Dr. K. Subramanian
Consultant Neurosurgeon
Anuradha Clinic &
Sooriya Hospital

CLINICAL FUNDUS EXAMINATION, PAPILLEDEMA & PAPILLITIS
What is the Fundus of the eye?
Interior surface of the eye opposite the lens – includes retina, optic disc, macula, fovea and posterior pole.
Fundus – what, why, how, when, side

Fundus is the window to the brain – increased intra cranial pressure is reflected on the optic disc and surrounding structures with no barriers – interface to the clinician by air, clear tissue and clear fluid.

Fundus examination can answer most symptoms caused by eye disease, provide answers to the most complicated headaches and help rapid diagnosis of life and vision threatening conditions.
Fundus – what, why, how, when, side

How – Instruments – Ophthalmoscope invented
1847 by Charles Babbage
1851 by Herman Von Helmholtz (independently)

Technique
- Patient sitting, look straight
- Examiner standing approach laterally
- Red reflex
- Approach slowly focus field
- Trace vessel to centre
- Note disc color, edge clarity, cup size
A good video can be seen here about the procedure:
http://www.youtube.com/watch?feature=player_detailpage&v=PUz2HLromxY
Fundus – what, why, how, when, side

- Is a must during eye exam, nervous system exam and must be performed routinely.
- Practice makes perfect.
- Both sides – always.
- Compare – to the other eye, match it to your memory database.
Optic nerve – developmentally and histologically optic nerve is a part of the brain and surrounded by three meninges. Dura continuous with orbital periosteum, pia and arachnoid fuse with the sclera.

Subarachnoid space around optic nerve is continuous with the brain subarachnoid space.

Rise in cerebral subarachnoid pressure is transmitted to the optic subarachnoid space.
Papilloedema – mechanism

Rise in ICP results in
1. Compression of central vein of retina as it crosses the space.
2. Impeding lymphatic drainage from retina.
3. Interference with slow component of anterograde axoplasmic transport in the optic nerve head.

Thus swelling of axons in optic disc and surrounding retina occurs.
Papilloedema – Progressive Changes

1. Congestion of retinal veins – loss of venous pulsation,
2. Hyperemia of disc – filling of physiologic cup,
3. Disc edges blurred – first upper and lower margins, then nasal margin, finally temporal margin;
4. Elevation of nerve head (3 – 10 Dioptres),
5. Spread of edema to retina – macular fan,
6. Hump of vessels leaving and entering disc more marked,
7. Vessels appear and disappear as they course near the disc,
8. Disc swelling reduces – disc becomes yellowish white – arteries become constricted, veins remain congested,
Papilloedema grading

Figure 6. Grade I papilledema is characterized by a C-Shaped halo with a temporal gap.
Papilloedema grades 2 & 3

Figure 7. With grade II papilledema the halo becomes circumferential.

Figure 8. Grade III papilledema is characterized by loss of major vessels as they leave the disc (arrow).
Papilloedema grades 4 & 5
Resolving Papilloedema

- Venous congestion disappears
- Pulsation returns
- Other changes take much longer to resolve or may remain permanent.
Absence of papilloedema despite increased ICP

1. Optic subarachnoid space is congenitally absent.
2. Optic subarachnoid space is occupied by inflammation.
3. Optic subarachnoid space is obstructed by neoplasm.
4. Optic nerve fibers are already atrophied.
Increased ICP causes

- Craniocerebral volume disproportional to bone,
- Obstruction to CSF circulation and absorption,
- Edema surrounding a pathological lesion,
- Obstruction to venous drainage.

Also can be classified as Congenital, traumatic, inflammatory, neoplastic, vascular or benign ICT.
Papillitis

- Inflammation or infarction of optic nerve head
- Caused by Usually Optic neuritis, multiple sclerosis
<table>
<thead>
<tr>
<th>Feature</th>
<th>Optic Neuritis</th>
<th>Papilloedema</th>
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<tbody>
<tr>
<td>Side</td>
<td>Unilateral</td>
<td>Bilateral (rare exceptions)</td>
</tr>
<tr>
<td>Pain on eye movement</td>
<td>Usually present</td>
<td>No pain (rare exceptions)</td>
</tr>
<tr>
<td>Onset of visual loss</td>
<td>Sudden</td>
<td>Gradual</td>
</tr>
<tr>
<td>Degree of visual loss as compared to degree of disc swelling</td>
<td>Gloss</td>
<td>Slight (except PPOA)</td>
</tr>
<tr>
<td>Color vision</td>
<td>Impaired (especially red and green)</td>
<td>Defective only at late stage</td>
</tr>
<tr>
<td>Field defect</td>
<td>Central or centrocecal scotoma</td>
<td>Enlarged blind spot, Peripheral constriction</td>
</tr>
<tr>
<td>Pupillary reaction</td>
<td>Ill sustained</td>
<td>Normal</td>
</tr>
<tr>
<td>Degree of disc swelling</td>
<td>Less than 3 Dioptres</td>
<td>More than 3 Dioptres</td>
</tr>
<tr>
<td>Venous engorgement</td>
<td>Less marked</td>
<td>More marked</td>
</tr>
<tr>
<td>Venous pulsation</td>
<td>Present</td>
<td>Absent</td>
</tr>
<tr>
<td>Hemorrhages</td>
<td>Uncommon</td>
<td>May be present</td>
</tr>
<tr>
<td>Slit lamp examination for cells in vitreous</td>
<td>Positive</td>
<td>Negative</td>
</tr>
</tbody>
</table>
Papilloedema – D.D.

- Increased ICP
- Optic Neuritis
- Edema associated with disease of retinal arteries, malignant hypertension, giant cell arteritis
- Massive increases in CSF protein – Gullian Barre syndrome, Spinal neurofibroma.
- Changes in composition of blood – Anemia (acute iron deficiency, sickle cell), Polycythemia Vera
Papilloedema – D.D.

- Venous obstruction
  - Thrombosis of central vein of retina
  - Mass lesions of orbit – Hemangioma, Meningioma, Neurofibroma
  - Cavernous Sinus thrombosis
  - Carotido Cavernous fistula
  - Superior Sagittal and Lateral Sinus thrombosis
  - Intra thoracic venous obstruction – mediastinal tumours, aortic aneurysm, severe emphysema
Miscellaneous causes

- Eclampsia
- Premenstrual edema
- Vitamin A excess or deficiency
- Tetracycline administration
- Leukemia
- Lead poisoning
Optic atrophy

- Caused by chronic edema, infection or tumors, sometimes injury.
- Features – pale, moon like appearance of optic disc.
- Increased ICP will not be reflected on atrophied disc and will need other imaging modalities for diagnosis.