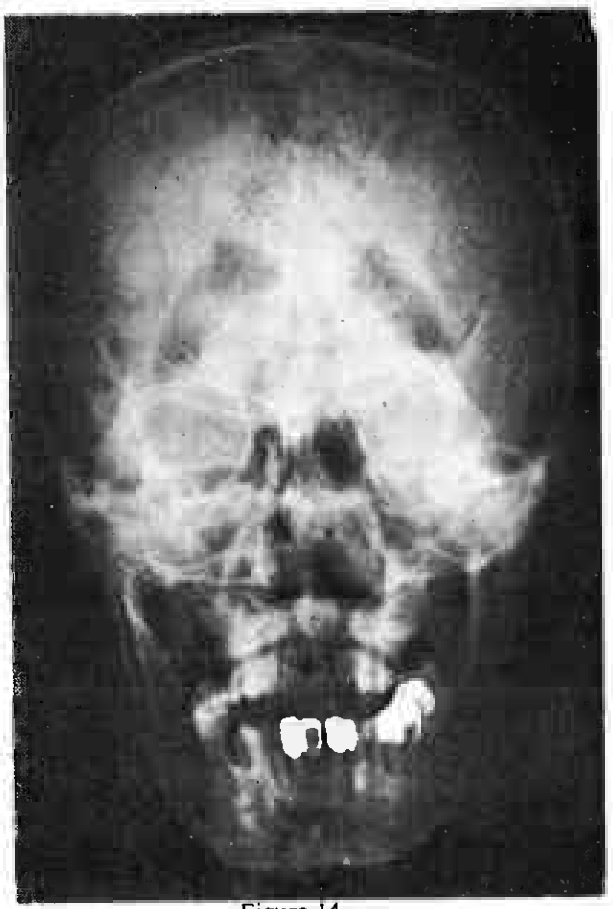

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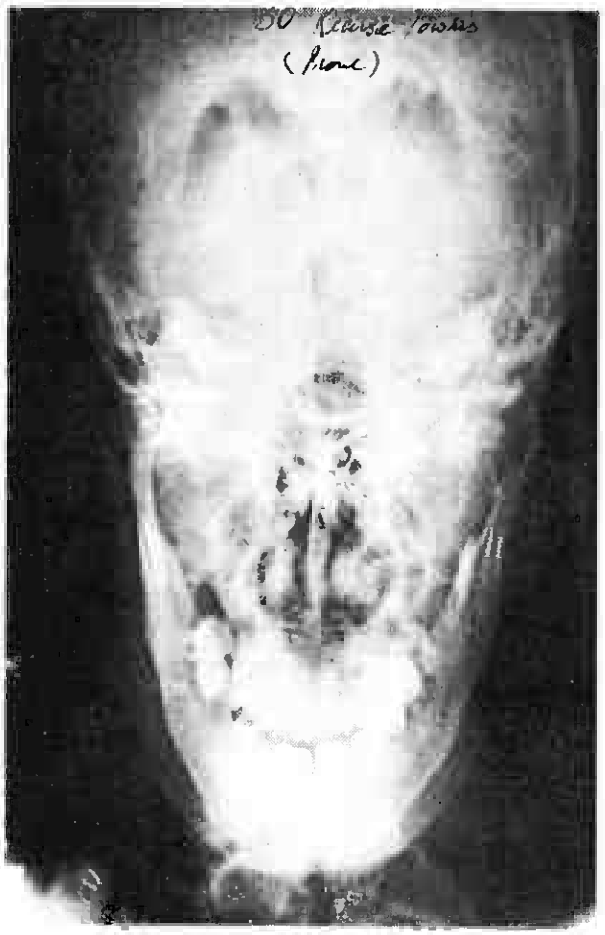

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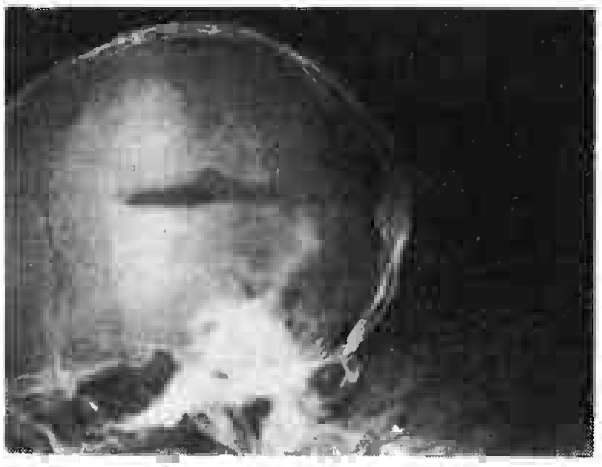

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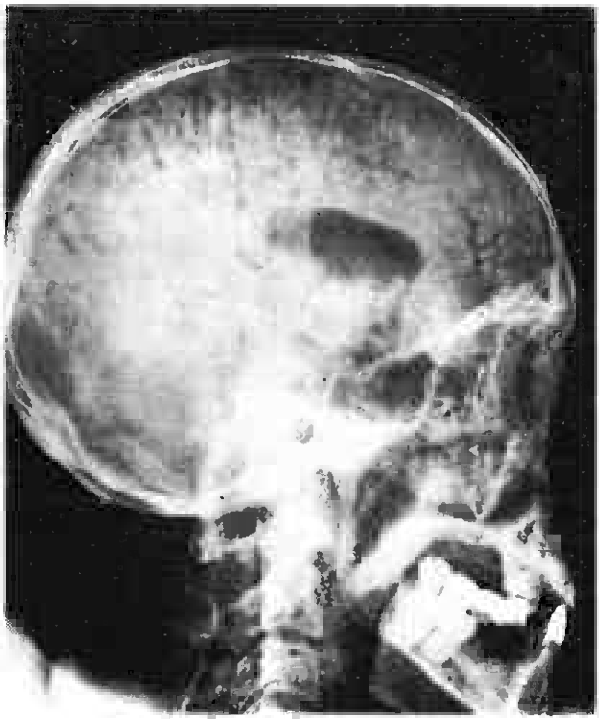

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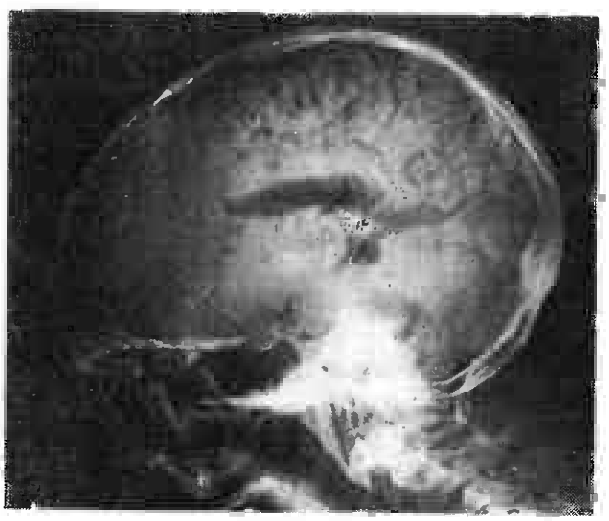

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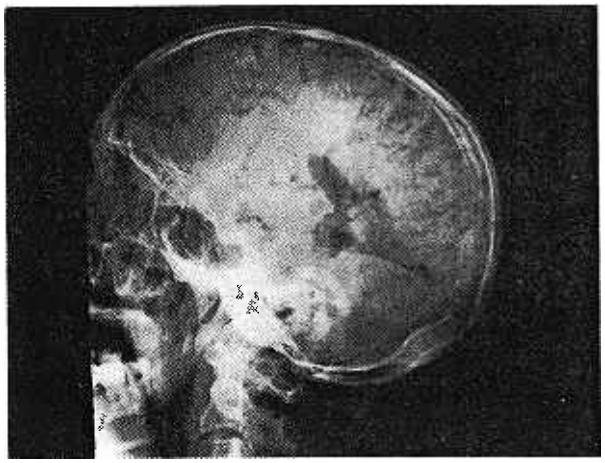

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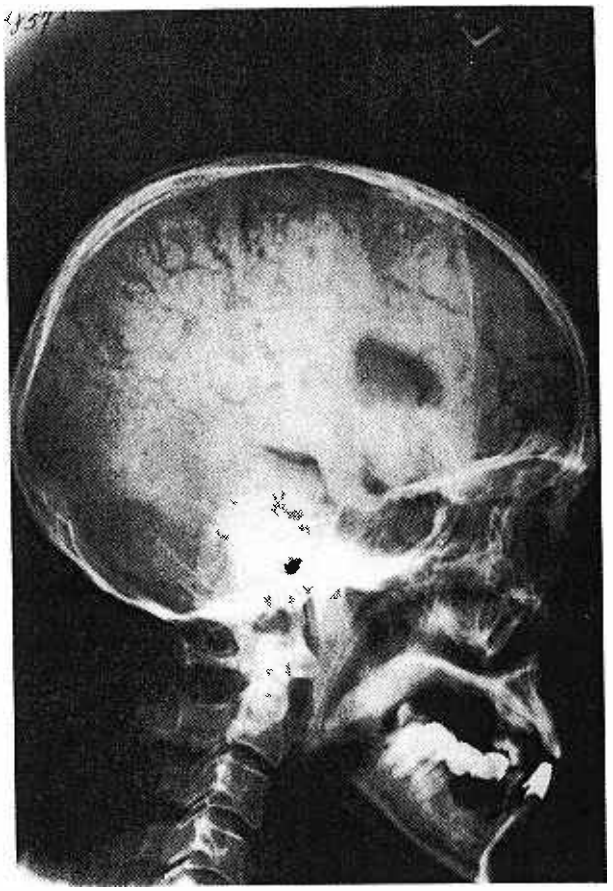

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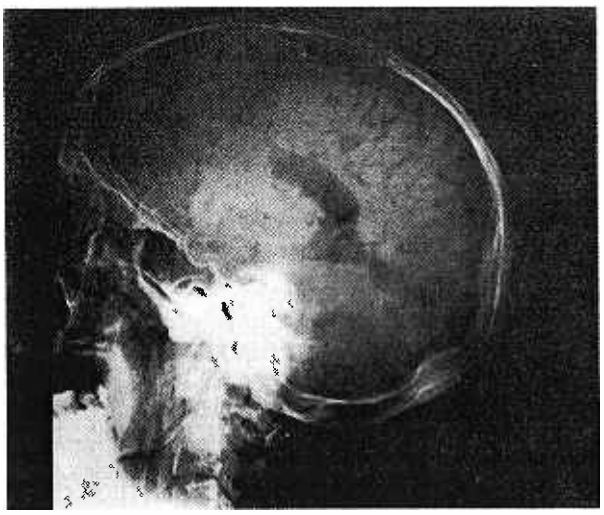

Figure 21.

Figs. 13-21. Lumbar route air encephalogram.

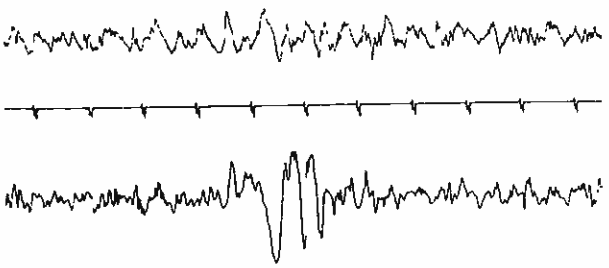

Fig. 22. Electro-encephalograph of both upper fronto-parietal area showing abnormal spikes on left side and delta rhythm both sides. Marker at 2 sec. intervals.

which were however equal on both sides. Babinski responses downgoing, and abdominal reflexes were present. He had, however, a mild impairment of coordination in the right upper limb, but his gait was normal. There was no nystagmus. The speech showed a marked naming aphasia.

The signs showed rapid deterioration and within a fortnight, he was hemplegic and bedridden, with akinesia, and lethargy. The papilloedema remained much the same. From then on, he deteriorated steadily until 3 months later, he was tremulous all over, mute and akinetic, conscious but unable to respond to spoken words. He assumed an attitude of flexion in the upper limbs and extension in the lower limbs in a posture of decerebrate rigidity. Babinski sign was positive on both sides, and there was an impairment of convergence with a rotatatory nystagmus in both eyes. The pupillary reflexes were normal, and the papilloedema resolved. He remained in this state till death occurred on 14.1.67—six months from time of admission.

Investigation at the time of onset showed the following:

Hb, TW, LP — normal
Chest and skull films normal
EEG—high voltage slow waves 3-4/pc bilaterally with right focal discharge
Carotid arteriogram — normal
Vertebral arteriogram — normal
Lumbar air encephalogram — normal
C.S.F. enzymes — glutathione
Reductase normal. LDH 21. — normal.

Xrays

Skull: B.35760

No radiological evidence of raised intracranial pressure, no abnormal calcification and the pituitary fossa looks normal
—Dr. Boey H.K.

Chest: Normal

Y.40388

—Dr. Yin J.

Left Carotid Arteriogram: Normal position of the anterior and middle cerebral arteries. No avascular areas seen. No areas of abnormal vascularity.

Vertebral Arteriogram: Direct right vertebral artery puncture. The right posterior cerebral and superior cerebeller arteries are rather narrowed, and appear somewhat straightened although this may be within limits of normality.

CONCLUSION

There is no obvious space-occupying lesion. Appearance of arterio-sclerotic narrowing of posterior cerebral and superior cerebellar arteries on the right.

Dr. Yin J.

Lumbar air encephalogram: U.38573. Easy flow of air into the ventricular system. The size and position of the ventricles are normal. The position of the aqueduct is normal. Size of the sulci and cisterns are also normal.

Normal air encephalogram.

Dr. Yu S. F.

A premortem diagnosis was made of a progressive parieto-temporal lesion with brain stem involvement—? glioma, secondary deposit? encephalitis. The neuro-surgeon was not prepared to explore him just for a brain biopsy, and it was thought that in the absence of positive proof, it would be unreasonable to submit the case to deep xray.

After death, post-mortem permission was not given, and a brain biopsy was done through the right orbit. The biopsy specimen was reported by the pathologist as follows: Section showed gemistocytic astroctoma (Dr. Lee Swee Kok).

SUMMARY

A brief discussion of the diagnostic aspects of intra-cranial space-occupying lesions was made, and it was recapitulated that the reliability of air and dye studies was usually better than that of electro-encephalogram from the point of the exact localisation of a lesion. A case was reported however, to show that in the presence of an infiltration tumour, the EEG was the only abnormality other than clinical signs, and that air and dye studies both failed to demonstrate the lesion.