7. The Limitations of Computerised Tomography in the Study of Tumours of the Skull Base and Face

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Although CT has amply proved its effectiveness in exploration of the head, it is beginning to reveal its defects and inadequacies in other areas. With the skull base and the facial mass, its performance is markedly inferior. Our study bears upon the limitations of CT in these areas.

I. MATERIAL AND METHODS

All our patients were investigated using a Total Body Scanner (Acta Scanner) equipped in short scan with 160 x 160 matrix. Each rotation provides 2 slices 7,5mm thick and 3mm apart. The theoretical spatial resolution is 1,5mm and the densitometric resolution 0,5%. The density of water is 200 on a scale of 2048 levels.

We examined 32 patients who presented, or had presented with tumours of the skull base or affecting the facial bones (Table 7.1). We excluded from this study intracranial extra-axial tumours near the base or invading the base: neurinomas, meningiomas, pituitary tumours, etc. The CT problems posed by these tumours are essentially the same as those of intra-axial tumours. For the same reasons we excluded tumours with an intra-orbital starting point: as embryology, anatomy, physiology and now densitometry all show, the fundus oculi is an organ which cannot be regarded separately from the head itself.

Of the 32 patients, 11 were examined before and after injection with iodinated contrast medium; 4 were examined before and after radiotherapy; 4 were examined for the first time only after radiotherapy.

II. RESULTS

The mean density of most of the tumours is compared to that of the lateral pterygoïd muscles.

A - THE DISTRIBUTION OF THE DENSITIES OF THESE TUMOURS IN RELATION TO THE DENSITY OF THE LATERAL PTERYGOID MUSCLE IS ROUGHLY SYMMETRICAL (Fig. 7.1)

9 were more dense, 7 of the same density and 7 less dense. The density of the pterygoïd muscle was taken as reference because it is large, always visible no matter what window is used for reading the slices, and usually situated near the tumour; it also provides an important reference point for evaluating tumoral extensions towards the pterygo-maxillary region.

B - AFTER CONTRAST INJECTION (11 patients, Fig. 7.2) THE DISTRIBUTION OF DENSITIES CHANGED:

- 3 tumours had a density above that of lateral pterygoïd by 8 to 14 points on average;
- 6 tumours had the same density as that of the muscle;
- 2 tumours had a density lower by 4 to 6 points.

Thus, most of the tumours (8 out of 11) had a density comparable to or only slightly below that of the lateral pterygoïd.
C - CHANGES OF TUMORAL DENSITY AS COMPARED WITH DENSITY OF THE MUSCLE AFTER CONTRAST INJECTION (Fig. 7.3).

- In 4 cases, initial density very much above that of the muscle diminished and became identical or very nearly identical to that of the muscles;
- In 1 case, tumour density compared to that of the muscle changed from +4 to -4. The contrast thus remained the same;
- In 1 case, the density remained the same as that of the muscle both before and after injection;
- In 5 cases, the density increased after injection:
  . in 1 case, it changed from -10 to -4, the new density being thus closer to that of the muscle after injection,
  . in 1 case, the increase was very slight (+ 2 points),
  . in 3 cases, the increase in contrast was significant, with final densities of +10, +14, +16.
Thus, only 4 of the 11 tumours became markedly more visible after contrast. There were: an angiosarcoma, an extracranial meningioma, a tumour of the cavum oris and a chordoma.

D - TUMOURS AND RADIOTHERAPY (Fig. 7.4):
- 4 patients were examined before and after radiotherapy;
- 4 patients were examined 6 months to 3 years after radiotherapy only.
After radiotherapy, only one of these tumours had a density equal to that of the lateral pterygoid muscle. The other 7 had a density very much below (-4 to -10 points).
The decrease in density for the 4 patients examined before and after radiotherapy was on average 8 points. Contrast injection of these irradiated and apparently inactive tumours did not change their density.

E - TUMOURS OF THE SKULL BASE (12 cases) (Fig. 7.5. & 7.6)
The majority of these cases were examined secondarily. CT was done in order to get as exact an idea as possible of the inextension before treatment.

F - TUMOURS OF THE SINUSES (9 cases) (Fig. 7.7 & 7.8)
Of the 8 cases of cancer of the maxillary sinus (6 epidermoid carcinomas) in which tumoral and muscular density were compared, 7 had a density equal to or lower than that of the muscle (2 cases of identical density and 5 cases of lower density).
After radiotherapy (4 cases) the density was still 5 to 6 points below that of the muscle.
In 2 cases, the density, which before radiotherapy had been the same as that of the muscle, became lower by 6 to 8 points, 2 and 8 months after therapy.

G - TUMOURS OF THE CAVUM ORIS ( 5 cases) (Fig. 7.9 & 7.10)
In these 5 cases, the primary tumour was not known before CT. 3 of them had already been irradiated for apparently primary cervical adenopathy before CT. Conventional X-rays were considered normal in all cases, and in 4 cases pharyngoscopy was negative. CT allowed guided biopsy, which thus confirmed the diagnosis.
These 5 patients were examined before and after contrast injection. In 4 cases, the contrast of the tumour decreased or remained the same after injection of iodinated contrast medium: the difference of density remained the same or approached that of surrounding structures. In only 1 case did the injection allow diagnosis of a tumour: the density was identical to that of the pterygoid muscle before injection but 10 points above it after contrast injection.