21. Tomodensitometry Under Stereotaxic Conditions
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In tumoral pathology, there are 2 types of abnormality shown by CT. The first group is of usually rather large lesions which when correlated with other abnormal findings, clinical, isotopic or neuroradiological, allow a fairly firm diagnosis. In these cases CT provides supplementary information which though useful in determining treatment does not radically change the plan of treatment.

The second group is of lesions usually limited in size, in which all other isotopic and neuroradiological findings are normal. In the vast majority of cases, these findings are discovered in connection with epileptic seizures. Although they present difficult problems, it is not satisfactory simply to put them in the patient's file and to check their progress routinely, for the simple reason that we are dealing with evolving neoplastic lesions.

On the other hand, to recommend an immediate open surgical investigation is almost always difficult. Apart from the risk of functional deficit associated with certain regions of the head, the search for a small lesion deep in the brain can turn out to be a very hazardous enterprise.

The problem is to get a histological diagnosis precise enough to allow a decision to be made regarding treatment. We consider that stereotaxy can make a decisive contribution in this respect. In fact, a stereotaxic approach is the only one which enables one to deal with a small lesion almost anywhere in the head with great accuracy and without major functional risk.

The picture in question, which can only be provided by tomodensitometry, needs to be transferred to a stereotaxic context with great precision. This however presents considerable problems. The slice is generally considered to be parallel to a conventional base line (the orbito-meatal). Yet even if it has been taken under optimal conditions, which is far from being always the case, the direct transposition of the picture thus obtained into stereotaxic space is open to 2 sorts of errors: possible angular error of \( \pm 8^\circ \) and linear error of \( \pm 5 \) mm. These elements of uncertainty, serious enough when one is dealing with medium-sized lesions deep in the brain completely rule out any attempt to reach parasagittal lesions especially near the poles since the error can in this case be of several centimetres.

These difficulties can be overcome if CT itself is done under stereotaxic conditions, which is what we have done.

The examination is carried out after the patient has been placed in a stereotaxic frame, in our case an adaptation of Talairach's frame (Fig. 21.1). Each slice is parallel to the plane of the frame and the height of the slice is taken from the frame. The slices are enlarged photographically to the real dimensions of the head.

Then, in the operating theatre the patient's head is placed in an identical position in an identical frame and fixed surgically. In positioning the head there can be a possible angular error of \( \pm 2^\circ \) and a linear one of \( \pm 1.5 \) mm.

Angiography, ventriculography, encephalography are performed under the usual conditions with frontal and lateral angles strictly perpendicular to one
another and parallel to the plane of the frame. One then has three pictures in real size of the cerebral area, using the three conventional orthogonal planes: horizontal, frontal and sagittal.

The volume of the lesion is determined by successive horizontal slices and then reconstituted on the frontal and lateral photos, taking into account the known slight enlargement which occurs in teleradiographic pictures. One can obtain a perfectly accurate picture of the target volume even when the vascular, sulcal or ventricular pictures are normal.

Thus any target at all can be located stereotaxically with a considerable degree of security and accuracy.

Using 3 examples we would like to illustrate the possible value of this method, by showing:

1) that it allows biopsy of even very small lesions;
2) that it is a particularly simple and effective aid in radiotherapy;
3) that it allows particularly precise correlation between CT findings on the one hand and electrophysiological or anatomical ones on the other.

Case n°1, Mme F... 53 years had a series of adverse seizures on the left side. The electroencephalogram showed a discrete focus in the intermediate left frontal region. Tomodensitometry showed a low density image 1 to 2 cm in diameter close to the midline. Angiography and encephalography were strictly normal. After careful transposition of slices carried out under ordinary conditions biopsy was carried out. All four samples were normal.

A further slice was done, this time under stereotaxic conditions. Its transposition permitted further biopsy: a single sample allowed diagnosis of astrocytoma. The error in the first case was of only 12 mm.

Case n°2 MB... 28 years had two typical jacksonian seizures in the left arm one week apart. E.E.G. results were normal. Angiography showed a pre-rolandic artery slightly stretched at the point where it crosses the second frontal convolution. CT showed on 2 successive slices an area of reduced density 30 to 35 mm in diameter. Transposition in stereotaxic conditions reconstituted a pear-shaped tumour mass (35 mm in diameter anteriorly and 25 mm posteriorly). Only the lower part of this lesion was outlined by the stretched artery. Biopsy showed a grade 1 astrocytoma. This lesion in the centre of the rolandic region was inaccessible to surgical excision. Implantation of Iridium was decided upon. The reconstitution obtained from the CT allowed exact dosimetry for the implantation of 4 strands of Iridium, the isodose 4500 rads enveloping the whole tumour volume (1500 rads were later given over a larger area by external radiotherapy).

Case n°3 Mme P... 65 years had for several months presented a depressive state with apathy, apraxia and memory disorders. More recently she had had a slight deficit in the right arm. CT showed a spherical tumour of 35 to 40 mm diameter near the foramen of Monro on the left. During stereotaxic investigation, a stereo-electroencephalogram was carried out. The E.E.G. activity coincided to within a millimetre with the different peritumoral and tumoral zones as shown by CT.

Equally accurate correlations can be established from anatomical, biochemical and biophysical data obtained under stereotaxic conditions. These can be of considerable help in interpreting density variations shown on CT.