Ultrasound and Intraocular Tumors

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Outline

• Brief history and principles of ophthalmic ultrasound
• Types of ocular ultrasound
• Examination techniques
• Indications
• Cases

Ultrasound

• First used in ophthalmology by Mundt and Hughes in 1956 to evaluate an intraocular tumor.
• A simple B-Scan machine introduced by Bronson in 1972.
• Essential tool for evaluating ophthalmic disorders.

Types of Ultrasound

• A-Scan:
  – One dimensional acoustic display
  – Various types:
    • Axial length measurements
    • Vector A-Scan
    • Standardized A-Scan

• B-Scan:
  – Two dimensional acoustic section
  – Real-time, gray-scale display

B-scan

• Localization
• Shape
• Dimensions
• Vascularity
• Scleral irregularities and extracocular extension
Types of Ultrasound
- UBM - Ultrasound Biomicroscopy:
  - Uses highest frequency (~40 MHz)
  - Close to microscopic resolution
  - Anterior segment examination

Examination Technique B-Scan
- Three basic probe orientations
  - Transverse
  - Longitudinal
  - Axial
- Optic nerve “considered” as the center of posterior fundus and serves as a reference point for probe orientation.

B-Scan Examination
- Lesion
  - Location
  - Shape
  - Reflectivity
  - Vascularity
- Tumor
  - Size
  - Growth
  - Regression
  - Location
  - Extension
  - Type

Tumors
- Melanoma
  - Choroidal
  - Ciliary body
  - Iris
- Choroidal Nevus
- Metastatic Disease
- Choroidal Hemangioma
- Choroidal Osteoma
- Retinoblastoma

Choroidal Melanoma
- Solid consistency
- Collar button (mushroom) shape
- Low to medium internal reflectivity
- Regular internal structure
- Vascularity
- Subretinal fluid

Case
- 59 year old man who has been noticing decreased vision in his right eye for six months.

Case
- 70 year old man with sudden loss of vision in the right eye.
  - No view of the fundus on dilated examination.

Case
- 20 x 12 x 10.4 mm
  - Medium internal reflectivity
Case 1
- 56 year old woman who was recently found to have a choroidal mass in the left eye.
- Mass size: 12 x 12 x 3.3 mm

Case 2
- 58 year old man referred for choroidal nevus in the right eye.
- Nevus recently shows new elevation and subretinal fluid.
- Nevus size: 5 x 5 x 1.9 mm

Case 3
- 64 year old man referred for an elevated choroidal lesion.
- Growth size: 8 x 7 x 2.5 mm

Case 4
- 64 year old man referred for choroidal nevus.
- Pre-treatment size: 4.0 mm
- Post-treatment size: 1.8 mm
Case
- 62 yo woman presents with pigmented spots in her right eye.

Location
Extension
Choroidal Nevus
- Dome or irregular shape
- Shallow lesions
- Solid
- Regular structure
- High reflectivity
- No vascularity

Uveal Melanocytoma
- Dome shape over the optic nerve
- Solid
- Regular structured
- High reflectivity
- No vascularity

Case
- 63 year old man presents with mild loss of vision in the right eye for several months.

Lymphoma
- Diffuse infiltration of choroid; regularly structured; low reflective
11 year-old female with circumscribed choroidal hemangioma

Choroidal Hemangioma
- Dome or lobulate shape
- Posterior location
- Solid
- Regular structure
- High reflectivity

Choroidal Metastasis
- Irregular or lobulated shape
- Shallow lesion
- Extensive retinal detachment
- High or medium reflective
- Solid
- Minimal or no vascularity
- Unilateral or bilateral

Choroidal Osteoma
- Plaque-like shape
- Regular structure
- High reflectivity
- Calcified lesion – acoustic shadowing
- Unilateral

Retinoblastoma
- Focal or multifocal
- Contains calcium
- May show acoustic shadowing
- Variable shaped (usually irregularly shaped)
- Retinal detachment
- High reflective if calcified
- Unilateral or bilateral
Summary

- Ocular ultrasound is an important diagnostic tool.
- Non-invasive and safe.
- Critical for evaluation of eyes with opaque media.
- Essential for diagnosis and treatment of intraocular tumors.

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