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Visual Fields in Retinal Diseases

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• Most retinal diseases are readily diagnosed by ophthalmoscopy; hence, visual fields receive little clinical attention in the diagnosis or follow-up of retinal disorders.
Principles of Perimetry

- The island of Traquair

- **Superior:** 60 degrees
- **Nasal:** 60 degrees
- **Inferior:** 70 to 75 degrees
- **Temporal:** 100 to 110 degrees
Physiologic Factors Affecting Measurement of the Visual Field

**BOX 12-1**
Some Variables Affecting Measurement of the Visual Field

- **Environmental**
  - Illumination
  - Equipment
  - Examiner
  - Technique

- **Ocular**
  - Retinal adaptation
  - Refractive state
  - Media
  - Pupil size

- **Global**
  - Age
  - Fixation
  - Reaction time
  - Fatigue
Methods of Perimetry

• **Qualitative techniques:**
  – Confrontation testing
  – Amsler grid
  – Tangent screen

• **Quantitative techniques:**
  – Goldmann
  – Tübinger
  – Fieldmaster 101
  – Dicon unit
  – Octopus
  – Humphery Field Analyser
Fig. 12-4  The Amsler grid is viewed at 35.5 cm (14 in), using the central dot for fixation. Regions of metamorphopsia (C), scotoma (B), and blur (A) are noted.
• *Quantitative Methods:*
  – More important for follow-up than diagnosis.
  – Documentation of visual recovery after RD surgery, laser therapy and anti-inflammatory drug therapy is an important aspect of patient care.
• Automated, quantitative perimetry is ideal for the evaluation of retinal diseases.

• SWAP isolates the S-cone system (blue-yellow pathway)
  – Lens status due to its chromatic filtering effect should be appreciated.
  – Longer duration, increased variability, and learning effects
  – Most applicable when early detection has important therapeutic application.
Microperimetry is a new, research tool, especially helpful for central retinal disease.

Use an SLO: a modulated helium-neon laser beam of variable intensity (0-21 dB) at 633 nm projects stimuli onto the retina during ophthalmoscopy performed with an infrared diode laser at 780 nm.
PERIMETRY OF DIFFUSE RETINAL DISEASES
Retinitis Pigmentosa (RP)

• Earliest field defect: a group of isolated scotomata 20 to 25 degree from fixation
• Eventually these isolated defects coalesce into a “ring scotoma” affecting the midperiphery.
• Peripheral field loss progresses, leaving a small, central island of vision.
• Eventually, complete visual loss may occur.
Gyrate Atrophy

- Progressive peripheral visual field constriction.
Diabetic Retinopathy

• May be an ideal method for follow-up of the disease.
• Field defects exist even in the absence of observable retinopathy:
  – Central field defects present in 40% of eyes without visible retinopathy and in all diabetic patients with retinopathy *
• Central 10 degree SWAP is abnormal in diabetic patients without macular edema.

• In diabetic children without retinopathy midperipheral visual field sensitivity impairs proportional to the degree of microalbuminuria *

• Retinal hemorrhages and exudates of at least 3 to 4 degrees in diameter produce localized depressions in the visual field.
• Macular exudation and edema cause irregular depression and flattening of static profile of the central field.
• Visual sensitivity in Octopus static perimetry quantitatively correlate with retinal perfusion in preproliferative diabetic retinopathy.
• The degree of retinal perfusion is more important in predicting visual field loss than the amount of proliferative retinopathy.
• There is a correlation between the degree of retinopathy in type 1 diabetic patients and SWAP field loss.
• PRP produces a marked concentric contraction of the visual field.
• Central visual field sensitivity significantly depresses 1 week after treatment, but recovery of up to 95% occurs within 3 months.
Toxic Retinopathy

- Tamoxifen: even in the absence of retinopathy SWAP MD depresses proportional to the duration of therapy.
- Vigabatrin: peripheral visual field losses in 30%.
- Sildenafil: substantial acute decrease in SWAP MD and milder decrease in MD on standard perimetry (case report).
Infectious Retinopathies

- HIV-positive patients demonstrate significant localized as well as mean defect (more apparent in SWAP than in white-on-white AVF); even in patients with no infectious retinopathy.
- More marked in patients with low CD4 counts.
PERIMETRY OF FOCAL RETINAL DISEASES
Retinal Detachment

- RD have sloping isopters on kinetic perimetry.
- Helpful to differentiate from a retinoschisis, which is characterized by dense defects with steep margins, usually located supranasally.
- Long-standing RD may produce steep isopters.
- In shallow RD, assessment of the visual field may be more accurate than ophthalmoscopy in identifying the border of detached retina.
- Recovery of retinal sensitivity following long-standing RD is incomplete.
- Cone function returns before rod function after successful surgical reattachment of the retina.
• Central visual field defects occur following a high percentage of RD surgeries, especially with internal SRF drainage.
Choroidal Melanoma

• Anterior melanoma: localized constriction of the visual field.
• Posterior melanoma: dense scotoma with steep borders.
• Choroidal nevus: no or subtle field defect (important in DDx)
Choroidal Metastases

• Dense scotoma with steep borders.
  – Visual field depression does not consistently correspond to tumor size or location.
Vascular Lesions

• In BRAO and BRVO, the density of visual filed defect is proportionate to the amount of ischemia.
Inflammatory Diseases

• Toxoplasmosis: dense, irregular, steep-margined, isolated scotoma.
• Syphilitic choroiditis: more diffuse depression of visual field function.
• Corresponding arcuate field defects to the vasculitis affected temporal arcades.
PERIMETRY OF MACULAR DISEASES
Macular Drusen

- No effect on retinal sensitivity using standard techniques.
- In SWAP, mean sensitivity of patients with soft drusen is significantly lower.
Age Related Macular Degeneration

- Pigmentary AMD cause irregular shaped central scotoma with sloping margins and variable density.
- May be bilateral, but often asymmetric.
- Disciform macular degeneration causes a dense central scotoma.
- Absolute scotoma associate strongly with choroidal scars (RR= 107.61) and RPE atrophy (RR= 9.97). [SRH RR= 2.88; CNV RR= 1.86]
Cone Dystrophy

- Progressive symmetric to slightly asymmetric central visual loss.
- Central scotoma with relative sparing of the fovea.
Stargardt’s Disease

• Two types of scotoma in microperimetry:
  – A dense ring scotoma with stable fixation.
  – Dense central scotoma with fixation shift.
Macular Cysts and Holes

• Macular cysts may present without appreciable scotoma.
• Macular holes produce dense scotoma with steep margins.
• Microperimetry may be helpful in predicting the outcome of MH surgery.
  – Visual outcome correlated with the maximum sensitivity adjacent to the hole*.
  – Absolute scotoma disappeared completely in 64% of patients achieving complete MH closure following surgery.
  – High incidence of inferotemporal and temporal peripheral field loss after uncomplicated MH surgery.

Macular Edema

• CSCR, CSME, CME, Berlin’s edema
  – metamorphopsia on Amsler grid testing;
  – mild central scotoma (2-5 degrees) larger on SWAP than white-on-white perimetry.
  – Majority of patients have residual Amsler and perimetric defects even after resolution of edema.

• SWAP in early diabetic maculopathy demonstrated that MD decrease correlate with the increase in size of FAZ.
• In all CSME patients SWAP 10-2 fields are abnormal (only 1/3 on standard AVF). The area of abnormal sensitivity was greater than that expected by clinical assessment.
Toxic Disease of the Macula

• Chloroquine Retinopathy:
  – The most characteristic field defect is a ring-like central scotoma with a small island of slightly lesser visual loss in its center.

• Thioridazine:
  – Produce central scotoma.
Summary

- Achromatic and SWAP automated static perimetry provide a cost-efficient, standardized, and reliable way to evaluate and follow visual fields in patients with retinal disease.