A Concerning Case of Constriction

Jen Sandbach
Medical Retina, Neuro-ophthalmology
Prince of Wales Hospital

Case History
- 67 y.o. woman
- Past history: temporal lobe epilepsy following head injury (fall from ferris wheel)
- Medications: tegretol

Case History
- Attended ophthalmologist for "glasses check"
- Normal corrected acuity
- Normal fundus exam
- But
- Very abnormal visual fields

5 Sep

14 Sep
Constricted fields with normal acuity

Causes of constricted fields with retained acuity
• glaucoma
• papilloedema
• disc drusen
• optic neuritis
• AION
• retinitis pigmentosa
• drug toxicity - quinine, vigabatrin, siderosis
• bilateral occipital infarcts with macular sparing

Glaucoma

Idiopathic intracranial hypertension
• overweight, f > m, 15 - 45 y.o.
• symptoms of raised ICP
• headache, N, pulsatile tinnitus, TVO, diplopia
• disc swelling / pallor, +/- field defect, +/- sixth nerve palsy
• normal neuroimaging, normal CSF contents, raised CSF pressure
• associated drugs: tetracycline, vitamin A, OCP, lithium
• monitor: acuity, colour, automated fields, disc
• treatment: weight loss, diamox, ONSF, CSF shunt, CVS stent

Visual field constriction is one of the most important signs of progressive optic neuropathy in papilloedema
causes of constricted visual fields with retained acuity

- disc drusen

- multiple nerve fibre defects, “motheaten” field

- optic neuritis

- AION may have combined superior and inferior altitudinal defects with central sparing

10/01. Bilateral disc pallor from sequential NAION

9/93

10/01

causes of constricted visual fields with retained acuity

retinitis pigmentosa
ring scotoma

causes of constricted visual fields with retained acuity
- drug toxicity - vigabatrin

merged 60° normal field  merged 60° vigabatrin field

constricted Goldmann fields with vigabatrin

vigabatrin
- gamma-vinyl GABA
  - irreversible inhibition of GABA transaminase
  - indicated for infantile spasms, partial onset epilepsy
  - introduced to UK in 1989, not US FDA approved because
- up to 50% of patients have visual field constriction
  - nasal > temporal, Goldmann > automated
  - frequently asymptomatic, probably permanent
  - VA, colour vision may be normal or mildly reduced
  - normal fundus or disc pallor, vascular attenuation

causes of constricted visual fields with retained acuity
- drug toxicity - quinine
**quinine**
- deliberate overdose or IVDU
- N, V, tinnitus, cardiac arrhythmias
- severe LOV (often NPL), fixed dilated pupils, initially normal fundus
- small central field, acuity usually recovers
- disc pallor, attenuated arterioles develop

**siderosis**
- iron foreign body
- anterior segment changes
  - deep corneal rust, iris heterochromia, mydriasis, lenticular deposits
- progressive retinal degeneration with night blindness, peripheral field loss, late acuity loss
- ERG transient supranormal, then negative, finally extinguished

**causes of constricted visual fields with retained acuity**
- bilateral occipital cortical lesions with macular sparing
  - look for notch along vertical meridian

**causes of constricted fields with retained acuity**
- artefact / functional !!
causes of constricted fields with retained acuity

- drug toxicity - quinine, vigabatrin, siderosis
- retinitis pigmentosa
- glaucoma
- disc drusen
- AION
- optic neuritis
- papilloedema
- bilateral occipital infarcts with macular sparing
- artefact / functional

physical and cognitive factors affecting visual field results

- lens rim artefact
- incorrect refraction
- excessive pupil constriction / dilation
- ptosis
- attention / fatigue
- motivation
- response bias

elimination of rim artefact with properly positioned lens holder

lens rim artefact

- causes constriction / ring scotoma

incorrect refraction / small pupil

- decreased sensitivity

ptosis / incorrect head posture

- superior defect
• attention / fatigue
  - cloverleaf on automated perimetry

• motivation
  - hysteria / malingering - Goldmann useful

  overlapping isopters
  spiralling

• constriction on Goldmann

“response bias”

• Kutzko et al. IOVS 2000;41:2006

• effect of instructions on conventional automated perimetry
  - conservative
  - neutral
  - liberal

neutral instructions

• “Always look straight ahead at the steady yellow light. Other lights will flash, one at a time off to the side. Some will be bright, some dim. Press the button whenever you see one of these flashes. You are not expected to see all of them. The best time for you to blink is just as you press the button.”

liberal instructions

• “On this test we are trying to find the dimmest light that you can see. The test will push you to see very dim targets. We want you to press the button as soon as you think you might see a light. There is no penalty for guessing. In fact, we encourage guessing. Remember the test is trying to push you to see very dim targets.”

• conservative instructions
  - “On this test you will be able to see half of the stimuli that are presented. We want you to be certain that you see a light before pressing the button. Do not respond if you are unsure. If you respond while there is no light presented, the test time will increase and an error will be recorded. Remember, you will not be able to see all the lights that are presented. Make sure you are certain a light was presented before pressing the button.”
Humphrey 30-2 full-field threshold test
- mean deviation (dB)
• older subjects had lower visual sensitivity
  - old -2.26 vs young -0.46
• conservative instructions led to lower sensitivity, more marked in older subjects

<table>
<thead>
<tr>
<th></th>
<th>conservative</th>
<th>neutral</th>
<th>liberal</th>
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<tbody>
<tr>
<td>young</td>
<td>-1.55 +/- 1.4</td>
<td>-0.34 +/- 0.86</td>
<td>0.55 +/- 0.96</td>
</tr>
<tr>
<td>old</td>
<td>-4.49 +/- 5.6</td>
<td>-2.08 +/- 2.7</td>
<td>-0.22 +/- 1.2</td>
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effect of instruction on central vs peripheral thresholds
• instruction type did not affect visual sensitivity of a central point
• instruction type did affect measured visual sensitivity of a peripheral point

clinical significance
• for older subjects
  – failure to give liberal instructions may induce factitious constriction of visual fields
  – the change in visual sensitivity may be clinically significant

Swedish Interactive Threshold Algorithm (SITA)
• SITA standard, SITA fast replace Humphrey full threshold, FASTPAC
• faster to perform
• higher light sensitivity
• less variation between subjects
  – less variation between subjects in central regions, but more at edge locations in one study
• age associated decrease in sensitivity less
full threshold, FASTPAC thresholding
• full threshold uses a 4 - 2 dB step staircase strategy
  – initial crossing of threshold in 4dB increments, final crossing in 2dB increments
• FASTPAC uses a single threshold cross with 3dB step size
  – FASTPAC is 35% duration of FT, but has 25% increase in intratest variability and underestimates focal loss in glaucoma
• threshold is last seen luminance
• assumes frequency of seeing curve is independent of stimulus location

SITA standard, SITA fast thresholding
• SITA standard uses 4 - 2 dB step, SITA fast 4dB
• assumes frequency of seeing curve alters with threshold level and therefore eccentricity, defect depth
• threshold estimate and associated measurement error are continually calculated during the test according to two internal models,
  • for normal and glaucomatous fields
• thresholding stops when predetermined level of accuracy reached (50% chance of seeing)

should SITA fields be read differently?
• Yes, for greyscale
  – SITA greyscale will appear lighter because of higher sensitivity
  – greyscale may obscure real defects. Narrower confidence intervals mean that different probability levels may appear the same grey
• No, for probability plots
  – these may be read as for full threshold