CT of the Orbit: Current Status With High Resolution Computed Tomography

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Summary. In this review the CT appearance and differential diagnosis of a variety of orbital lesions is discussed.

Key words: CT – Orbit – CT optic nerve – Orbit neoplasm – Nerves, optic

The introduction of CT considerably altered neuroradiological diagnosis, allowing direct visualization of the brain and soft tissues of the skull. The high fatty content of the orbit made it an ideal subject for CT study because of the high contrast between the orbital fat and the optic nerve, the ocular muscles and vascular structures. In the radiological evaluation of orbital pathology, additional invasive procedures such as orbital venography and carotid angiography are frequently needed. With CT more detailed study of orbital disease became possible in a non-invasive way, making it a standard procedure for the diagnosis of orbital processes, namely their location, extent and the involvement of adjacent structures.

It is the aim of this article to summarize the CT features of specific orbital disease, to review literature and to add personal experience with emphasis on high resolution thin section computed CT.

Technique

CT examinations in our department are performed with a Somatom SD (Siemens). A complete CT examination of the orbit consists of two series of slices: an axial series completed with frontal slices. Contiguous 2 mm slices are made from the floor to the roof of the orbit and from the papilla to the orbital apex. Thin sections offer the advantage of less volume-averaging and allow better quality reconstructions [12, 40].

A scan time of 10 s is chosen. If the bony orbit is of interest, a special “high resolution” soft-ware program recalculates the raw data in order to enhance bony detail.

If a lesion is detected contrast medium is used (250 ml of Na – meglumine iodamide 1240 mg/ml in drip infusion).

The main condition for adequacy of the axial CT slices is that the optic nerve should be visible in its entire course from the papilla to the orbital end of the optic strut. The CT slices are therefore performed parallel to the infra-orbitomeatal line (Frankfurt – Virchow plane). This requires a negative angulation of –10° [32] to –20° [39] to the orbitomeatal base line.

The patient is asked to keep the eyes in the up-gaze position, in order to reduce, as Unsöld stressed [39], bone artefacts arising from the skull base and the petrous bone.

The coronal sections are performed in the supine “hanging head” position [35]. The prone position [9] has proved to be too uncomfortable. The patient’s head is extended 65° in order to avoid molar artefacts [11].

The axial plane studies the optic nerve, the lateral and medial muscles and the lateral and medial bony walls of the orbit (Fig. 1). The coronal sections compare the thickness of both optic nerves and the ocular muscles and study more fully the superior and inferior muscle groups as well as the orbit and the roof of the orbit (Fig. 2). Some authors advise oblique CT sections for demonstrating medial, superior and lateral inferior orbital masses [24, 43]. Analogous re-
results can be obtained by frontal or sagittal reconstruction or by reformatted views [12, 40].

Nystagmus must be considered a relative contraindication for the CT examination of the orbit [32]. Hard copy reproduction is carried out with a window-width setting of 512.

Concerning the radiation dose, although some authors report a lens dose as high as 40 rads with high resolution computed tomography [31] personal measurements did not exceed 10 rads. These findings fit with the figures of Forbes [11].