

ALTERED VISION

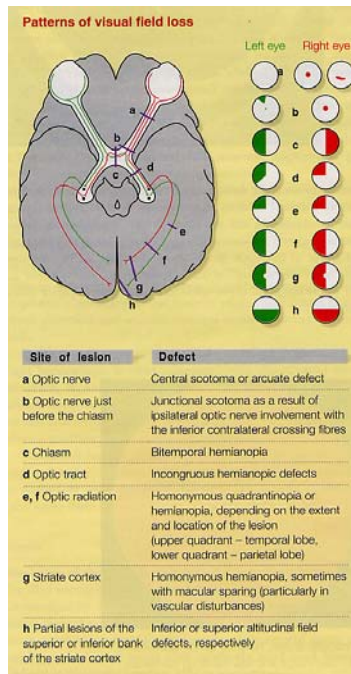
Masud Husain

Vision is altered by abnormalities of the afferent pathway from retina to primary visual cortex.

If the lesion is complete, it leads to complete loss of vision in a sector of the visual field. The precise pattern of visual loss (e.g. hemifield or quadrant) helps to localize the lesion.

THE NEXT SLIDE IS IMPORTANT!

Afferent system



Pre-chiasmatic lesions

produce monocular visual loss (see a)

Chiasmatic lesions

Bitemporal hemianopia (see c)

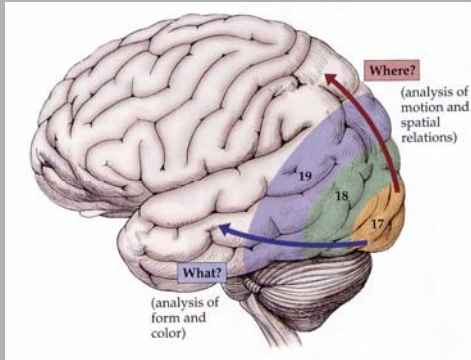
Post-chiasmatic lesions

Tend to produce homonymous hemianopias or quadrantanopias (see e, f, g)

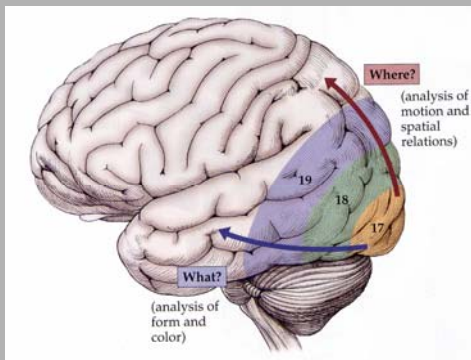
Vision is altered by abnormalities of the afferent pathway from retina to primary visual cortex.

If the lesion is complete, it leads to complete loss of vision in a sector of the visual field. The precise pattern of visual loss (e.g. hemifield or quadrant) helps to localize the lesion.

Vision may also be altered by lesions of higher-order cortical areas, giving rise to visual agnosias or visual neglect.

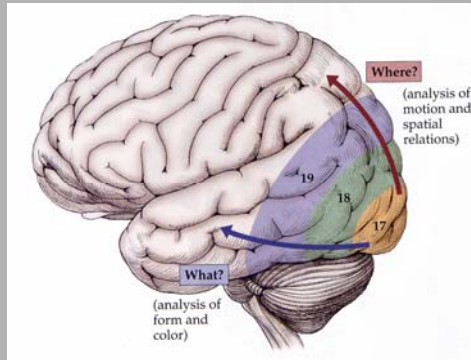


The 'dorsal' stream or 'where' pathway, from occipital to posterior parietal cortex, is involved in spatial vision - perceptual localisation and visual control of eye / hand movements.



The 'ventral' stream or 'what' pathway, from occipital to inferior temporal cortex, is involved in form, colour and motion perception.

Dorsal stream damage leads to deficits in spatial vision and visual guidance of movement; whereas lesions of the ventral stream lead to impaired form perception.



Spatial / dorsal syndromes

- Optic ataxia or misreaching to visual targets

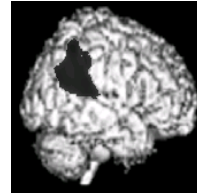
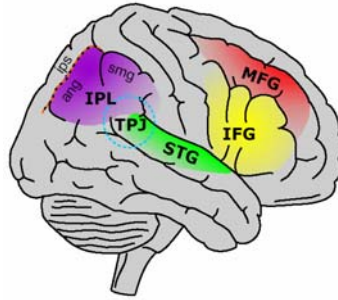


Spatial / dorsal syndromes

- Optic ataxia or misreaching to visual targets
- Visual neglect

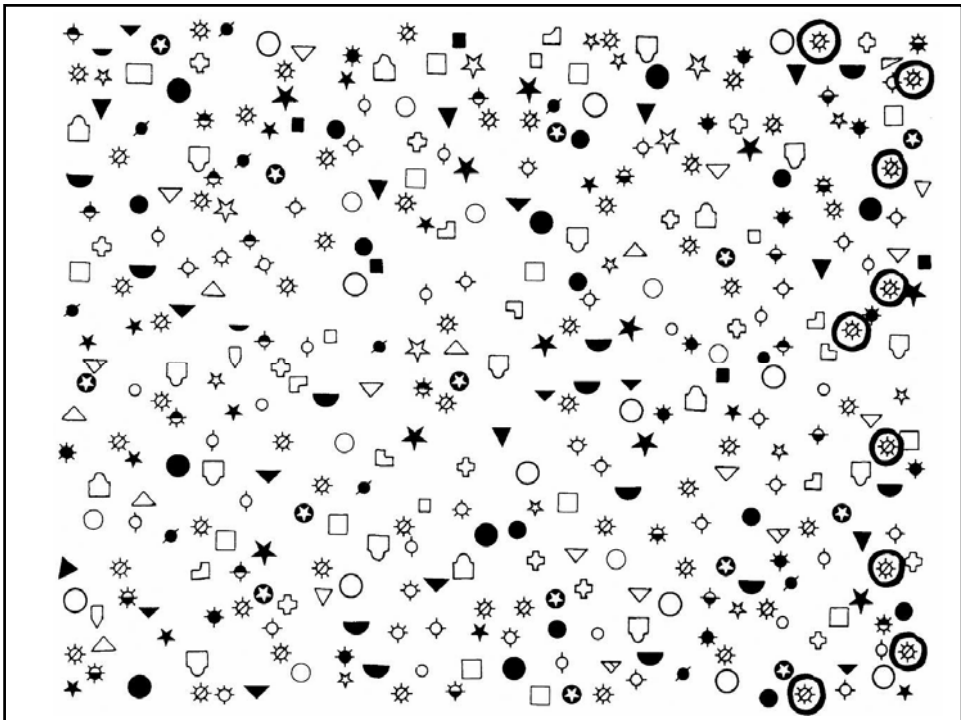


Lesions of the right inferior parietal and right inferior frontal lobes cause left-sided neglect

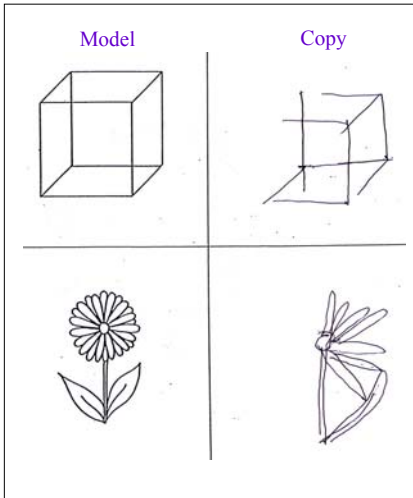


Husain & Rorden *Nature Reviews Neuroscience* (2003)

Compare with language areas in left hemisphere



Copying (or painting) tasks may reveal leftward omissions in neglect



Spatial / dorsal syndromes

- Optic ataxia or misreaching to visual targets
- Visual neglect
- Visual extinction



Visual extinction



Patient: “Left”

“Right”

“Right”

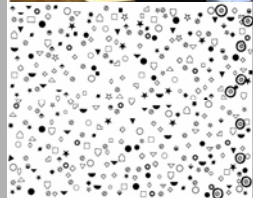
Normals: “Left”

“Right”

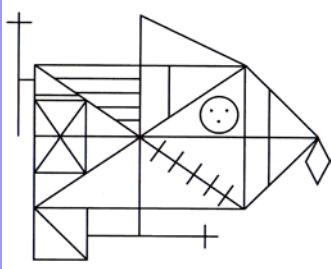
“Both”

Spatial / dorsal syndromes

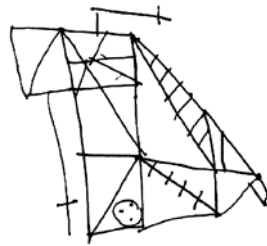
- Optic ataxia or misreaching to visual targets
- Visual neglect
- Visual extinction
- Constructional apraxia



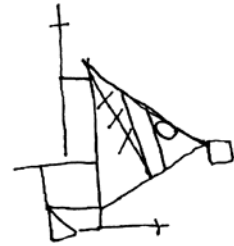
*Constructional apraxia
following right parietal damage*



Rey-Osterreith Figure

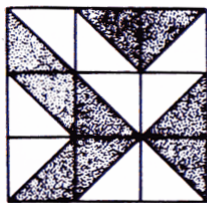


Patient A's copy

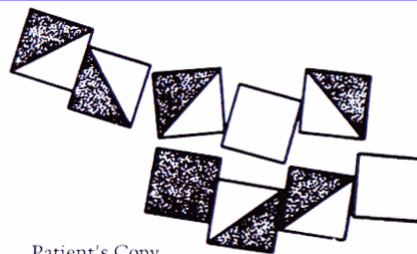


Patient B's copy

*Constructional apraxia
following right parietal damage*



Model

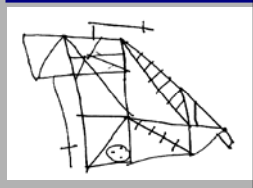
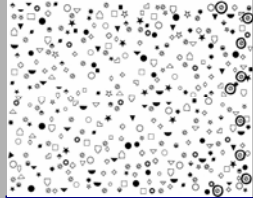


Patient's Copy

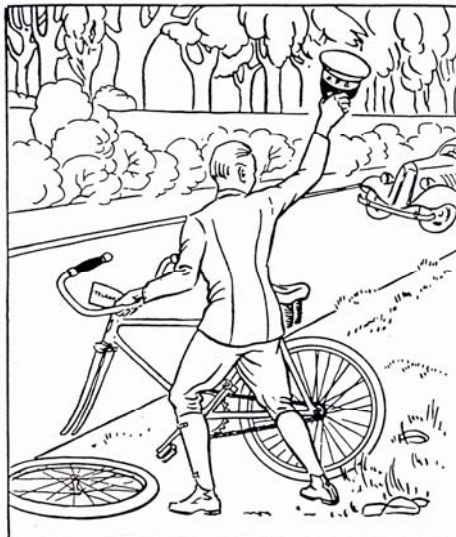
Block construction

Spatial / dorsal syndromes

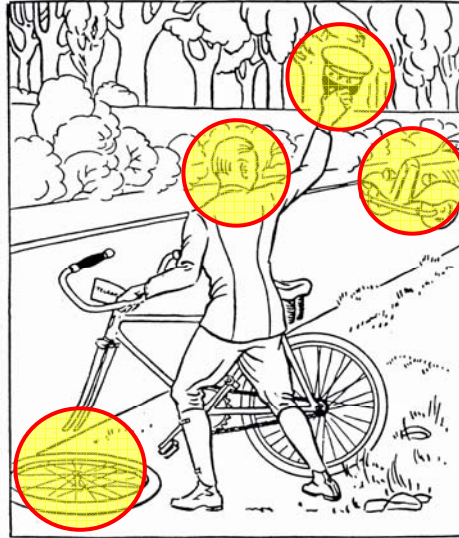
- Optic ataxia or misreaching to visual targets
- Visual neglect
- Visual extinction
- Constructional apraxia
- Simultanagnosia



*Simultanagnosia:
perceiving only one thing at a time*



*Simultanagnosia:
perceiving only one thing at a time*



Ventral syndromes

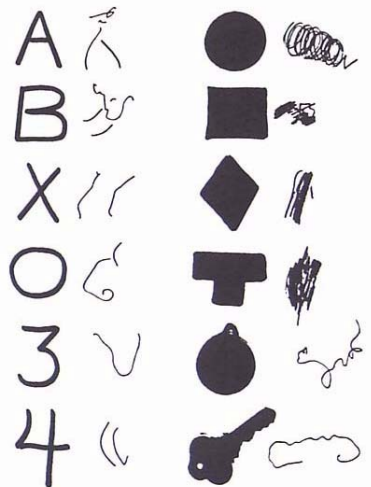
- Apperceptive visual agnosia
- Associative agnosia - perception 'stripped of meaning'

Visual Agnosia

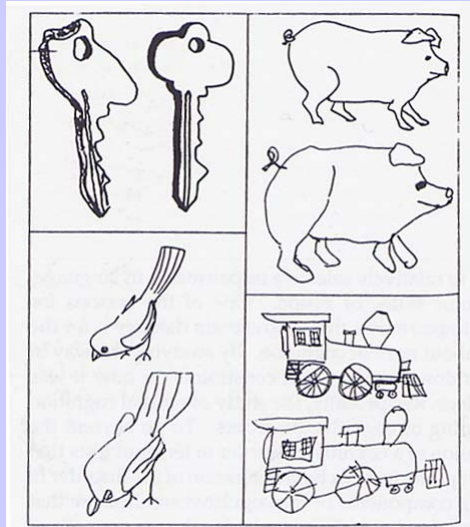


A disorder of object recognition. Note that a patient with anomia may also respond in a similar way, but they can describe what the object is used for, whereas this patient with agnosia cannot.

Copying in Apperceptive Visual Agnosia is poor



Copying in Associative Visual Agnosia is pretty good

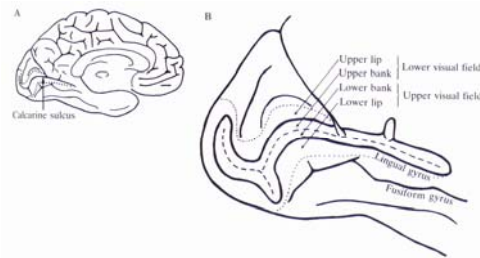
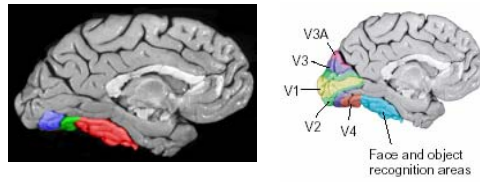


Ventral syndromes

- Apperceptive visual agnosia
- Associative agnosia - perception 'stripped of meaning'
- Prosopagnosia - impaired face perception
- Cerebral achromatopsia - impaired colour perception

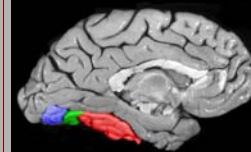


Anatomy of achromatopsia and prosopagnosia



Ventral syndromes

- Apperceptive visual agnosia
- Associative agnosia - perception 'stripped of meaning'
- Prosopagnosia - impaired face perception
- Cerebral achromatopsia - impaired colour perception
- Motion blindness



Motion Blindness

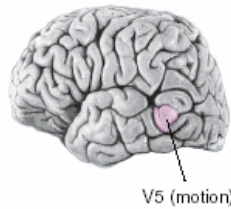
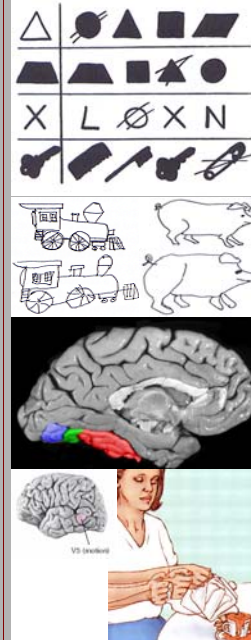


Figure 5.27 For the patient with motion blindness, the world appears as if viewed through a strobe light. Rather than see the liquid rise continuously in the teacup, the patient reports seeing the liquid jump from one level to the next.

Ventral syndromes

- Apperceptive visual agnosia
- Associative agnosia - perception 'stripped of meaning'
- Prosopagnosia - impaired face perception
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If the lesion is complete, it leads to complete loss of vision in a sector of the visual field. The precise pattern of visual loss (e.g. hemifield or quadrant) helps to localize the lesion.

Vision may also be altered by lesions of higher-order cortical areas, giving rise to visual agnosias or visual neglect.

Remember also that vision depends upon the oculomotor system. Diplopia may occur when the visual axes of the two eyes are not aligned.

Case History 1

- 23-year old woman, normally fit and well
- Three days progressive visual impairment in rt eye

- Initially vision blurred
- Now difficult to read with that eye

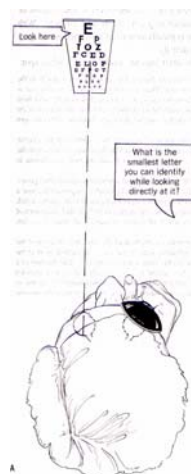
- Eye feels sore on moving it
- Colours seem drab

Examination Case 1

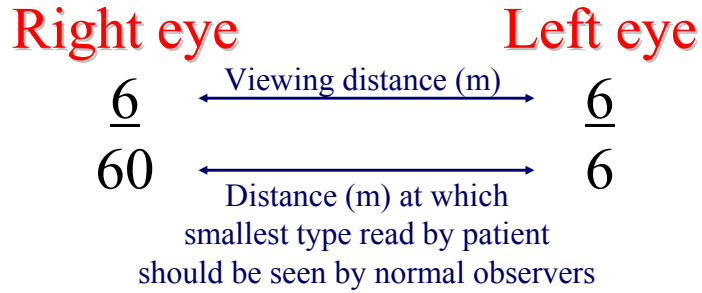
- Visual acuity reduced in right eye

Visual Acuity

meter scale		foot scale	
6/60	T	20/200	5
6/36	E P	20/120	2 7
6/24	L H V	20/100	9 4 8
6/18	O S T A	20/80	7 3 4 6
6/12	L C V E	20/60	6 2 5 8 3
6/9	F Z T H P	20/40	2 8 3 4 5 9
6/7.5	N L O S V H	20/30	6 1 7 3 2 5
6/6	O Z U F K L	20/20	7 5 6 4 2 3
6/5	T E P C L V O		3 1 5 2 7 9 4

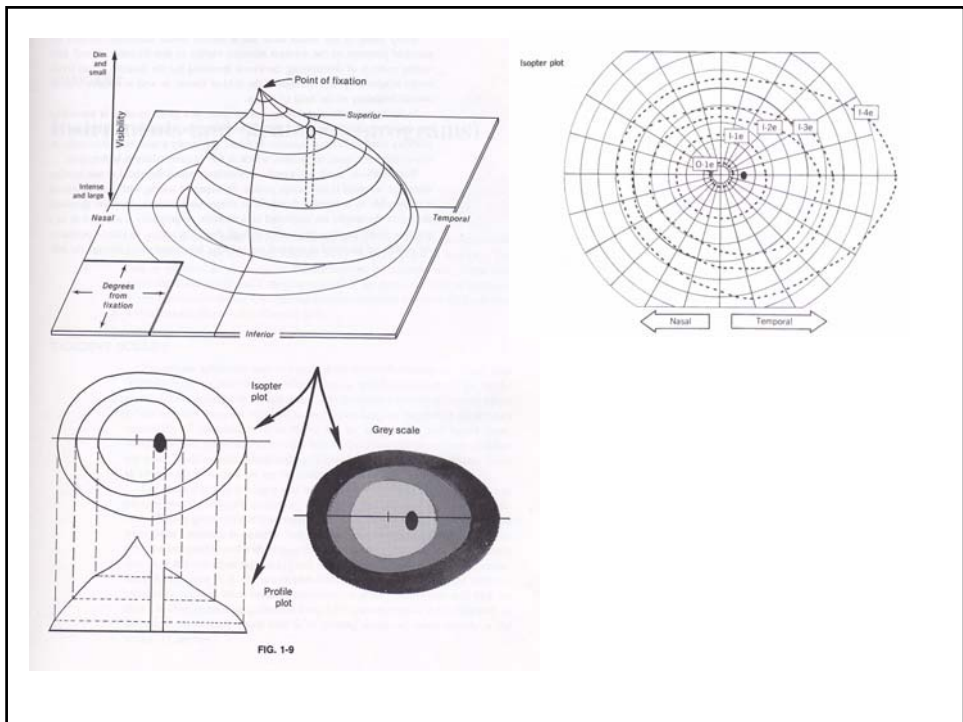
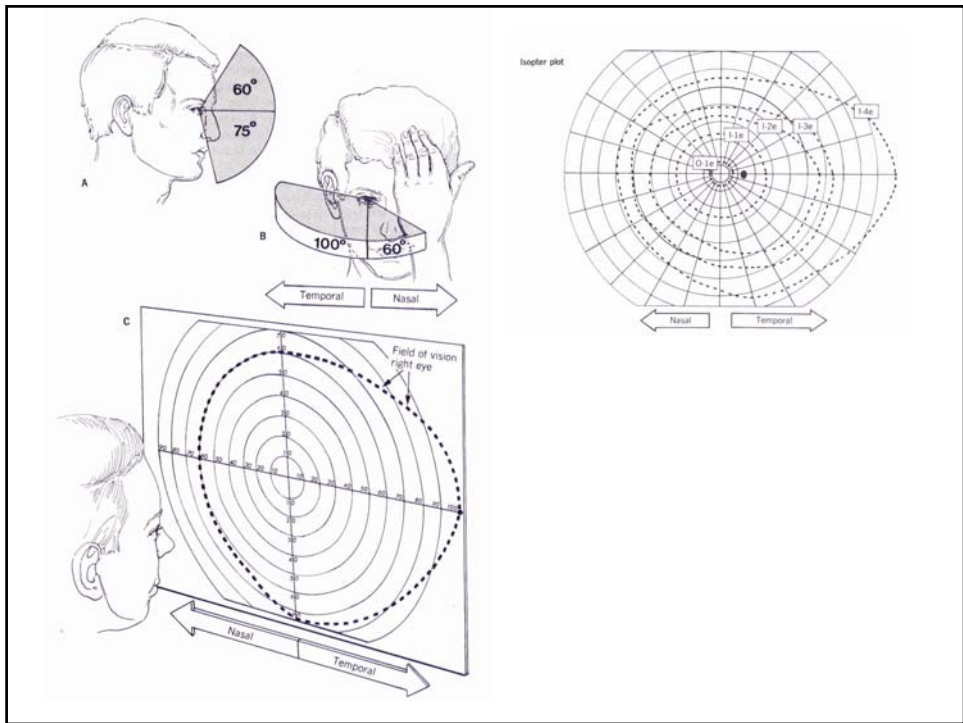


Visual Acuity

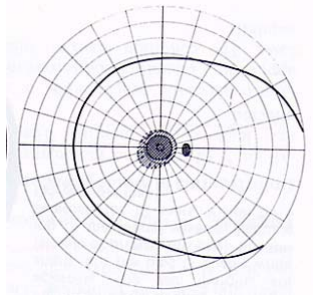


Examination Case 1

- Visual acuity reduced in right eye
- Central scotoma in right eye
- Otherwise visual fields intact



Central Scotoma

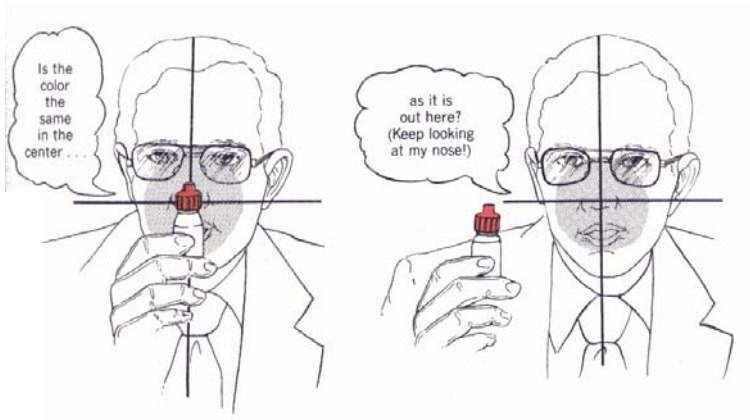


Examination Case 1

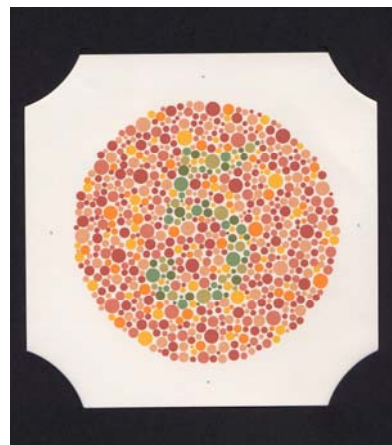
- Visual acuity reduced in right eye
- Central scotoma in right eye
- Otherwise visual fields intact

- Colour vision defective in right eye

Central colour desaturation



Colour Vision

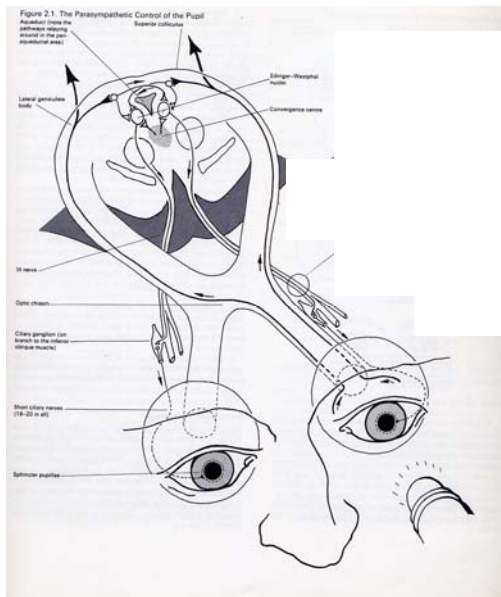


Examination Case 1

- Visual acuity reduced in right eye
- Central scotoma in right eye
- Otherwise visual fields intact

- Colour vision defective in right eye
- Relative afferent pupillary defect (RAPD)

Pupillary reflexes



Relative afferent pupillary defect

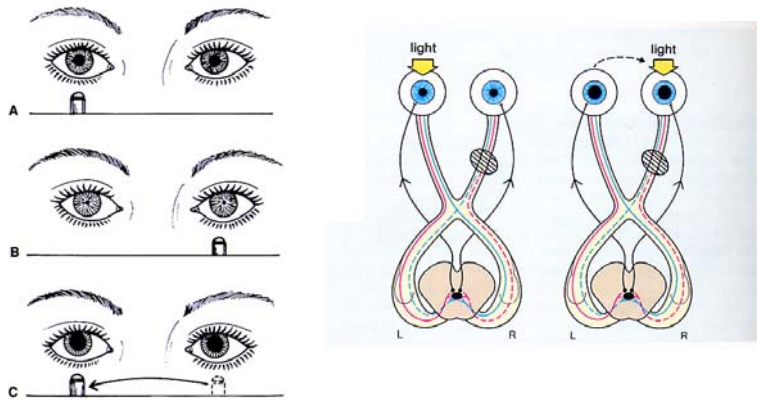
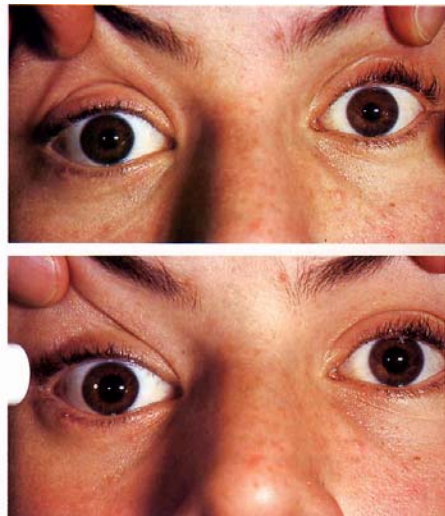


FIGURE 43.3 Right relative afferent pupillary defect (Marcus Gunn pupil) from right optic nerve lesion. A. Right eye illuminated. Poor direct and consensual reaction. B. Excellent direct and consensual response. C. Light swung from left to right with redilation of both pupils.

Relative afferent (RAPD)

A right afferent pupillary defect is seen in this patient with retrobulbar neuritis of the right optic nerve. Stimulation of the left eye produces bilateral pupillary constriction. Transfer of the light to the right eye produces a relative dilation of the pupil in both eyes. If one pupil is damaged or paralysed, an afferent pupillary defect can still be diagnosed by observing whether the size of the response varies in the functioning pupil with alternate stimulation of the two eyes.



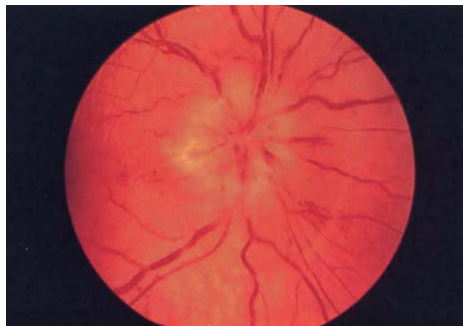
Examination Case 1

- Visual acuity reduced in right eye
- Central scotoma in right eye
- Otherwise visual fields intact

- Colour vision defective in right eye
- Relative afferent pupillary defect (RAPD)

- Fundus

Fundus



Investigations & R_x

Optic Neuritis

Investigations & R_x

- MRI brain (+/- optic nerves)
- Visual evoked potentials (VEPs)

Optic Neuritis

P100 amplitude is delayed

Visual evoked potentials

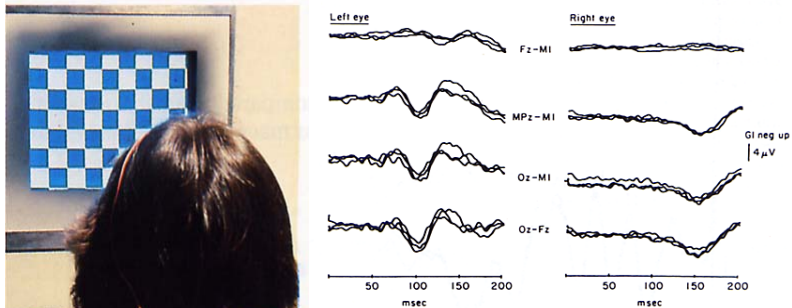


FIGURE 37A.20 Pattern-shift VEPs in a patient with right optic neuritis illustrating marked delay of the P100 component from the right eye. As is typical of demyelinating optic neuropathies, waveform is relatively preserved.

Optic Neuritis

Investigations & R_x

- MRI brain (+/- optic nerves)
- Visual evoked potentials (VEPs)
- [CSF]

Investigations & R_x

- MRI brain (+/- optic nerves)
- Visual evoked potentials (VEPs)
- [CSF]

- iv Methylprednisolone / oral prednisolone

Case History 2

- 64-year old man. Hypertensive.
- Two episodes of transient visual loss in right eye

- Sudden-onset complete monocular loss of vision
- Painless

- Lasting approx. 15 minutes

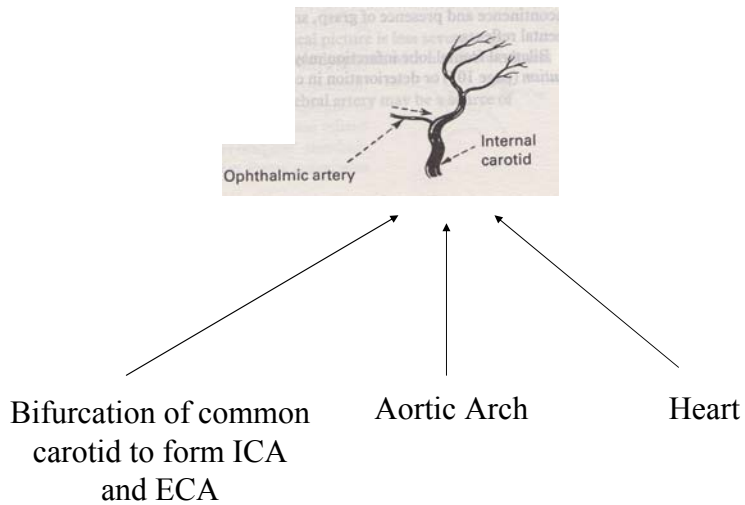
Examination Case 2

- Visual acuity 6/6 in both eyes
- Visual fields intact
- Fundi normal

- BP 140/98 P110 irreg
- HS I + II
- No carotid bruits

Investigations & R_x

Amaurosis fugax



Amaurosis fugax

Investigations & R_x

- ECG
- Glucose, lipids
- Doppler ultrasound / MRA (MR angiography)
- Brain CT
- [Echocardiogram]

- Aspirin
- Endarterectomy if ICA stenosis > 70%
- Consider anticoagulation if in AF

Case History 3

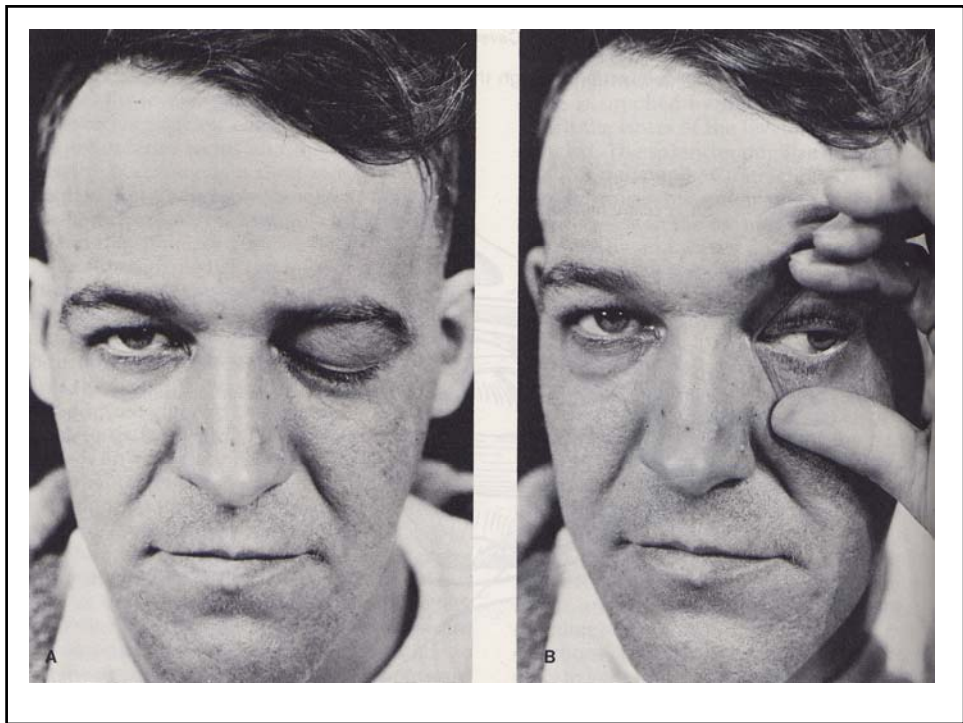
- 40-year old diabetic man.
- Progressively worsening double vision

- Drooping of left eyelid
- Pain around left orbit.

Examination Case 3

- Visual acuity 6/6 in both eyes
- Visual fields intact
- Fundi normal

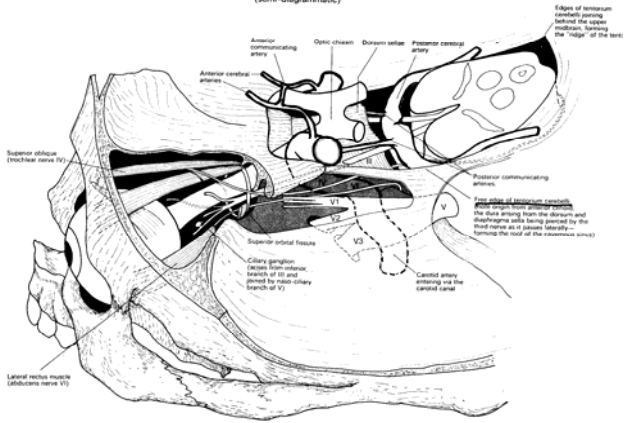
- Complete left IIIrd nerve palsy
- Pupil involved



Investigations & R_x

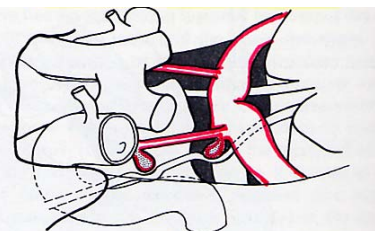
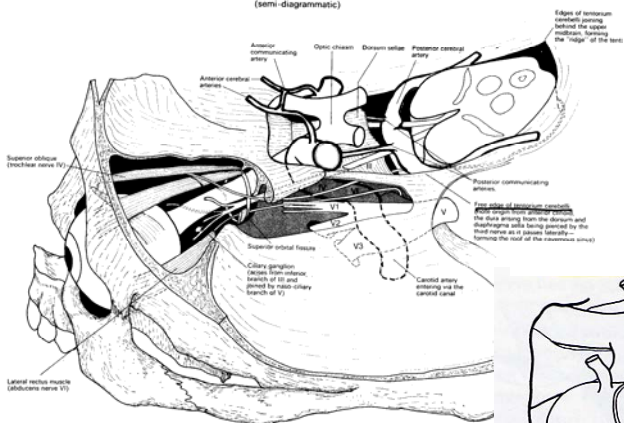
P Com artery aneurysm

Figure 5.9 The Intracranial Course and Relations of Cranial Nerves III, IV, V, VI (semi-diagrammatic)



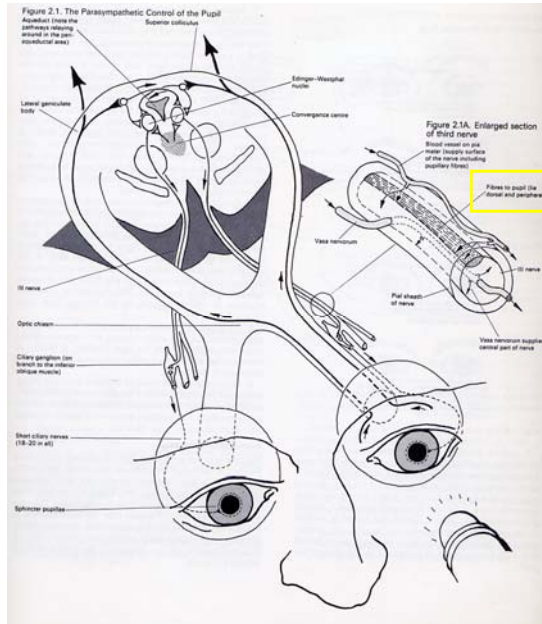
P Com artery aneurysm

Figure 5.9 The Intracranial Course and Relations of Cranial Nerves III, IV, V, VI (semi-diagrammatic)

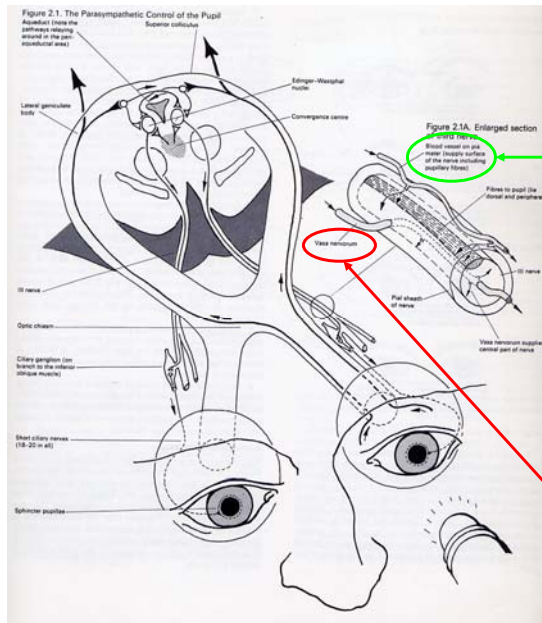


Aneurysms at either end (they typically occur at these sites) are likely to damage III nerve as the artery is immediately adjacent to it

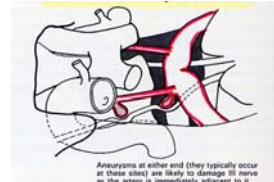
P Com artery aneurysm



P Com artery aneurysm



Structural lesions, e.g. P Com aneurysm



Often involved in diabetes

Investigations & R_x

- MRI
- MRA
- Definitive angiography

- Surgery / endovascular treatment

Further Reading

Neurological Differential Diagnosis
John Patten

Neurological Eye Problems
Husain & Kennard *Medicine International*