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Images of the Optic Nerve:
Anatomic-CT Correlation

Renate Unsöld[1, 2]
Jack DeGroot[3]
Thomas H. Newton[1]

The course of the intraorbital part of the optic nerve, as demonstrated on anatomic sections in various planes, is correlated with the appearance of the nerve in computed tomographic (CT) images. Discrepancies between the anatomic and CT appearance are analyzed and discussed. Since the optic nerve has a sinuous course in both the horizontal and vertical planes, no thin axial or sagittal section can be entirely parallel to the nerve. Any section will transsect the optic nerve obliquely, leading to an apparent hypodensity or "thinning" of certain segments as shown on CT. The appearance of the course of the nerve on reformatted CT images depends on the plane of the original CT section. Computed tomograms that are obtained with the eye in primary position do not allow reliable judgments regarding the course and size of the optic nerve.

Authors have indicated that detailed computed tomographic (CT) examination of the optic nerve, particularly in axial sections, is difficult [1–3]. The optic nerve cannot be visualized along its entire orbital course in thin axial sections. It usually appears irregular in caliber and density. The reason for this irregularity has been attributed to its sinuosity and motility within the orbit. We analyzed the appearance of the optic nerve in various axial, coronal, and sagittal anatomic sections, and then correlated the anatomic and CT appearances in corresponding planes.

Materials and Methods

The anatomic part of the study consisted of an analysis of 2–3 mm slices of heads of embalmed human cadavers. The sections were made in various planes using a fine-tooth band saw. The axial planes chosen were those most frequently recommended for CT (fig. 1). In addition, coronal, sagittal, and oblique (through the optic nerve) sections were obtained.

The CT part of the study consisted of scanning a fresh human cadaver using the General Electric 8800 scanner, with the eyes in neutral position, looking straight on. A 1.5 mm collimator was used and sections were obtained at 1.0 mm intervals in the same axial planes described in figure 1. Reformatted views in coronal, sagittal, and oblique planes were obtained from the axial sections performed at an angle of −20° to the orbitomeatal baseline.

Results

Axial Planes

The appearance of the optic nerve is determined by the angulation of the axial plane of section. Sections obtained in an axial plane of −20° to the orbitomeatal baseline first encounter the most distal part of the optic nerve in the superior

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R. Unsöld is a Neuroradiology Fellow, University of California, School of Medicine.

[1]Department of Radiology, Room M-396, University of California, School of Medicine, San Francisco, CA 94143.

[2]Permanent address: Universitäts-Augenklinik, Freiburg, W. Germany.

[3]Department of Anatomy, University of California, School of Medicine, San Francisco, CA 94143.

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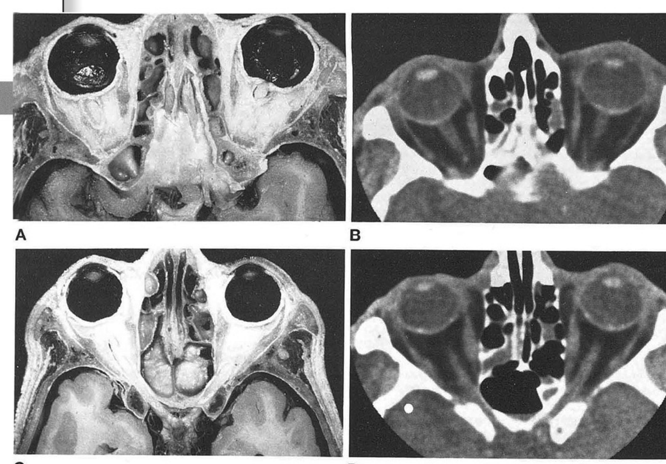
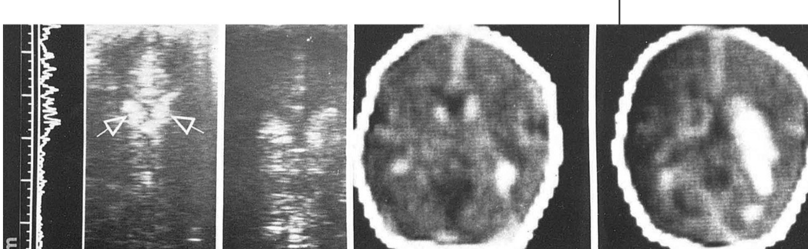


A B C D

Sonography of Ventricular Size and Germinal Matrix Hemorrhage in Premature Infants

D. A. London[1]
B. A. Carroll
D. R. Enzmann

Using the anterior fontanelle as an acoustic window, high resolution gray scale sonography brain scans with mobile apparatus were obtained in 35 premature infants. The sonographic technique provided accurate assessment of ventricular size and detected the subependymal germinal matrix and intraventricular hemorrhages. Ventricular size measurements correlated closely with computed tomographic (CT) determinations ($r = 0.83$–0.92) in 29 infants. Sonography imaged the hemorrhages as areas of increased echogenicity with mass effect located characteristically in the region of the caudate nucleus. The size of the hemorrhages could be grossly estimated, but the full extent of hemorrhages was better delineated by CT. Sonography seemed superior in detecting small hemorrhages that were isodense with surrounding brain on CT. Despite its advantages of benignancy, accuracy, ease of examination, and cost, our sonography technique had limitations. False-negative sonograms occurred when the hemorrhage was located only in the posterior aspects of the ventricular system. Small hemorrhages in the caudate could be missed by either CT or sonography because of sampling error. Recognition of other disease processes was limited with sonography. The sonographic brain scan is a good initial test for high risk premature infants suspected of having subependymal germinal matrix and intraventricular hemorrhages. If the sonogram is negative or not typical for subependymal germinal matrix and intraventricular hemorrhages, CT is indicated.



Intracranial hemorrhage is recognized as a significant factor in mortality of premature infants. Although major advances in respiratory support and infection control have resulted in greater survival among these infants, improvements have also resulted in a significant shift in neonatal pathology. In 1972, only 25% of neonatal deaths were associated with intracranial hemorrhage; in 1978, this figure was 65% [1–3].

Computed tomographic (CT) brain scans permit accurate and noninvasive detection of subependymal germinal matrix and intraventricular hemorrhage in premature infants as well as assessment of possible sequelae such as hydrocephalus and porencephaly [4–6]. Because the accuracy of CT exceeds that of clinical examination in detecting such hemorrhages, the reported incidence of such hemorrhages has increased dramatically [5–8]. In premature infants weighing less than 1,500 g, the incidence by CT is 43%–70% [7, 8]. Unfortunately, the widespread and serial use of CT scanning for detection of hemorrhage and its sequelae is logistically limited in these fragile infants because of difficulties in transport, sedation, temperature maintenance, and respiratory support. The risk of repeated exposure to ionizing radiation must also be considered.

Sonography has been useful in determining ventricular size in both term infants and young children [9–13]. We report the use of a mobile sonography unit with a high resolution probe for measuring ventricular size and detecting subependymal germinal matrix and intraventricular hemorrhages in premature infants.

Subjects and Methods

An orbital sonography unit was adapted for use with premature infants. The linear array, high frequency (7.2 MHz) probe produces a real time, rectangular 3 × 6 cm image that can be frozen for photographing with a standard Polaroid camera. The axial resolution is 0.2–0.3 mm. The lateral resolution is 2 mm at less than 2 cm (near field) and 4–5 mm at 6

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[1] All authors: Department of Radiology, Diagnostic Radiology Division, Stanford University School of Medicine, Stanford, CA 94305. Address reprint requests to D. R. Enzmann.

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