Spiral CT Angiography in the Olfactory groove meningioma with 3-D Reconstruction.

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Pictorial Assay

Spiral CT angiography is a news, minimally invasive technique for vascular imaging,calcified and densely enhanced lesion imaging that made possible by combining two recently developed techniques: slip-ring CT scanning and computerized three-dimensional (3D) reconstruction (1). The purpose of this essay is to illustrate the appearance of the densely calcified olfactory groove meningioma relating to the surrounding vessels, the base of the skull and the adjacent brain, using this technique.

Technique

At Urupong Medical Center, a spiral CT scanner capable of performing 32 rotations in 32 sec at 120 kV and 300 mA has been used (Elscint CT twin, Elscint Ltd., Haifa, Israel). The raw data from the 32 rotations can be processed to yield multiple overlapping in 32 sec, a high level of intravascular contrast can be maintained throughout the acquisition by mechanical injection of 100 ml of 300 mgI/ml contrast material via an antecubital vein at a rate of 2 mm/sec with a scan delay of 60 sec. A table speed of 3.75 mm/sec is used, and images of 2.5 mm-thick sections are reconstructed every 1 mm, resulting in a maximum of 150 images of 2.5 mm-thick sections, each of which overlaps 1.5 mm with its adjacent section. In obtaining the CT scan, a field of view 250 mm, zoom 1.25, 512 × 512 matrix is used.

Non i.v. contrast scan of the brain is performed to locate the lesion, and to determine the cut levels. Then the spiral CT angiography was performed to cover the whole lesion.

The CT data currently can be used to produce vascular images in three different ways: shaded surface display, maximum intensity projection, and curved planar reformatting (2). The figures in this article are examples of the shaded surface display technique plus cut 3D images which requires more time and operator input than the other techniques but the advantage that it provides excellent anatomic detail without visualization of overlapping structures. The program used allows the operator to define lower and upper Hounsfield unit that encompass the actual density of the opacified lumen, the bony structures, the calcified and enhanced lesion (highlight threshold technique). The volume definition technique with manual subtraction of the irrelevant structures is combined using connecting algorithm. Later the 3D images (done by loading axial CT images and selecting multiple desired plane of CT images) is brought to superimpose the 3D surface images in the real-time mode. The processing time is 3 hrs.

The images obtained can help the neurosurgeons to plan for the operation better.

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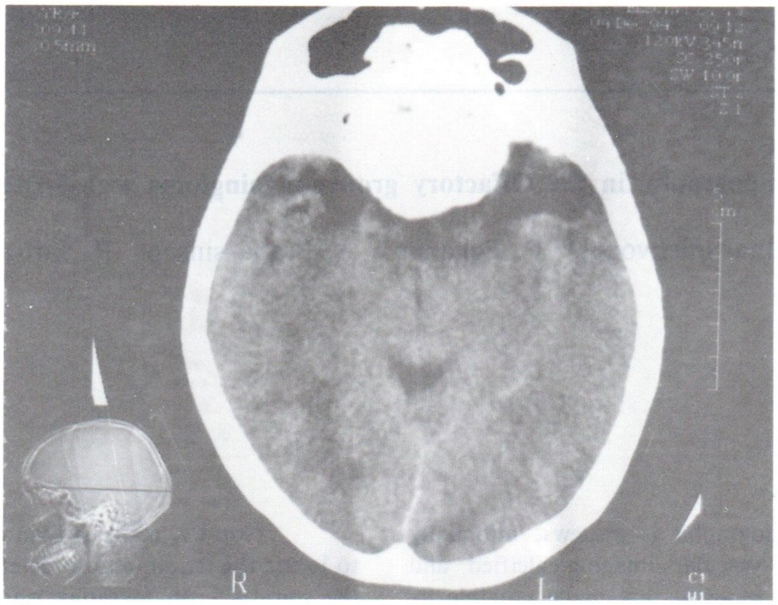

Fig. 1a Non i.v. enhanced CT scan of the brain at basal frontal region (third ventricular level). showed "bone density" round mass at midline basal frontal lobe, projecting into posterior frontal sinuses.

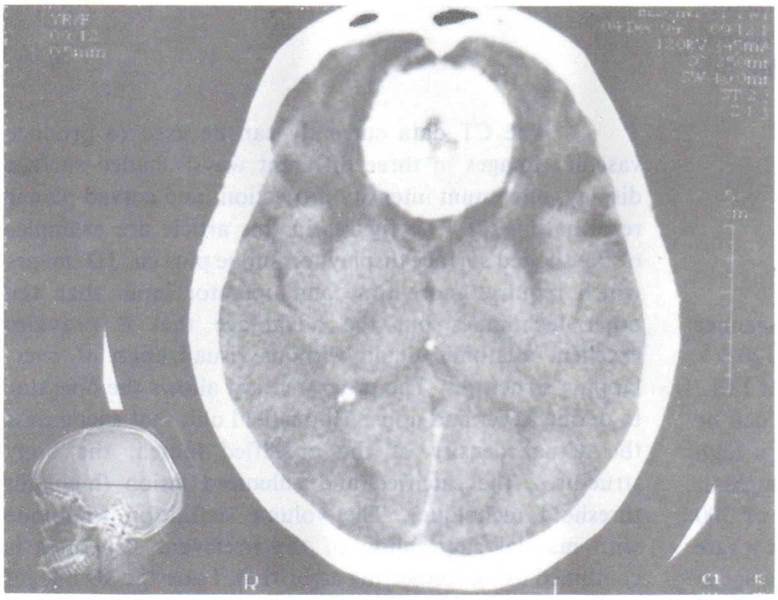

Fig. 1b Non i.v. enhanced CT scan of the brain at slightly higher level (inferior frontal horn level) showed this heavily calcified mass anterior to the frontal horns with surrounding brain edema.

Fig. 2a I.V. enhanced CT scan of the brain at the mass region, showed no significant enhancement of the already dense mass.

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Fig. 2b I.V. enhanced CT scan of the brain at the mass region, adjusting window width and level showed soft part of the lesion.

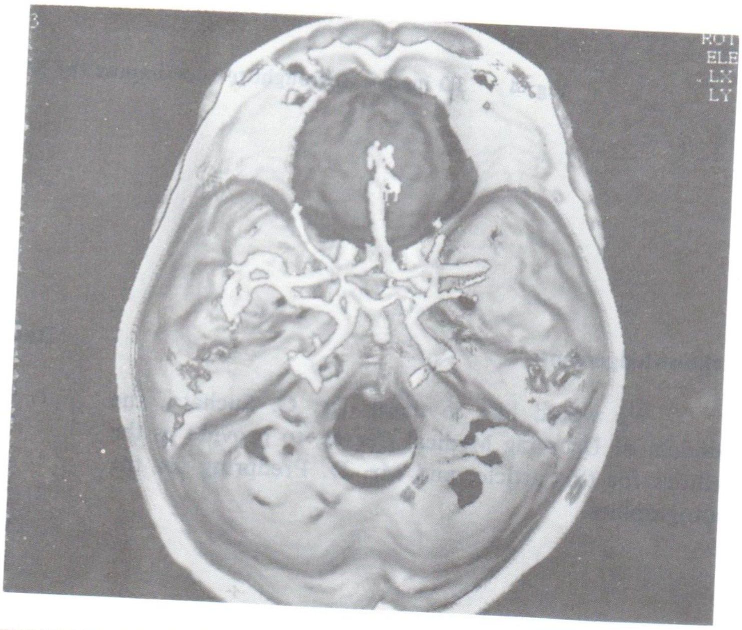

Fig. 3a 3D surface image of the mass, relating vessels and bony parts, view from above.

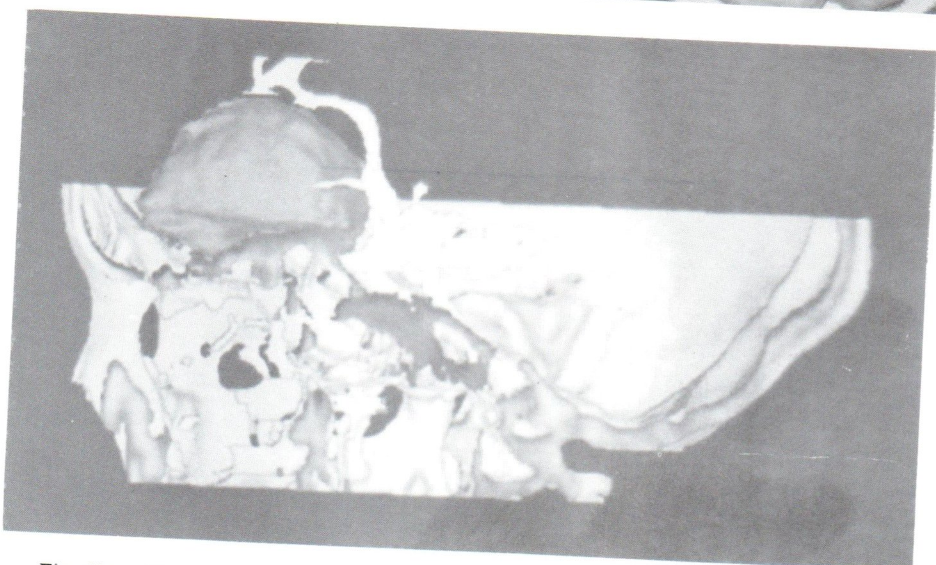

Fig. 3b 3D surface image of the mass, relating vessels and bony parts, side view.

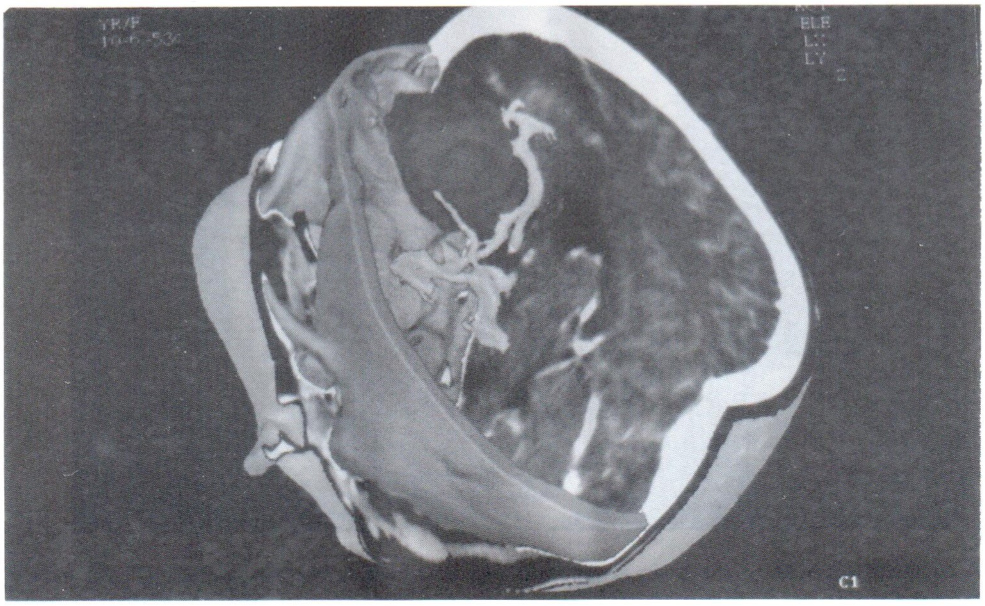

Fig. 4 3D images is brought to superimpose the 3D surface images in the real time mode.

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References:

1. Dillon EH, Leeuwen MSV, Fernandex MA, Mali WPTM. Spiral CT angiography. AJR 1993; 160: 1273-1278.
2. Vahlensieck M, Lang P. Chan WP, Grampp S, Genant HK. Three-dinensional reconstruction : parts I and II. Eur Radiol 1992; 2: 503-510.