Retinal Diseases

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Financial Disclosures

NONE
Overview

- Background Information
- Retinal Vascular Disease
- Age-Related Macular Degeneration
- Diabetic Retinopathy
- Questions from the Audience
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The eye can only perceive a small portion of the spectrum of electromagnetic waves.
Sectional Anatomy of the Eye

- Lacrimal caruncle
- Anterior cavity
- Posterior chamber
- Anterior chamber
- Cornea
- Suspensory ligament of lens
- Visual axis
- Iris
- Limbus
- Conjunctiva
- Lower eyelid
- Lateral canthus
- Medial canthus
- Ciliary body
- Ora serrata
- Ethmoidal labyrinth
- Medial rectus muscle
- Optic disc
- Lens
- Orbital fat
- Optic nerve
- Central artery and vein
- Fovea
- Lateral rectus muscle

(c) Horizontal section
The Organization of the Retina
Overview

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Case 1

- 76 yo man notices his right eye is blurry and will not improve.
- He can barely distinguish the fingers on his own hand, even with glasses.
- He does not have pain.
Central Retinal Artery Occlusion
Case 2

- 68 yo woman notices her left eye does not see clearly today.

- She cannot read or even recognize faces with the left eye, even with glasses.

- She does not have pain.
Central Retinal Vein Occlusion
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- Dry AMD
- Wet AMD
Overview

- Dry AMD
- Wet AMD
Vitamins for Dry AMD

- **AREDS 2**
  - Vitamin C - 500 mg
  - Vitamin E - 400 IU
  - Zinc - 80 mg
  - Copper - 2 mg
  - Lutein - 10 mg
  - Zeaxanthin - 2 mg
Case 3

- A 72 yo patient with “dry AMD” has been noticing bending and distortion in the right eye of things she knows to be straight. Letters seem smaller out of this eye than the other eye.
Overview

- Dry AMD
- Wet AMD
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Diabetic Retinopathy

- Diabetic retinopathy is the most common cause of new cases of blindness among adults 20-74 years of age.
- Each year, about 24,000 people lose their sight because of diabetes.
- During the first two decades of disease, nearly all patients have retinopathy.
Retinopathy Screening

- Type 1 diabetes - screen within 5 years of diagnosis
- Type 2 diabetes - screen at time of diagnosis
- Pregnancy - women with preexisting diabetes should be screened prior to conception and during first trimester
- Examination Methods – Dilated ophthalmoscopy

\(^1\)American Diabetes Association: Retinopathy in Diabetes (Position Statement). *Diabetes Care* 27 (Suppl.1): S84-S87, 2004
Natural History of Diabetic Retinopathy

- Mild nonproliferative diabetic retinopathy (NPDR)
- Moderate NPDR
- Severe NPDR
- Very Severe NPDR
- Proliferative diabetic retinopathy (PDR)
Mild/Moderate NPDR
Severe NPDR

PDR

Proliferative Diabetic Retinopathy

- Neovascularization
  - at the optic disk (NVD)
  - elsewhere in the retina (NVE)
- Vitreous hemorrhage
- Retinal traction, tears, and detachment
Proliferative retinopathy

- NVD
- NVE
- Pre-retinal haemorrhage
- Laser burn scars
neovascularization  capillary nonperfusion


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TREATMENT

- LASER: Light Amplification by the Stimulated Emission of Radiation
  - Focal
  - Grid
  - Panretinal photocoagulation
PDR Retinal Detachment
Diabetic Macular Edema

Hard exudate
Normal OCT
Diabetic Macular Edema

OCT
DME laser treatment
DME laser treatment
Randomization

Randomly Assigned Eyes (one per participant):
N = 660

Baseline
- Aflibercept (2.0 mg) N = 224
- Bevacizumab (1.25 mg) N = 218
- Ranibizumab (0.3 mg) N = 218

One Year
- N = 208 (93%)
- N = 206 (94%)
- N = 206 (94%)

One Year Excluding Deaths
- 94%
- 97%
- 96%
# Ocular Baseline Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Afibercept (N = 224)</th>
<th>Bevacizumab (N = 218)</th>
<th>Ranibizumab (N = 218)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean visual acuity letter score (~Snellen Equivalent)</strong></td>
<td>69 (20/40)</td>
<td>69 (20/40)</td>
<td>68 (20/50)</td>
</tr>
<tr>
<td><strong>Mean OCT CST (µm)</strong></td>
<td>387</td>
<td>376</td>
<td>390</td>
</tr>
<tr>
<td><strong>Any Prior Focal/Grid Laser</strong></td>
<td>36%</td>
<td>39%</td>
<td>37%</td>
</tr>
<tr>
<td><strong>Any Prior Treatment with anti-VEGF</strong></td>
<td>11%</td>
<td>14%</td>
<td>13%</td>
</tr>
<tr>
<td><strong>Phakic</strong></td>
<td>74%</td>
<td>73%</td>
<td>79%</td>
</tr>
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</table>
## DME Treatment Through 1 Year: anti-VEGF and Laser

<table>
<thead>
<tr>
<th></th>
<th>Aflibercept N = 208</th>
<th>Bevacizumab N = 206</th>
<th>Ranibizumab N = 206</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong># of Injections (Max = 13)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>9.2</td>
<td>9.7</td>
<td>9.4</td>
<td></td>
</tr>
<tr>
<td>Median (25&lt;sup&gt;th&lt;/sup&gt;, 75&lt;sup&gt;th&lt;/sup&gt; percentile)</td>
<td>9 (8, 11)</td>
<td>10 (8, 12)</td>
<td>10 (8, 11)</td>
<td>0.045‡</td>
</tr>
<tr>
<td>At least one focal/grid laser</td>
<td>37%</td>
<td>56%</td>
<td>46%</td>
<td>&lt;0.001‡</td>
</tr>
</tbody>
</table>

*‡Global (overall 3 group comparison) P-value. Pairwise comparisons (adjusted for multiple comparisons): aflibercept-bevacizumab: \( P = 0.045 \), aflibercept-ranibizumab: \( P = 0.19 \), bevacizumab-ranibizumab: \( P = 0.22 \).*

*§Global (overall 3 group comparison) P-value. Pairwise comparisons (adjusted for multiple comparisons): aflibercept-bevacizumab: \( P < 0.001 \), aflibercept-ranibizumab: \( P = 0.058 \), bevacizumab-ranibizumab: \( P = 0.061 \).*
Mean Change in Visual Acuity Letter Score, Full Cohort

52 Week Treatment Group Comparison*:
- **Aflibercept** vs. Bevacizumab $P<0.001$
- **Aflibercept** vs. Ranibizumab $P = 0.034$
- **Ranibizumab** vs. Bevacizumab $P = 0.12$

* $P$-values adjusted for baseline visual acuity and multiple comparisons
Subgroup Analysis
Baseline Best-corrected Visual Acuity

20/32-20/40

20/50 or worse

Mean Change is Visual Acuity
Letter Score

Visit Week

Aflibercept
Bevacizumab
Ranibizumab

45
Conclusion

- All three anti-VEGF agents are effective treatments for DME
- When initial visual acuity loss is mild, on average there is little difference in visual acuity at 1-year.
- At worse levels of initial visual acuity aflibercept is more effective at improving vision.
End-stage diabetic eye disease

- PHTHISIS
  Shrunken, soft eye with opaque vascularised cornea and no visual potential
Prevention of Diabetic Retinopathy Associated Vision Loss

- Intensive glycemic control
- Blood pressure control (<130/80 mmHg)
- Annual dilated eye examinations
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