Dissertation on

A STUDY ON OPHTHALMIC MANIFESTATIONS

IN PITUITARY GLAND TUMORS

Submitted in partial fulfilment of requirements of

M.S. OPHTHALMOLOGY
BRANCH - III
REGIONAL INSTITUTE OF OPHTHALMOLOGY
MADRAS MEDICAL COLLEGE
CHENNAI- 600 003

THE TAMILNADU
DR.M.G.R. MEDICAL UNIVERSITY
CHENNAI
APRIL 2017

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI 600 003

EC Reg.No.ECR/270/Inst./TN/2013
Telephone No.044 25305301
Fax: 011 25363970

CERTIFICATE OF APPROVAL

To
Dr.Sahana A
Post Graduate in M.S. Opthalmology
Regional Institute of Ophalmology and Hospital for Ophtalmology
Madras Medical College
Chennai 600 003

Dear Dr.Sahana.A.,

The Institutional Ethics Committee has considered your request and approved your study titled " **A STUDY ON OPHTHALMIC MANIFESTATIONS IN PITUITARY GLAND TUMOURS" NO.-19052016**

The following members of Ethics Committee were present in the meeting hold on **03.05.2016** conducted at Madras Medical College, Chennai 3.

1. Dr.C.Rajendran, MD.,	:Chairperson
2. Dr.Isaac Christian Moses.,M.D.,Dean,MMC,Ch-3	:Deputy Chairperson
3. Prof.Sudha Seshayyan,MD., Vice Principal,MMC,Ch-3	: Member Secretary
4. Prof. B.Vasanth, M.D.,(Prof of Pharmacology)	: Member
5. Prof.P.Raghumani, M.S.,Prof ofSurgery, Inst. of Surgery	: Member
6. Prof. Md Ali, M.D., D.M.(Prof & HOD of MGE)	: Member
7. Prof. K.Ramadevi, M.D., (Director of Biochemistry)	: Member
8. Prof.M.Saraswathi,MD.,Director, Inst.of Path,MMC,Ch-3	: Member
9. Prof.Srinivasagalu,Director,Inst.of Int.Med.,MMC,Ch-3	: Member
10.Tmt.J.Rajalakshmi, JAO,MMC, Ch-3	: Lay Person
11.Thiru S.Govindasamy, BA.,BL,High Court,Chennai	: Lawyer
12.Tmt.Arnold Saulina, MA.,MSW.,	:Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary - Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE.
MADRAS MEDICAL COLLEGE
CHENNAI-600 003

CERTIFICATE

This is to certify that this dissertation titled "**A STUDY ON OPHTHALMIC MANIFESTATIONS IN PITUITARY GLAND TUMORS**" is a bonafide record of the research work done by **Dr Sahana A.** , post graduate in Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Madras Medical College and Government General Hospital, Chennai 03, in partial fulfilment of the regulations laid down by The Tamil Nadu Dr M.G.R. Medical University for the award of M.S. Ophthalmology Branch III, under my guidance and supervision during the academic years 2014-2017.

Dr R MALARVIZHI
MS., DO.
Chief –Squint & Neuro-Ophthalamology
RIO – GOH
Egmore, Chennai – 08

Dr WAHEEDA NAZIR
MS., DO.
Director and Superintendent
RIO-GOH
Egmore, Chennai – 08

Dr. M.K.MURALIDHARAN, M.S., M.Ch.
Dean,
Madras Medical College.
and Government General Hospital
Chennai –03

ACKNOWLEDGEMENT

I express my sincere thanks and gratitude to **Prof. Dr. M.K.Muralidharan, M.S., M.Ch.,** Dean, Madras Medical College and Government General Hospital for permitting me to conduct this study.

I express my sincere gratitude to **Prof. Dr Waheeda Nazir M.S., D.O.,** Director and Superintendent, Regional Institute of Ophthalmology and Government Ophthalmic Hospital, Madras Medical College, Chennai for her valuable advice as my guide in preparing this dissertation.

I am extremely grateful to **Prof R Malarvizhi Prof.M.S D.O,** my Unit Chief and **Prof Dr. M. R. Chitra, M.S.,** for their valuable guidance and constant support at every stage throughout the period of this study.

I am very grateful to my Assistant Professors **Dr Geetha, M.S,D.O., Dr T G Uma Maheswari, M.S., and Dr P Shobha M.S,D.O.** for their valuable guidance and support not only during the study but also throughout my course in all aspects.

I wish to express my sincere thanks to all the professors, assistant professors and all my colleagues who had helped me in bringing out this study.

Finally, I am indebted to all the patients for their sincere cooperation for the completion of this study.

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation titled, "**A STUDY ON OPHTHALMIC MANIFESTATIONS IN PITUITARY GLAND TUMORS**" is a bonafide and genuine research work conducted by me under the guidance of Prof. Dr R Malarvizhi, M.S., D.O., Professor Department of Squint & Neuro-ophthalmology services, Regional institute of ophthalmology, Government Ophthalmic hospital. Chennai-600008.

Date : **Dr. Sahana A**

Place:

INTRODUCTION

Pituitary adenoma is a benign tumour that originates from the adenohypophyseal cells of the anterior lobe of pituitary gland. It accounts for 12% to 15% of all intracranial tumours.[1] A spectrum of visual manifestations are seen with these tumours, ranging from the absence of any visual symptoms to severe visual field defects and loss of vision

The clinical manifestations depend on the cell

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	221413008 Ms Opthal Sahana A
Assignment title:	2015-2015 plagiarism
Submission title:	A STUDY ON OPHTHALMIC MANIF...
File name:	final_part_1.docx
File size:	1.52M
Page count:	80
Word count:	6,900
Character count:	38,579
Submission date:	27-Sep-2016 11:52AM
Submission ID:	709839117

CONTENTS

INTRODUCTION

Pituitary adenoma is a benign tumour that originates from the adenohypophyseal cells of the anterior lobe of pituitary gland. It accounts for 12% to 15% of all intracranial tumours.[1] A spectrum of visual manifestations are seen with these tumours, ranging from the absence of any visual symptoms to severe visual field defects and loss of vision

The clinical manifestations depend on the cell type of the tumour, hypo or hypersecretion of hormones, direction of local spread and compression of adjacent structures.

Pituitary adenomas are of 2 types according to the size : microadenomas (≤10 mm) and macroadenomas (>10 mm).[3] In comparison to men, women have a 2-fold increased risk of developing pituitary adenomas. Pituitary adenoma is a benign tumour, however, it has a tendency of recurrence. Clinical features of adenomas are either due to hypersecretion or hyposecretion of hormones or compression of pituitary adenoma to the surrounding structures.[3]

Pituitary gland is situated in the sella turcica, 10–13 mm below the optic chiasm. Therefore, when it increases in size, it can easily compress the optic nerve fibres at the chiasma.

Microadenomas can have a little effect on the optic nerve or on the function of other glands, whereas macroadenomas can cause significant visual impairment.

Compression of the frontal part of the optic nerve, affects the visual fields, visual acuity, and contrast sensitivity.

Compression of optic chiasma for a long duration can cause severe vision impairment due to optic atrophy. Functioning adenomas cause less specific visual symptoms as they are diagnosed earlier due to hormone specific symptoms.

Non-functioning pituitary adenomas cause progressive visual loss as they grow slowly and compress the optic chiasm.[5] Pituitary adenomas are diagnosed earlier nowadays because of the availability of radioimmunoassay techniques for the hormones and use of CT scanning and MRI imaging, done for indications unrelated to suspicion of pituitary tumours like head injuries and evaluation of headache.

The arrangement of fibres characteristically account for a classical bitemporal hemianopia, however other defects like arcuate scotomas, junctional defects, nasal field loss can occur.

Other manifestations like ophthalmoplegia due to involvement of 3,4,5,6 cranial nerves, see saw nystagmus, disturbance in depth perception, optic atrophy related to compression of surrounding structures can occur.

ANATOMY OF SELLAR REGION

Sellar region occupies most of the middle cranial fossa. Upper border of sella tursica lies in the plane of floor of anterior cranial fossa.

Boundaries

front it is bounded by the posterior border of the lesser wing of sphenoid, the anterior clinoid processes and anterior margin of sulcus chiasmata. Behind by the superior borders of the petrous border of the temporal bone and the dorsum sellae of the clinoid bone. Laterally by the temporal squamae, the frontal angles of the parietal bones and the greater wing of the sphenoid.

Centrally the floor is formed by the body of the sphenoid. In front, the sulcus chiasmatis leads on each side into the optic canal, the sulcus is rarely in contact with optic chiasma which is usually above and behind it. The optic canal is between the 2 roots of lesser wing with medially the body of the sphenoid.

It extends forwards, laterally and somewhat downwards containing the optic nerve, ophthalmic artery and meninges.

Immediately behind the sulcus the upper surface of body of sphenoid is shaped like a “Turkish saddle” and it is named as “sella tursica”.Its anterior slope bears a medium elevation, the tuberculum sellae and behind that the surface is hollowed out as hypophyseal fossa which contains the hypophysis cerebri.

The floor of the hypophyseal fossa forms a part of the roof the sphenoidal sinus. Posterior to the fossa, a plate of bone projects upwards and forwards to form the dorsum sellae. On each side the superolateral angle of the dorsum sellae is expanded into the posterior clinoid process. Lateral to the sella tursica, the body of the sphenoid presents a shallow groove for the internal carotid artery which runs forwards from the foramen lacerum.

Laterally, the middle cranial fossa is deep and supports the temporal lobe of the cerebrum. It is formed in the front by cerebral surface of the greater wing of the sphenoid, behind by the anterior surface of petrous part of the temporal lobe and laterally the cerebral surface of the temporal squama occupies interval between these 2 bones.

It is related in front to the apical region of the orbit, laterally to the temporal fossa and below to the infratemporal fossa.

Anteriorly it communicates with the orbit through the superior orbital fissure. It transmits the terminal branches of the optic nerve, ophthalmic vein, oculomotor, trochlear and abducent nerves and some smaller vessels.

The anteroposterior diameter of the sella is the greater diameter and is not related to any fixed landmark. 17mm is upper limit of the normal diameter. The depth is the greatest downward distance to the floor along a perpendicular line traced between tuberculum sellae and top of the dorsum sellae.

However, a deeper sella may be normal. Width of the floor may be variable from 10 to 15 mm .Mean volume of the sellar cavity is 594 cubic mm. Maximum value is 1092 cubic mm.

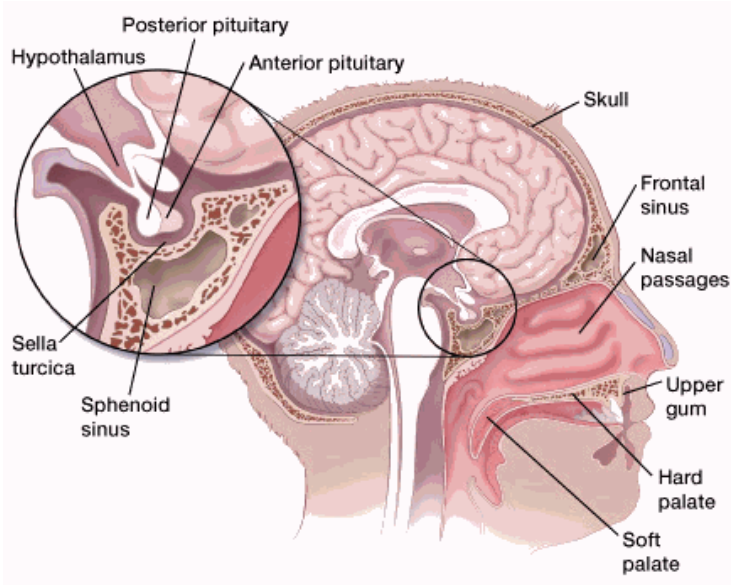


Figure 1: anatomy of sellar region

Structures present in sellar region

1. Optic nerve
2. Optic chiasma
3. Optic tracts
4. Internal carotid arteries
5. Hypophysis
6. Hypothalamus

ANATOMY OF PITUITARY GLAND

The hypophysis lies in a depression in the roof of the body of the sphenoid bone .The roof of the sella is formed by a fold of duramater called the diaphragm sellae which stretches from the anterior to the posterior clinoids.

Pituitary gland is situated in the base of the brain, and is the most important endocrine gland producing a number of hormones controlling many other endocrine glands. The stalk of the pituitary gland pierces the diaphragma sella and is related above to the floor of third ventricle.

Relations

Hypophysis cerebri is superiorly related to optic chiasma, tubercinerium and infundibular recess of the third ventricle and inferiorly related to hypophysial fossa and sphenoidal air sinuses.

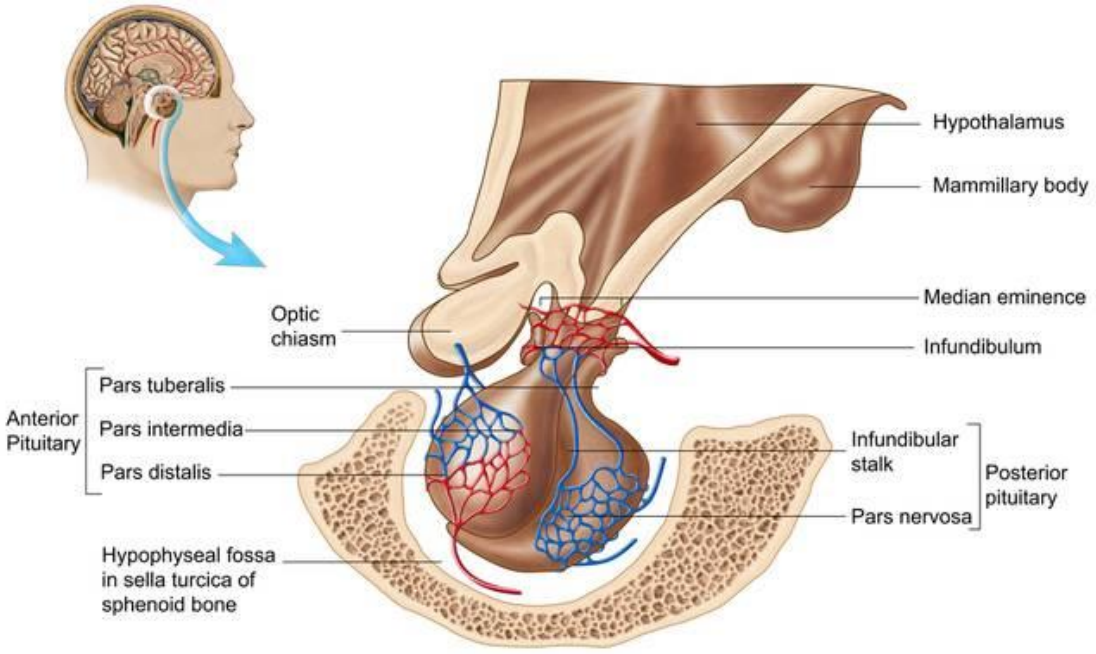


Figure 2 :Anatomy of pituitary gland

Embryology

The gland has 2 main parts namely adenohypophysis ,which develops from the Ratkhe's pouch and neurohypophysis which develops as a down growth from diencephalon .

Adenohypophysis has an anterior lobe or pars anterior, an intermediate lobe or pars intermedialis and a tuberal lobe or pars tuberalis .The anterior lobe is the largest, the intermediate lobe is a remnant of Ratkhe's pouch and the pars tuberalis is an upward extension of the anterior lobe and also forms a part of the infundibulum.

The neurohypophysis has a posterior lobe or pars posterior, an infundibular stem and the median eminence.

Blood supply

Pituitary gland is supplied by the following branches of internal carotid artery:

1. Superior hypophyseal artery on each side that supply ventral part of hypothalamus, upper part of infundibulum and lower part of infundibulum through long descending branch called ,trabecular artery.

2. Inferior hypophyseal branch that divides into medial and lateral branches that join one another forms an arterial ring.

3. The anterior lobe is exclusively supplied by portal vessels arising from capillaries from superior hypophyseal arteries. These are of importance as they carry hormone releasing factors from hypothalamus.

Short veins on the surface of the gland drain into surrounding dural venous sinuses.

There are three possible routes for venous drainage of the neuro-hypophysis: to the adenohypophysis, via long and short portal vessels; into the dural venous sinuses, via the large inferior hypophysial veins; and to the hypothalamus, via capillaries passing to the median eminence. The venous drainage carries hypophysial hormones from the gland to their targets and also facilitates feedback control of secretion.

However, venous drainage of the adenohypophysis appears restricted: few vessels connect it directly to the systemic veins and so the routes by which blood leaves remain obscure.[14]

Hormones

Anterior lobe

1. Chromophilic cells (50%)

    - Acidophils/alpha cells(43%)
        a. Somatotrophs secrete growth hormones GH
        b. Mamotrophs secrete lactogenic hormone
        c. Corticotrophs secrete ACTH

    - Basophils/ beta cells (7%)
        a. Thyrotrophs secrete TSH

b. Gonadotrophs secrete LSH

c. Leucototrophs secrete LH

2. Chromophobic cells (50%)

Represent non secretory phase of other cells

Intermediate lobe

Secrete MSH melanocyte stimulating hormone

Posterior lobe

It is composed of a number of non myelinated fibers of hypothalamo-hypophyseal tract and modified cells called pituicytes.

Pituitary Adenomas with Secretory Function –

Eosiniphilic Adenoma

It results in excessive secretion of growth hormone causing acromegaly in adults and gigantism in the young

General Symptoms caused by this tumour includes

- Hands and Feet enlarged
- Prominent Jaw
- Increased Tongue thickness
- Loss of Libido

- Amenorrhoea in females
- Impotency in Males

Prolactin secreting adenomas result in galactorrhoea and amenorrhea.

Basophilic Adenomas

They secrete excessive ACTH resulting in Cushing's Syndrome

The symptoms of this tumour includes

- Adiposity
- Moon Face
- Hypertension
- Hypogonadism
- Osteoporosis

Pituitary Carcinoma has been pathologically verified to be associated with Cushing's Syndrome. Visual failures and field defects are less common with functional adenomas than with non-functional adenomas.

Non Secretory Pituitary Adenomas

Chromophobe Adenomas

It is a highly common intracranial tumour. This tumour flattens and compresses the pituitary glands against the wall of the sella producing hypo-pituitarism. Only 50 % of the patients clinically manifest endocrine dysfunction. Few features are :

1. Delayed body growth resulting in Pituitary Dwarfism.
2. Adiposogenital Dystrophy (Frohlich's Syndrome).
3. Sexual Disturbances such as amenorrhoea, loss of libido , impotency and gonadal atrophy.
4. Reduced hair growth
5. Intolerance to cold temperature.
6. Weight gain.
7. Cachexia (Simmonds disease).
8. Decreased BMR.
9. Dryness and Atrophy of Skin.
10. Tendency of hypoglycaemia.

If there is hypothalamic involvement it can result in imbalance of thermoregulation, diabetic insipidus and somnolence.

Pituitary Adenomas

The characteristic pituitary tumor is the adenoma. Uncommon in children, its incidence increases with age and may approach 30% in an older population. Pituitary adenomas constitute 12-15% of all symptomatic intracranial tumors. Most are sporadic. As a pituitary adenoma grows and extends beyond the sella turcica, it may then impinge upon the visual pathways, especially the chiasm, and the ocular motor cranial nerves in the cavernous sinus

Types of Pituitary Adenomas

Pituitary adenomas are arbitrarily grouped by size into

- microadenomas (less than 10 mm in greatest diameter) and
- macroadenomas(>10mm)

They are also classified according to their secretory function, although a single tumor may secrete more than one hormone. Many tumors that secrete hormones prolactin, growth hormone (somatotrophin), adrenocorticotropic hormone (ACTH or corticotrophin), and thyroid-stimulating hormone (TSH) present clinically as endocrinopathies. As a result, secreting tumors are often diagnosed while still microadenomas.

Non secreting tumors are usually recognized when they have grown large enough to produce visual symptoms or headache, thus tending to present as macroadenomas. The widespread use of imaging has led to the discovery of silent microadenomas, termed incidentaloma, measuring as small as 2-3 mm and present in 10-20% of the general population.

The prevalence of microadenomas at autopsy may be as high as 30%. The imaging procedure of choice in the detection of parasellartumors, including pituitary adenomas, is high-field magnetic resonance (MR) imaging performed both with and without gadolinium.

THE CHIASMA

Optic chiasma is the most important structure as the arrangement of fibres accounts for the characteristic defects. It is a flattened structure which is 12mm horizontally and 8mm antero-posteriorly and is 8 to 10 mm above the hypophysis cerebri .It is ensheathed by the piamater and is surrounded by the CSF.As it is related to the pituitary gland below appearance of a visual defect in the patient indicates a suprasellar extension. Posteriorly it continuous as the optic tracts. At the chiasma there is a hemi decussation or crossing over of nasal fibers to the opposite tract .

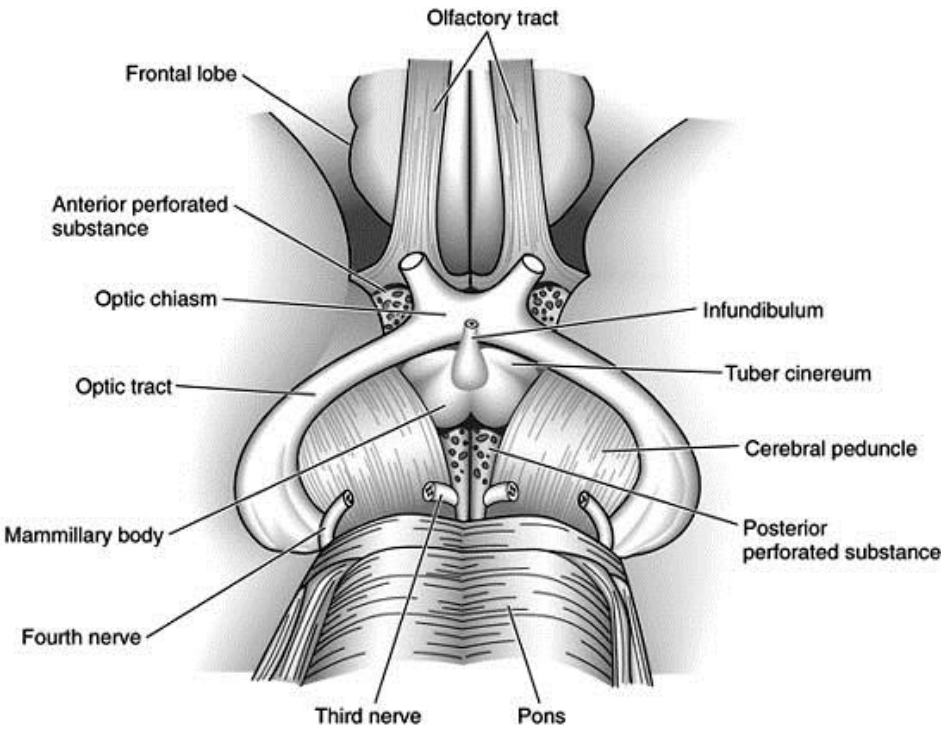


Figure 3: relations of chiasma

There are variations in the location of the chiasma in relation to the pituitary gland .In 80% it lies directly above the chiasma where the expansion of tumour can affect the chiasma first .In 10% it is located anteriorly over the tuberculum sellae which is called a prefixed chiasma where in optic tracts are affected first .In remaining 10%(post fixed) it lies more posteriorly over tuberculum sellae .

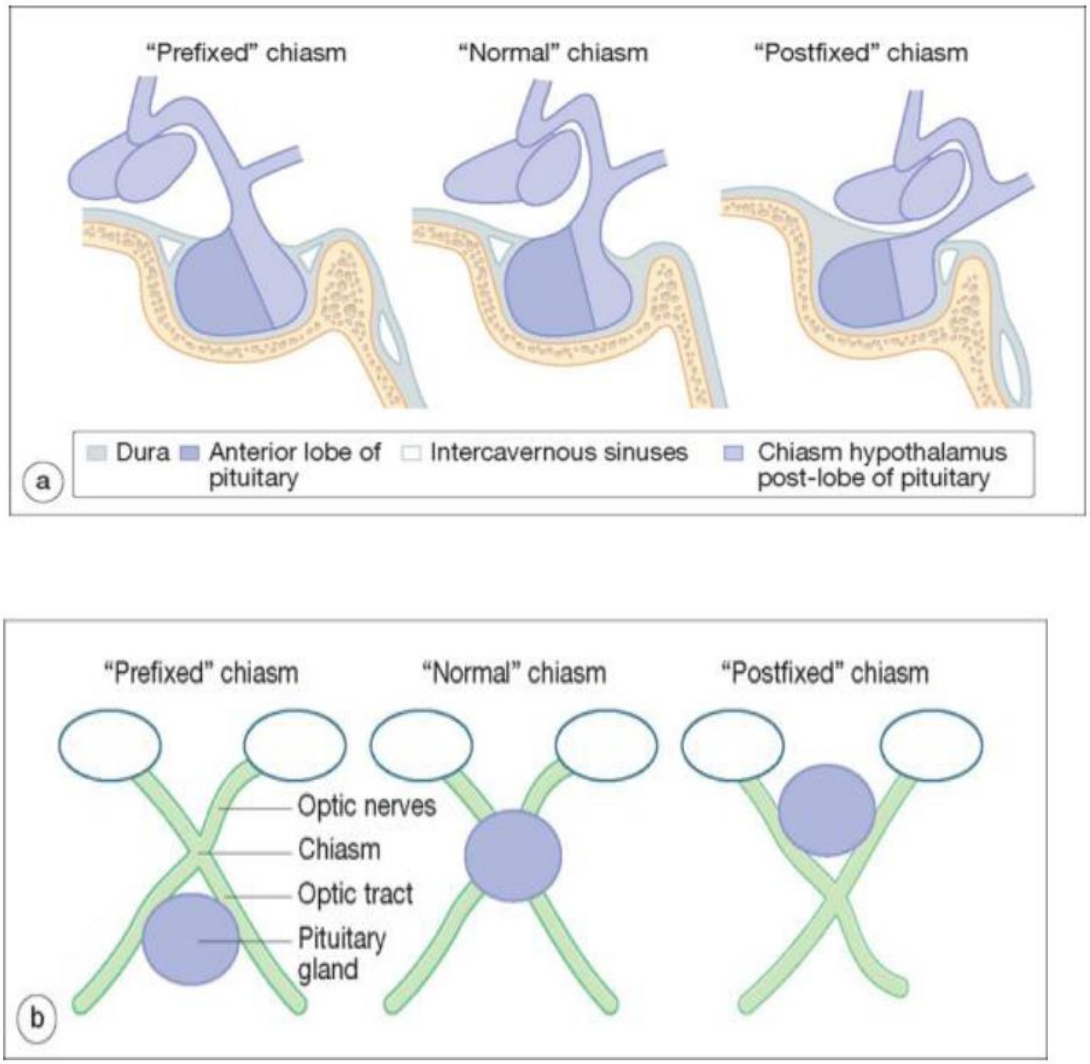
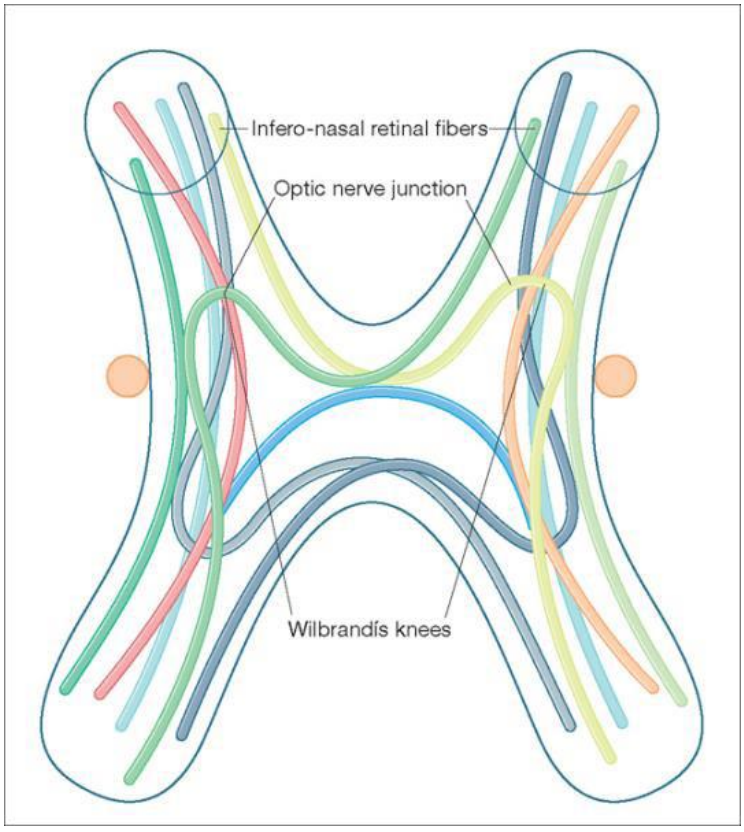


Figure 4: types of chiasma

Relations of chiasma

Anteriorly related to anterior cerebral and anterior communicating arteries and posteriorly, to Tuber cinerum, infundibulum mammillary body and posterior perforated substance It is superiorly related to the third ventricle, inferiorly to the hypophysis, laterally the internal carotid artery and anterior perforated substance.



Vascular supply

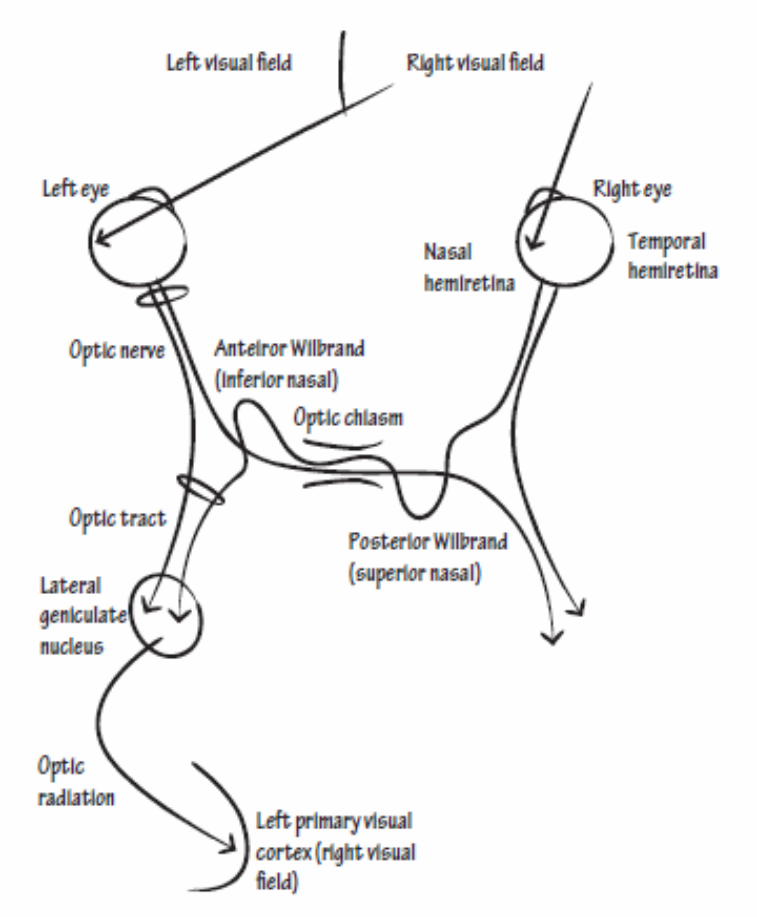
The anterior cerebral and anterior communicating arteries supply the superior aspect of chiasma. Internal carotid artery, anterior

hypophyseal artery and posterior communicating artery supply the inferior aspect.

The superior aspect is drained by superior chiasmal vein which drains into anterior cerebral vein and the pre-infundibular vein drains the inferior aspect of the chiasma.

According to Bergland and Ray, arteries at the chiasma can be divided into superior and inferior arteries. The inferior group supplies the decussating axons, thus any pituitary adenoma is more likely to compress this inferior division leading to the visual field defects. The superior group supplies the undecussated axons which occupy the lateral portion of the chiasma. Unless the size of the adenoma is large these axons remain unaffected. But another school of thought says that the arterial perfusion pressure is more when compared to the compression caused by the adenoma thereby suggesting that the arterial supply at the chiasma has no role in affecting the decussating fibres.

Hermann Willebrand in 1904, proposed that a group of inferonasal extramacular ganglion cell axons loop anteriorly into contralateral optic nerve (Willebrand’s knee)


Left visual field
Right visual field
Left eye
Right eye
Nasal hemiretina
Temporal hemiretina
Optic nerve
Anteiror Wilbrand (inferior nasal)
Optic chiasm
Optic tract
Posterior Wilbrand (superior nasal)
Lateral geniculate nucleus
Optic radiation
Left primary visual cortex (right visual field)

OPHTHALMIC MANIFESTATIONS

Presentation is typically during early adult adulthood or in the middle age .Chromophobe adenoma is the most common primary intracranial tumors to present with neuro-ophthalmic features. They are usually first presented to an endocrinologist,however non secreting tumors may present to ophthalmologists.

HEADACHE

The nerve fibers of diaphragma sellae are sensitive to pain and thus headache presents as a prominent and a common presenting complaint. Headache is usually a non specific complaint and is very rarely related to raised intracranial pressure due to extension of the tumor. This is the reason behind diagnostic delay in such cases where there are no obvious endocrinological signs.

The onset of visual symptoms are gradual as patient may be aymptomatic until well established. This obviates the need for a careful visual system examination in every case of non specific headache.

Chiasmal Field Defects

Pituitary adenomas usually compress the chiasm from below. The visual field defect most often produced is superior, bitemporal, and greater nearer fixation. While the macula represents only a small area on the retina, axons arising from macular ganglion cells occupy large portions of the optic nerves, chiasm, and optic tracts. One consequence is that compression of either the optic nerve or chiasm tends to reduce acuity and to depress the central field. Loss of stereopsis may be an early sign of chiasmal compression and bitemporal scotomatous field loss.

Fris divided chiasmal visual field defects into medial and lateral syndromes. Medial chiasmal syndromes have predominately bitemporal field defects, and lateral chiasmal syndromes have temporal field defects on the side of the tumour and another type of field defect in the fellow eye. Acuity in medial chiasmal syndromes is reduced in both eyes, often asymmetrically. In lateral chiasmal syndromes, the acuity may be reduced only in the eye with the temporal field defect.

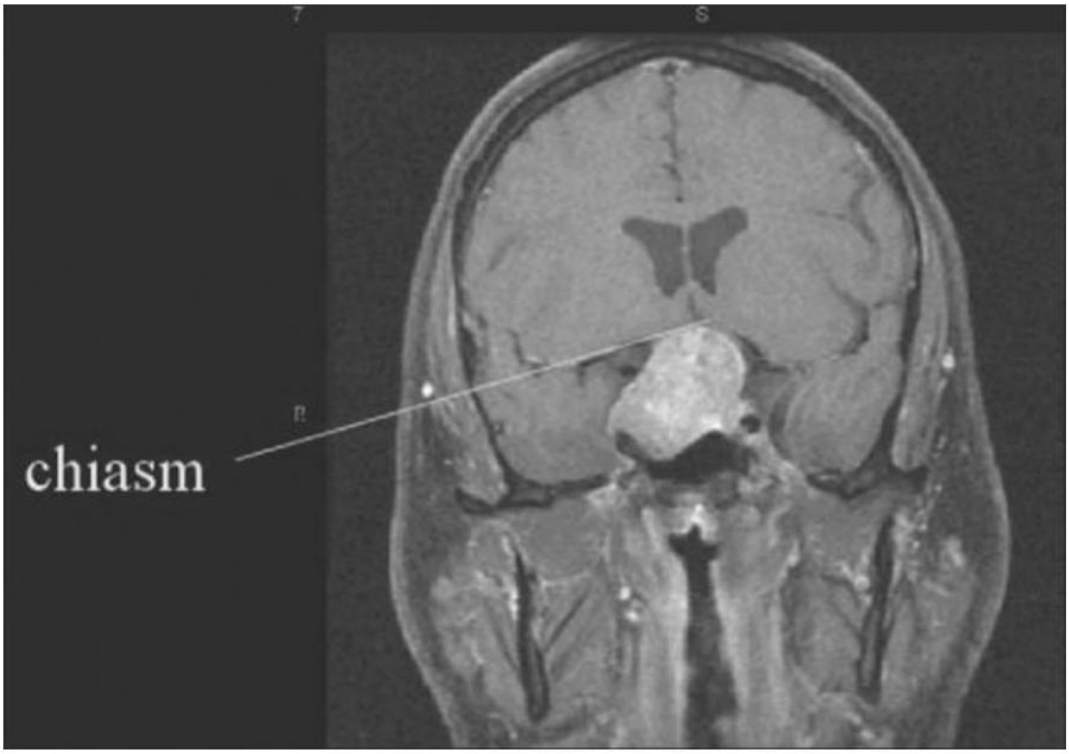


Figure 5:Pituitary macroadenoma

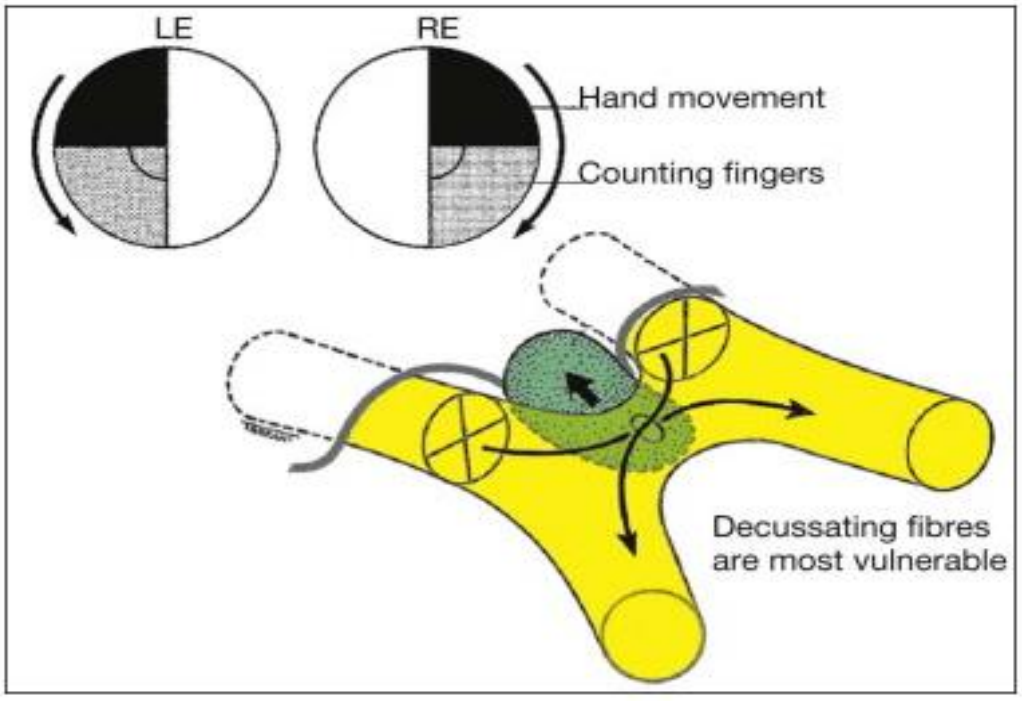


Figure 6:Progression of bitemporal visual field defects

Monocular Visual Field Defects

The occasional patient with sudden visual loss in one eye as the result of a pituitary adenoma once ran the risk of being misdiagnosed with retrobulbar optic neuritis. As virtually everyone with the putative diagnosis of optic neuritis now undergoes MR imaging to look for evidence of demyelination as a guide to immune modulation therapy, this should seldom be an issue. Sudden monocular visual loss may be the presentation of pituitary apoplexy. When such patients are evaluated emergently, careful testing of the visual field of the fellow eye may not be performed. Monocular visual field defects were detected in 9% of the 1,000 patients with adenomas in the Mayo Clinic series published in 1973 and in 38.7% of 307 cases of acromegaly evaluated in a Paris referral center between 1951 and 1996. In both series, a supertemporal quadrantanopia was the most common monocular defect.

Caution should be exercised in attributing a monocular temporal hemianopia to chiasmal dysfunction, as this is a common pattern of functional (psychogenic) visual loss. A functional etiology should be considered likely when there is no relative afferent pupillary defect or optic atrophy and may usually be confirmed by the persistence of the hemianopia on binocular testing.

Junctional Defects

One pattern of field loss whose localizing value is still a matter of discussion is a central scotoma in one eye associated with temporal field loss in the other, a combination thought to point to the junction between the optic nerve and the chiasm on the side of the scotoma. Traquair called attention to the hemianopic quality of the scotoma and used the phrase junction scotoma. An isolated, monocular temporal hemianopic paracentral scotoma is thus sometimes referred to as a junctional scotoma and may be the presentation of a pituitary adenoma.

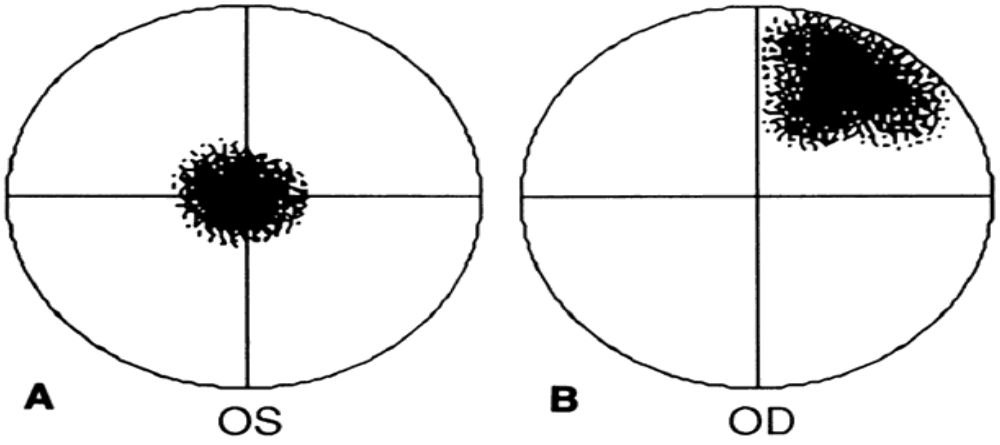


Figure 7 :junctional field defect

Traquair also attributed to Wilbrand and Saenger the observation that involvement of the knee of crossed fibers from the opposite nerve may be the source of a temporal defect in the opposite field. In a patient

with pituitary adenoma described by Karanjia and Jacobson with a central scotoma in one eye and a temporal field defect in the fellow eye localizing to the prechiasmatic optic nerve, Horton pointed out that careful review of their imaging actually reveals anterior chiasmal compression. In another reported instance of what could be interpreted as a junctional defect, imaging demonstrated a large mass extending out of the sella and compressing the chiasm.

Independent of the actual existence of knee fibers, the value of a central scotoma in one eye associated with a temporal field defect in the fellow eye should direct attention to the posterior optic nerve where it joins the chiasm. This pattern is less often encountered with pituitary adenomas than with other pathologies, such as meningioma, aneurysm, and inflammation.

Ophthalmoplegia

Third, fourth, and sixth nerve palsies individually and in combination are less common than optic nerve involvement in pituitary adenomas but still constitute an important clinical manifestation. As an isolated motor neuropathy, third nerve involvement is most frequent and may be painful.

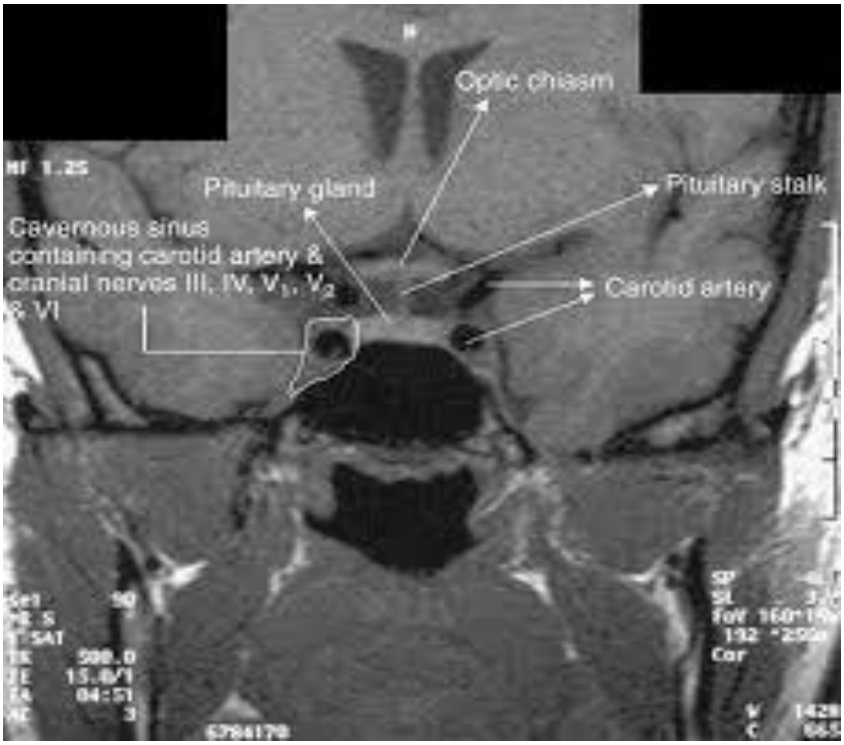


Figure 8: Parachiasmal structures

Parachiasmal vascualr structures

Cavernous sinus: an expanding hypophyseal tumor can invade laterally into cavernous sinus and thus involve cranial nerves .Conversely aneurysms from intracavernous internal carotid artery can also erode sella and can mimic pituitary adenoma

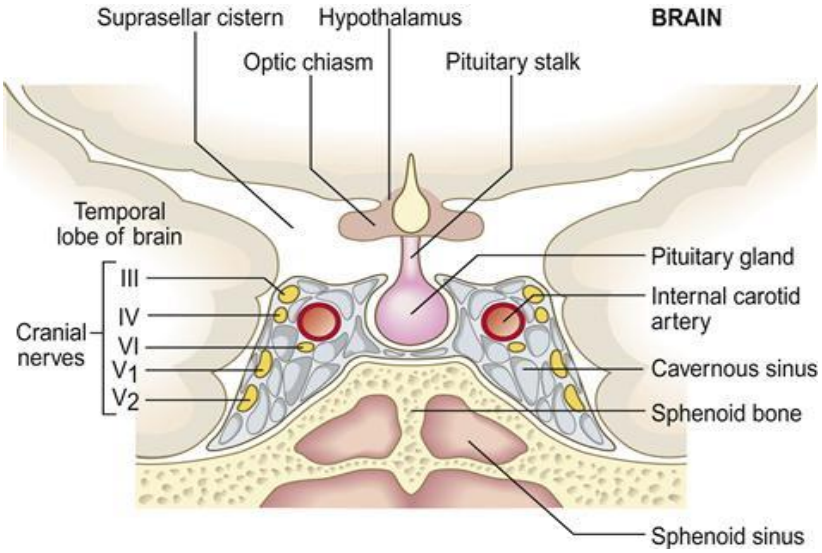


Figure 9 : Relation of pituitary with cavernous sinus

Pituitary Apoplexy

Headache, ophthalmoplegia with or without visual loss, and alteration in consciousness suggest sudden enlargement of a pituitary adenoma as the result of hemorrhage or infarction, an entity known as pituitary apoplexy. Pituitary apoplexy may also present with visual loss alone or in association with Horner's syndrome. Precipitating factors include head trauma, treatment with radiation or bromocriptine, estrogen administration or pregnancy, angiography, anticoagulation, cardiac or other recent surgery, dialysis, dynamic pituitary function or stimulation tests, and transient changes in intracranial pressure (ICP) from coughing or sneezing or spinal anesthesia. The majority, however, have no identifiable precipitant.

To evaluate a sudden, severe headache ,CT is usually performed without contrast, looking for subarachnoid hemorrhage. This may or may not lead to immediate recognition of the adenoma. CT, although usually more readily available than MR imaging, is not as sensitive as MR imaging in the diagnosis of pituitary apoplexy.

COLOUR DESATURATION

A colour desaturation especially in one half of the visual field across the vertical midline is an early detector of chiasmal compression. This can be tested easily with a red pen tip ,with each eye tested separately and asking the patient to compare the colour and intensity as the tip is moved across his nasal to temporal field or by simply asking the patient to compare the intensity of 2 red targets presented in nasal and temporal fields .If the patient fails to appreciate ,we can test on an Ishiharas chart.

Optic atrophy

This can present in 50% of cases caused by direct compression by pituitary adenomas. Such patients have complaints of defective central vision when compared to peripheral vision, hence present with complaints of difficulties in reading. It becomes important to explain a

guarded visual prognosis after treatment in such patients.When the compressing tumor affects only the nerve fibers originating in the nasal retina, only the nasal and the temporal aspect of optic disc is involved. This results in a band or a “Bow Tie atrophy “.

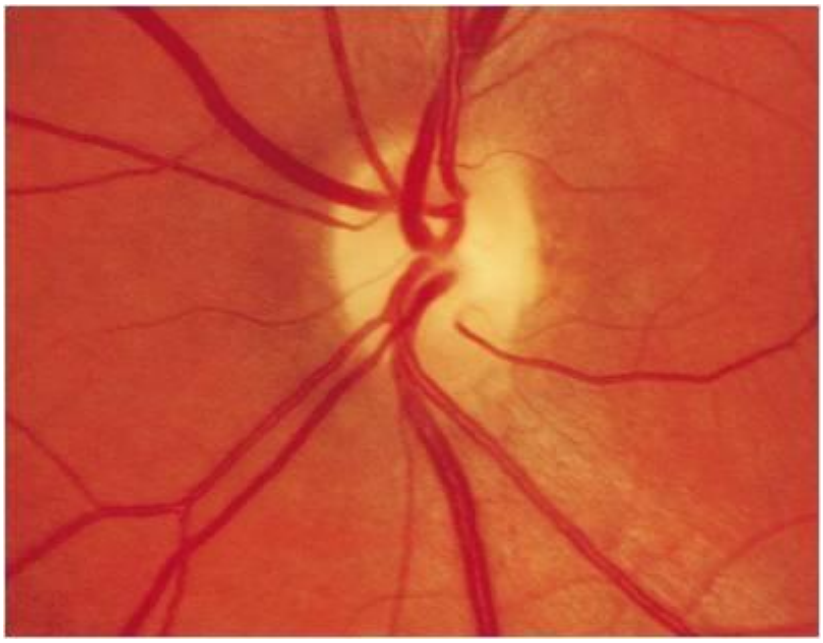


Figure 10: Bow tie optic atrophy

Hallucinations, Papilledema, and Other Visual Manifestations of Pituitary Adenomas

Virtually any sign or symptom that can be produced by damage to the anterior visual pathways and adjacent structures may be encountered in patients with pituitary adenomas. These include formed and unformed hallucinations, transient monocular blindness, and mental status changes.

Papilledema is unusual with pituitary adenomas as the axonal loss caused by direct compression results in optic atrophy before the tumour is of sufficient size to increase ICP. If tumour growth is asymmetric, the Foster-Kennedy syndrome may ensue. Bilateral disc swelling from malignant hypertension associated with Cushing's disease mimics true papilledema.

EXTENSIVE LOSS OF TEMPORAL FIELD

This can impair the sensory fusion and decompensate a phoria or cause problems with near vision .Post fixation blindness refers to the presence of a blind spot distil to the fixation point.

Diplopia Without Ophthalmoplegia

While the vast majority of patients with pituitary adenomas who complain of diplopia have ophthalmoplegia, some have normal ocular motility. This phenomenon, known as non paretic diplopia or hemifield slide, occurs when the degree of temporal visual field loss lessens the stabilizing effect of overlap with the contralateral eye's nasal field.

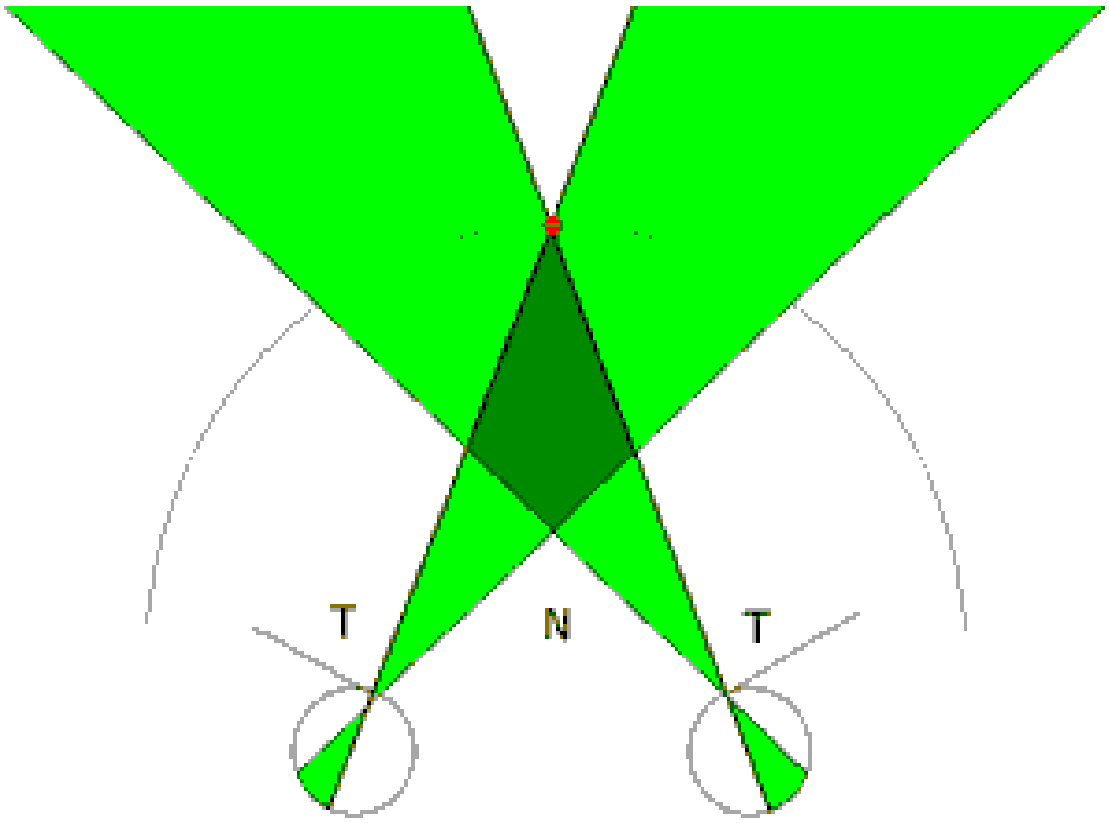


Figure 11: Hemifield slide phenomenon

This is probably the same mechanism that decreases stereopsis.

SEE SAW NYSTAGMUS

Loss of sensory input may be important in some cases of seesaw nystagmus, a rare ocular oscillation where the eyes appear to be riding on a seesaw across the nose. One eye elevates and intorts while the other eye is synchronously depressing and extorting, then the cycle reverses.

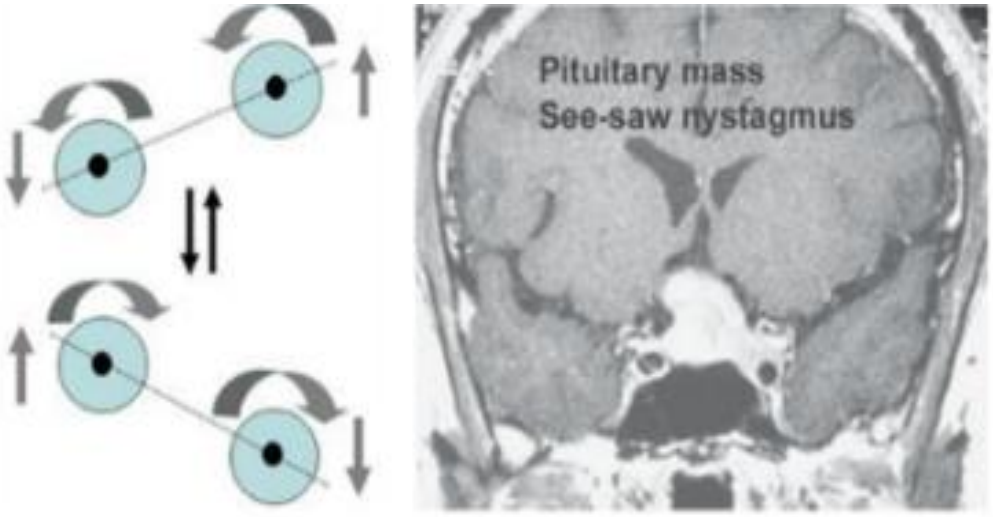


Figure 12: See saw nystagmus

Parasellar tumors, including pituitary adenomas, are accompanied by seesaw nystagmus on rare occasions, and one postulated mechanism is compression of the diencephalon in the region of the interstitial nucleus of Cajal. Usually these are large tumors with accompanying bitemporal field defects.

Photophobia

Intolerance to light is a symptom of many disorders, from ocular surface disease to migraine. Photophobia is a common feature of trigeminal neuralgia and may be prominent in patients with chiasmal compression. [16]

Visual field patterns

Neuro-Ophthalmologists can challenge at one point regarding the accurate diagnosis for neurological cases when it is at the level of optic chiasma. The detection and in interpretation of visual field defects at the level of optic chiasm will become more easy if the following factors are taken into account.

- Chiasmal fibre architecture and its vascular supply
- Normal Variation of chiasma to Pituitary Body
- Relation of Optic Chiasma to surrounding structures

Direction of Pressure and pressure effect of the tumor on the chiasma is not directly on the nerve fibres but on the blood vessels producing ischemia.

Visual field assessment is a method of plotting the boundaries of visual field and determining whether the field within the peripheral boundaries is intact.

History of visual field

- Marriotte in seventeenth century was the first to document a blind spot

- Young and Purkinje were the first to assess the peripheral boundaries of fields.

- Von Grafe was the first to clinically measure the visual fields

- Bjerrum, in 1889, introduced a tangent screen for assessing visual fields.

- Aimark in 1930 ,introduced arc perimeter

- Goldmann perimeter was introduced in 1945

- In 1970s, automated perimeters were introduced, with subsequent development of different types and many testing programs

Visual fields serve three important purposes:

- ***Diagnostic****:* Visual field defects indicate involvement of the visual pathways and the pattern of visual field defects help in localizing site of the lesion.
- ***Follow-up***: Visual fields provide an excellent tool to monitor resolution and/or recurrence of disease processes affecting the visual pathways.

- ***Activities of daily living***: Since visual field defects adversely affect the patient's ability to perform day-to-day activities such as personal hygiene, reading, and driving, these defects should be actively sought when planning rehabilitation strategies.
- Neuro-ophthalmic examination reaches a maximum importance with tumors of pituitary gland not so only because it permits exact localization, but because the symptoms produced by these tumours in the initial as well in the fully developed stage are ocular symptoms .Hence sooner or later ,these symptoms will bring the patient to the ophthalmologist

- In addition to the characteristic bitemporal Hemianopia few less pathognomonic forms for instance – Field loss may progress rapidly in one eye with amaurosis and a temporal hemianopia in its fellow eye can occur. Therefore, temporal hemianopia should be evaluated with great caution.

AFFERENT VISUAL PATHWAY

A 3 dimensional map of the visual sensitivity across the visual field is called as hill of vision.

- The highest area of sensitivity corresponds to the fovea. Towards the periphery the sensitivity decreases. The extent of the monocular visual field extends 90 to 100 degrees temporally,70 to 75 degrees inferiorly,60 degrees nasally and 50 to 60 degrees superiorly.

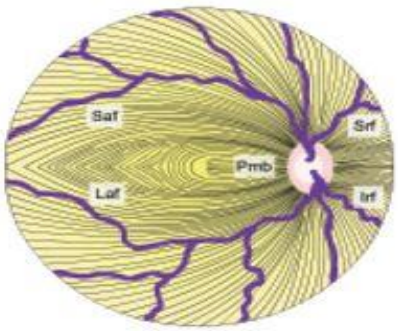
- The visual field is the perceived vision ,produced by the retinal stimulation of each eye, whilst maintaining a fixed steady fixation.

- Retinal images are projected to a position opposite to the area of stimulated retina.

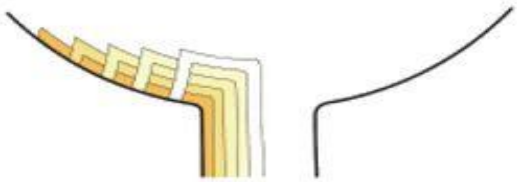
- Most of the nerve fibres that arise from the macular region ,directly pass directly to the optic disc (papillo macular bundle)

- The peripheral temporal fibres ,arc above and below the macula to enter the disc .Nasal nerve fibres enters the disc directly on the nasal side of the disc.

- In the optic nerve the macular fibres are in the centre with superior and inferior fibres around it.



Distribution of retinal nerve fibres.



Arrangement of nerve fibres within optic nerve head.

- In the optic chiasm, nasal nerve fibres decussate while temporal fibres pass on to the ipsilateral optic tracts.

- In the optic tract, ipsilateral temporal nerve fibres with contralateral nasal nerve fibres regroup,

- In lateral geniculate body, there is a more complicated, multilayer arrangement, with macular fibres distributed throughout the nucleus.

- From the lateral geniculate body, fibres fan out forming the optic radiation to directly reaching the posterior visual cortex.

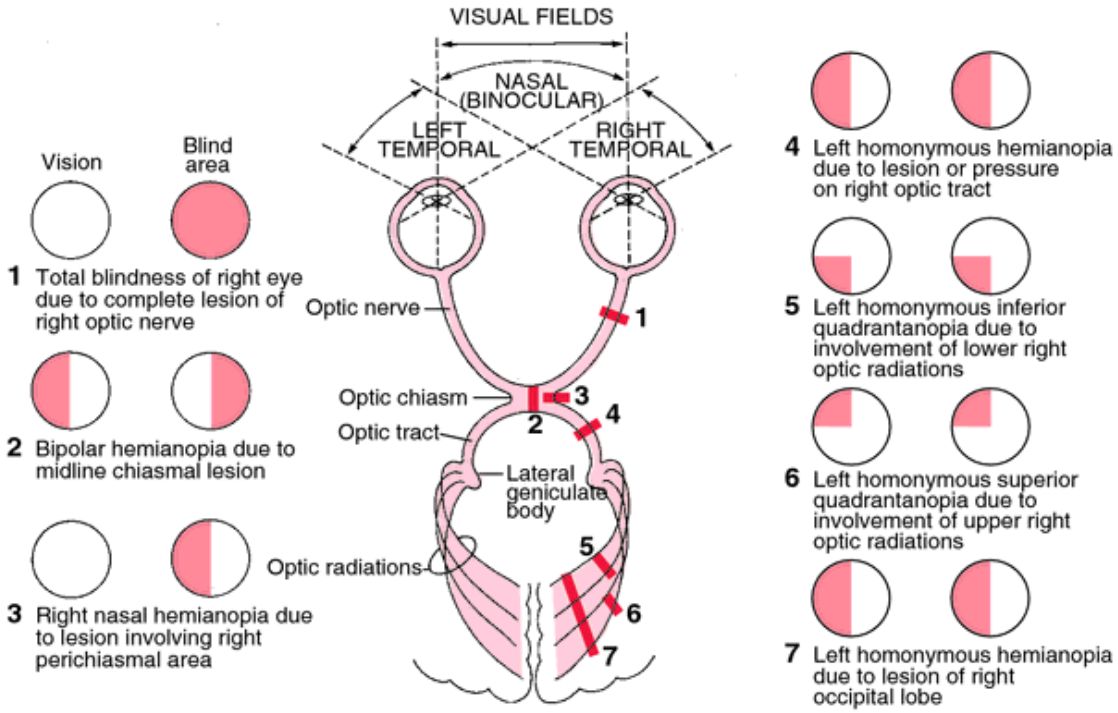
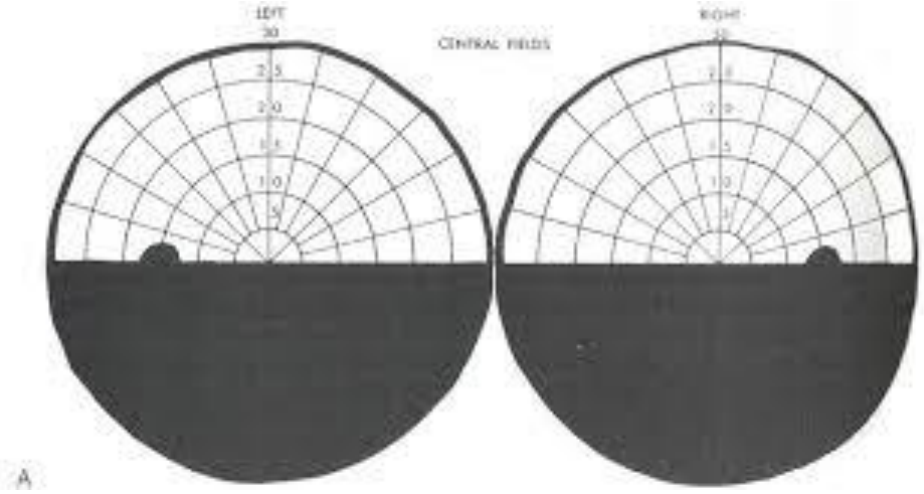


Figure showing afferent visual pathway

Altitudinal field defect

Involvement of any two quadrants either superior or inferior respecting the horizontal meridian, which is a characteristic finding in ischemic optic neuropathy. As the superior or inferior fibers in the region nasal to optic disc and temporal to macula is clearly demarcated they respect the horizontal meridian.

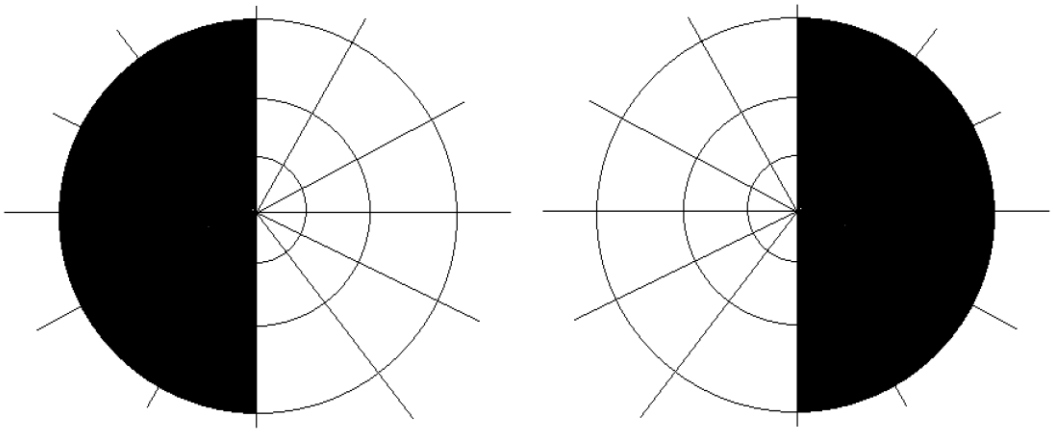


Arcuate field defect

Selective damage to the superior and inferior fibers as they enter into the optic nerve result in an arcuate defect which is a common feature of glaucoma. Such defects are also seen in ischemic optic neuropathy, optic neuritis etc.

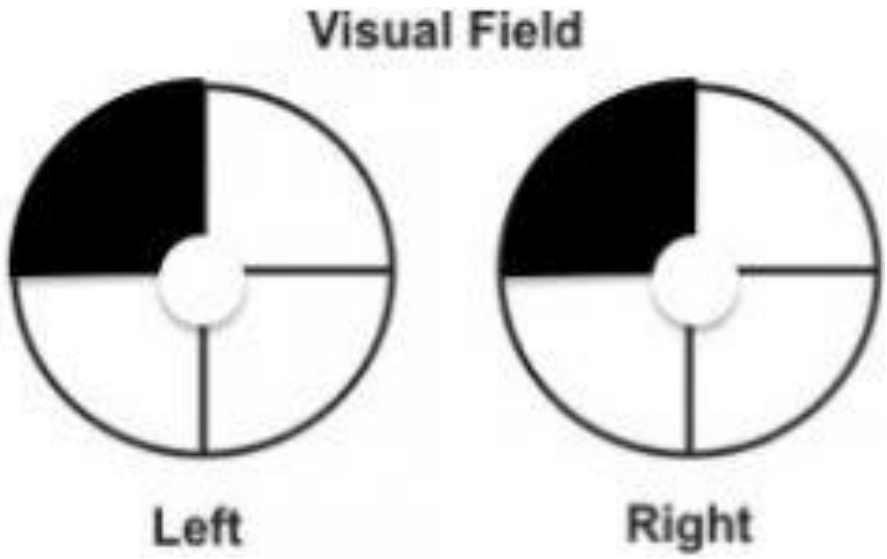
Hemianopia

A hemianopia involves one complete half of the visual field. It can be a nasal or a temporal hemianopia. It is said to be heteronymous when it involves the opposite sides of visual fields as seen in lesions compressing the chiasma resulting in a typical heteronymous bitemporal hemianopia. If a lesion involves the same side of the field in both eyes, as in case of retrochiasmal lesions it produces a homonymous hemianopia



Quadrantanopia

It is a defect involving one fourth or one quadrant of a visual field .It can be homonymous or heteronymous can involve superior or inferior quadrants .They are seen in lesions of temporal, parietal occipital lesions .



OCTOPUS PERIMETER

Perimetry is the study of visual fields. Visual field changes due to both glaucomatous and non glaucomatous causes can be evaluated and followed up using automated perimetry .

Octopus perimeter was first introduced in 1970. DrFranz Funkhauser and his associates developed the original octopus model 201, which was one of the first reliable perimeters available. In the last few years improved and new softwares have been added. Octopus perimeters have established standards for the present day perimetry.

In 1980s , octopus 2000 and octopus 500 were introduced. Later octopus 1-2-3 was introduced, which did not require any cupula as the stimulus was directly projected into the eye.in 1990s,Octopus 101 was introduced ,which was the first perimeter in windows ,it is very popular and is the most commonly used perimeter till date.

THE PROECTION SYSTEM

The 201,500 ,101and 2000 series project their stimuli on a cupula or a bowl with a background illumination of 4 asb whereas in octopus 1-2-3 the patient looks through a 3 inch port hole through which the stimuli

is directly projected into the eye.The stimuli appears to come from infinity to the patient.

In octopus 1-2-3 the stimuli is generated by a single light emiting diode and the white halogen light maintains a background illumination of 31.4 asb

STIMULUS

The target size used by Octopus machines is Goldmann target 3 for threshold and test screening. Goldmann size 5 can be used in patients with decreased vision .the stimulus duration is 100 ms and the machine gives the patient two seconds to respond to each stimulus .Further, the machine adjusts to patient's response time .The stimulus intensity ranges between 4000 to 0.4 asb.

FIXATION MONITORING

A 100 percent fixation control is maintained by octopus , as it has a unique fixation control system. Once the patient is positioned ,the centre of the patients pupil is projected on the display screen by aligning the perimeter .this fixation control monitor is electronically controlled .if the patient looses fixation it automatically stops projecting stimuli, resumes when the fixation is back on the target. The operator is signalled if the

fixation is lost for 3 seconds. If the patient blinks during the stimulus projection the machine repeats the stimuli.

The patients threshold it is defined as the stimulus luminance which is perceived for a given background illumination with a probability of 50% chance of seeing or non seeing which is described by the frequency of seeing curve as function of stimulus luminance.

Octopus perimeter has 2 models:

1. cupola type (101 and 900)
2. infinity projection system (123 and 300 series)

Figure 13: Octopus 300

The octopus 300 uses a

- Background luminance of 31.1asp.
- Stimulus size can be either Goldmann 3 or 5
- Duration of 100 ms
- Threshold range measuring 0 to 40 decibels

The test strategies can be :4-2-1 decibel bracketing/Dynamic strategy/Tendency oriented perimetry(TOP). These minimize the test duration decreasing the effects of physical and retinal fatigue.

TOP strategy

Tendency oriented perimetry was introduced by Prof Gonzallez De La Rosa .TOP strategy takes into account the neighbouring test locations when the results are interpreted. The neighbouring zones exhibit a topographical interdependence ,which establishes a tendency between an adjacent points under examination. In TOP strategy each test location is assessed only once and this response to a single location is used to assess not only the sensitivity at that point but assess the sensitivity of neighbouring locations.This estimates one direct response and 4 indirect response from the neighbouring locations.The advantage of this is that it

reduces the test time to 2.5 to 3 minutes ,but it can underestimate the extent of localised defect.

Program 32

This is the classic off axis program introduces by octopus and later by other perimeters as the 32-2 program. There are 76 test locations in a grid pattern with resolution of 6 degrees. This program is not related to the topography of the nerve fiber layer or pathology with both eyes having identical pattern of test locations. In neurological cases it gives a better definition of vertical and horizontal meridia .The area where the blind spot appears ,marks the right and left eye.

N 1 program

The N1 neurological program is a multistep examination program which takes inti account the possible displacement of blind spot due to extraocular muscle and avoids artifacts due to hemianopia or hemi neglect.

RADIOLOGICAL IMAGING OF PITUITARY ADENOMAS

- **Magnetic resonance imaging**

It is an optimal study to demonstrate the anatomical relationship between chiasma and pituitary gland. Ideally a corona, sagittal and an axial thin sections before and after gadolinium is necessary for the study of sellar contents. A coronal plane is optimal.Adenomas appear hypointense on T1, hyperintense on T2 and strongly enhance on gadolinium heterogeneously

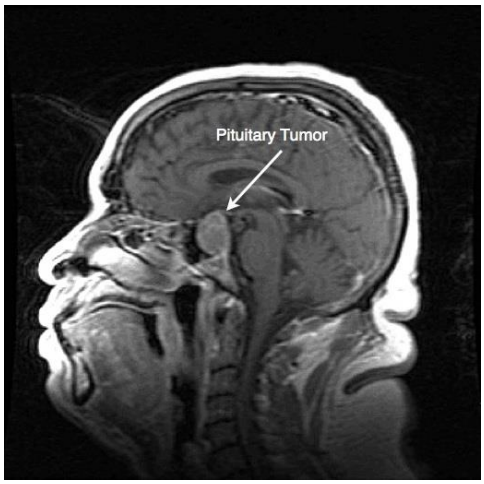
. 

Figure 14:MRI showing pituitary adenoma

- **Computerized tomography**

Usually used to demonstrate erosion of sella due to enlargement of tumour.

Radiographic features

Pituitary macroadenomas are by definition >10 mm mass arising from the pituitary gland, and usually extending superiorly. Indentation at the diaphragma sellae can give a snowman or figure eight configuration [10].

CT

No contrast attenuation can vary depending on haemorrhagic, cystic and necrotic components. Adenomas which are solid, without haemorrhage, typically have attenuation similar to brain (30-40 HU) and demonstrates moderate contrast enhancement; less marked than one typically sees in meningiomas. Calcification is rare.

MRI

MRI is the preferred imaging modality, not only able to exquisitely delineate the mass, but also clearly visualise the optic chiasm, anterior cerebral vessels and cavernous sinuses.

Overall signal characteristics can significantly vary depending on tumour components such as haemorrhage, cystic transformation or necrosis.

- **T1**
  - typically isointense to grey matter [10]
  - larger lesions are often heterogeneous and vary in signal due to areas of cystic change/necrosis/haemorrhage
- **T1 C+ (Gd)**
  - solid components demonstrates moderate to bright enhancement
- **T2**
  - typically isointense to grey matter [10]
  - larger lesions are often heterogeneous and vary in signal due to areas of cystic change/necrosis/haemorrhage
- **T2* gradient echo**
  - most sensitive for detecting any haemorrhagic components, which appear as areas of signal loss
  - calcification is rare, but should be excluded by reviewing CT scans

Assessment of cavernous sinus invasion can be difficult. The most convenient method is to assess the degree of encasement of the cavernous portion of the internal carotid artery. Less than 90 degrees makes involvement of the sinus very unlikely, whereas greater than 270 degrees makes involvement almost certain [10].

PET

Normal pituitary gland should not demonstrate significant FDG uptake and are normally not seen on PET-CT[12]. Pituitary macroadenomas are highly hypermetabolic both with FDG and Choline tracers.

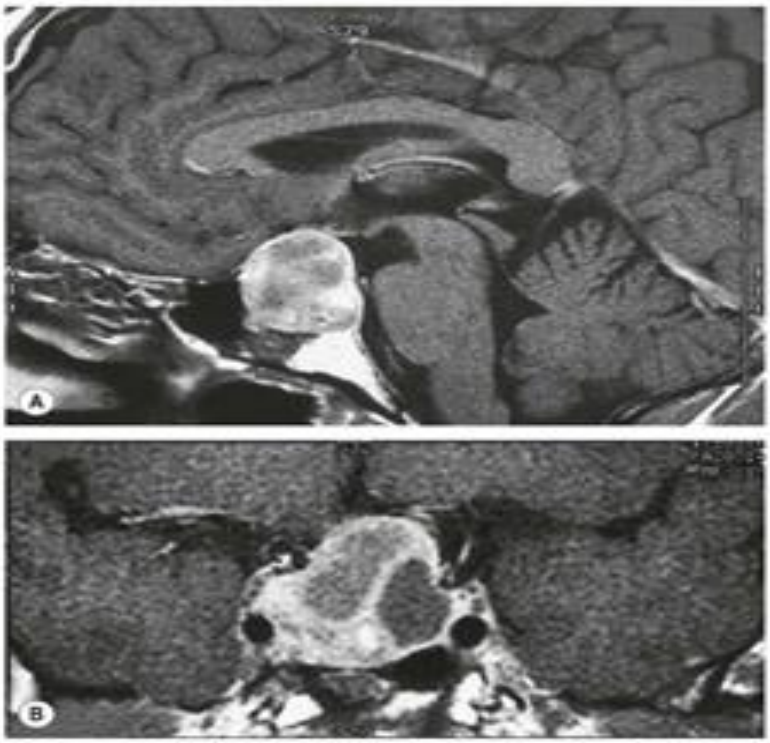
Differential diagnosis

The differential of a pituitary macroadenoma is essentially the list of conditions leading to a pituitary region mass. The most common considerations include:

- pituitary metastasis
    - often in the setting on known disseminated malignancy
    - often less well defined
    - bone destruction rather than remodelling may be seen

- pituitary carcinoma
    - indistinguishable on imaging
    - CSF seeding may be evident
    - rare
- meningioma
    - separate pituitary is usually identifiable
    - dural tail usually visible
    - enhancement more vivid
    - hyperdense on non-contrast CT
- craniopharyngioma (papillary type)
    - adamantinomatous craniopharyngiomas are more common in children
    - more likely to be cystic and to have areas of calcification (although still a minority of cases)
    - more likely to have areas of T1 intrinsic hyperintensity (although blood can result in similar appearances)

- lymphocytic hypophysitis
    - common in peripartum female
- saccular cerebral aneurysms
    - flow void common on MR; CTA can show flow
    - more likely to have calcification



MR T1 weighted gadolinium enhanced image of a pituitary adenoma

AIM OF THE STUDY

PRIMARY OBJECTIVES

- To study the various ophthalmic manifestations in cases of pituitary tumors.
- To analyse the proportion of cases presenting with ophthalmic manifestations in cases diagnosed as pituitary adenoma on radiological imaging.

SECONDARY OBJECTIVES

- To analyse the sensory visual disturbances like degree of visual loss, pattern of visual field defects and ocular motility defects, in diagnosed cases of pituitary adenomas.

MATERIALS AND METHODS

Patients who are diagnosed with pituitary adenoma on radiological imaging, presenting in Squint and Neuro-ophthalmology services will be registered and evaluated during the study period.

A detailed history of the patient, evaluation of visual acuity on a Snellen chart, extraocular movement and pupillary assessment, colour vision, visual field examination by 32 program on octopus field analyser octopus, slit lamp examination, and fundus examination will be done.

INCLUSION CRITERIA

1. Patients diagnosed as having pituitary tumour on radiological imaging
2. Age 25- 65 years.

EXCLUSION CRITERIA

1. Patients with other ocular pathologies affecting visual fields such as glaucoma, optic neuritis, retinitis pigmentosa.
2. Patients with pre-existing defective vision to due to other causes.
3. Patients with ocular media opacities
4. Patients physically or mentally unfit for detailed ocular examination

SCREENING PROCEDURE

After taking an informed consent from the patient the following screening procedures were done

1. Detailed history of present illness, headache evaluation
2. Head posture
3. Extraocular movements, diplopia charting
4. Visual acuity using Snellen’s acuity chart
5. Colour visionby Ishihara’s Pseudoisochromatic chart
6. Slit lamp biomicroscopy of anterior segment
7. Pupillary assessment to look for RAPD
8. Visual field examination using 32 program on the octopus field analyser
9. Intraocular pressure using Goldmann Applanation tonometer
10. Sterepscopic examination of the optic disc and nerve fibre layer using a +90D lens with the slit lamp
11. Indirect ophthalmoscopy

OBSERVATION AND ANALYSIS

1. Age distribution

Age	Frequency	Percentage
10-20	1	4
21-30	0	0
31-40	4	16
41-50	5	20
>50	15	60

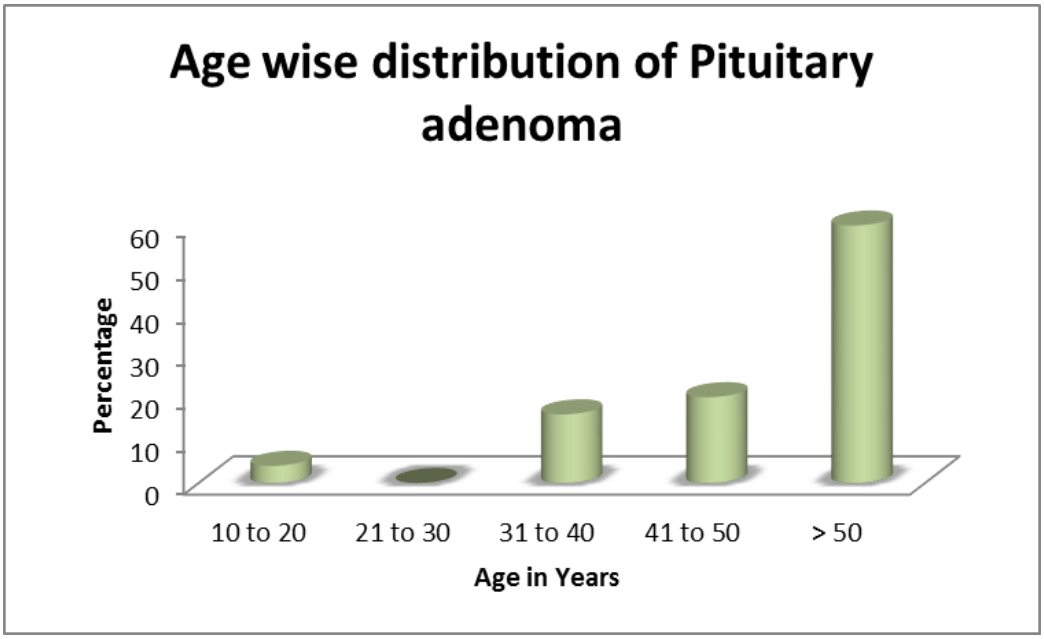


Figure 15

In the present study of 25 patients ,15 patients (60%) were above the age of 60 years, followed by 5 patients in the age group between 41 to 50 years , 4 patients were in the age group of 31 to 40 years and one patient was below 20 years.

2. Gender distribution

Gender	Frequency	Percentage
Male	7	28
Female	18	72
Total	25	100

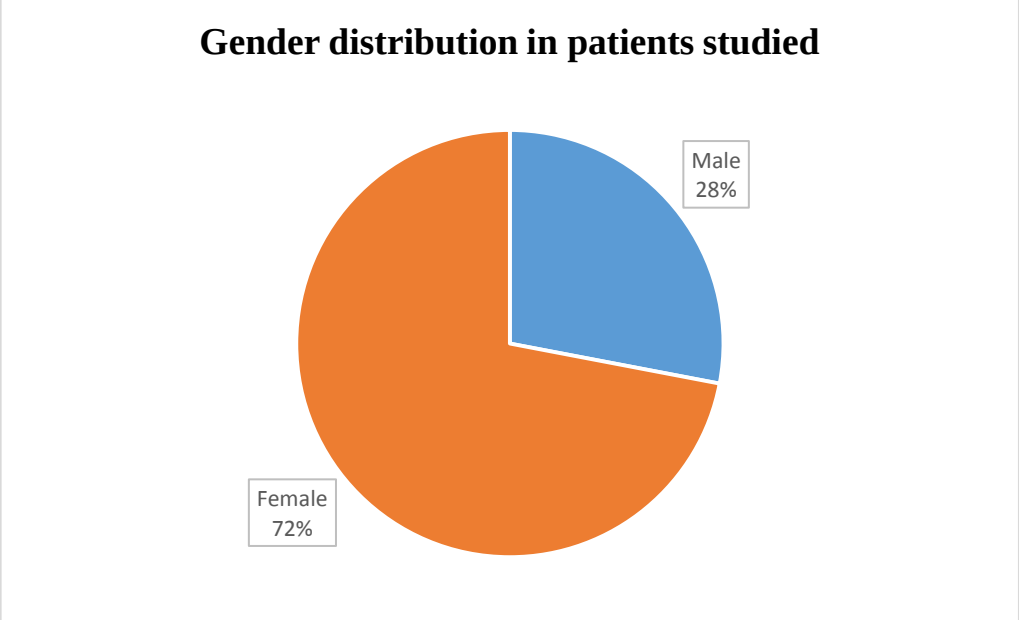


Figure 16

In our study females were predominantly affected (76%) when compared to males (28%)

3. Visual acuity of patients studied:

Best corrected Visual Acuity					
		6/6 to 6/12	**6/18 to 6/36**	**<6/60**	**Total**
Right Eye	Frequency	16	6	3	25
	Percentage	64	24	12	100
Left Eye	Frequency	15	8	2	25
	Percentage	60	32	8	100
Total	Frequency	31	14	5	50
	Percentage	62	28	10	100

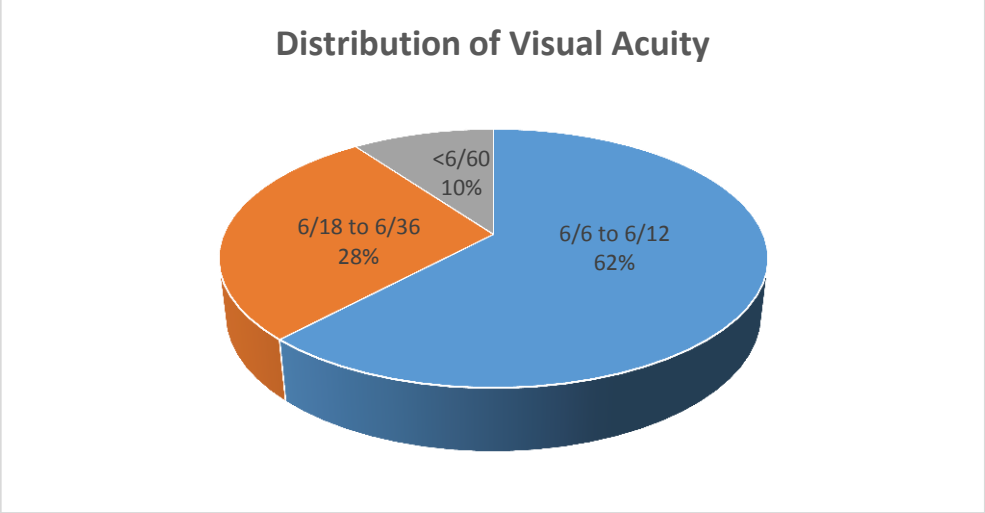


Figure 17

Out of 25 patients studied 62% had visual acuity between 6/6 to 6/12 on presentation.

28% of patients had a visual acuity between 6/18 to 6/36 and only 10% had an acuity below 6/60

4. Mode of presentation

Chief Complaints	Frequency	Percentage
Head Ache	20	80
Defective Vision	4	12
Diplopia	1	4
Total	25	100

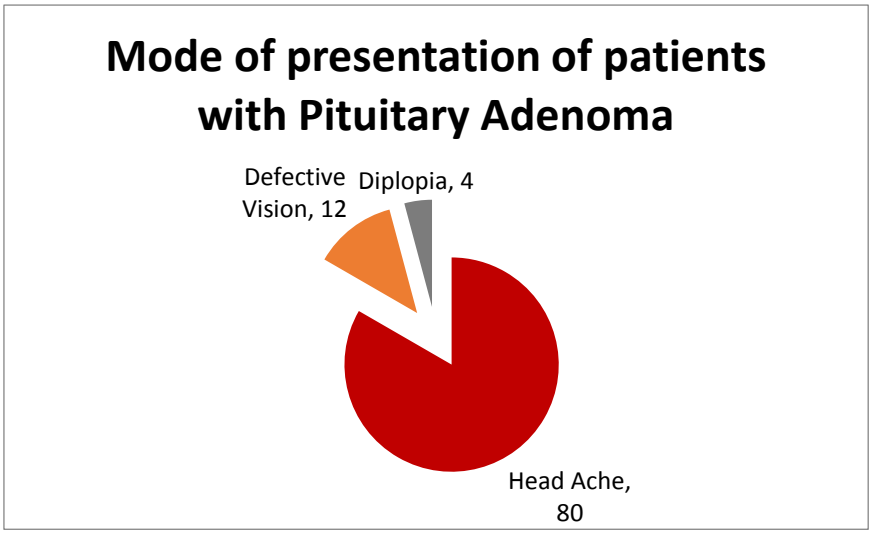


Figure 18

Headache was the predominant symptom in most of the patients (80%)

Four (12%) patients presented with complaints of defective vision and 1(4%) patient had complaints of diplopia

5. Distribution of pattern of visual field defects:

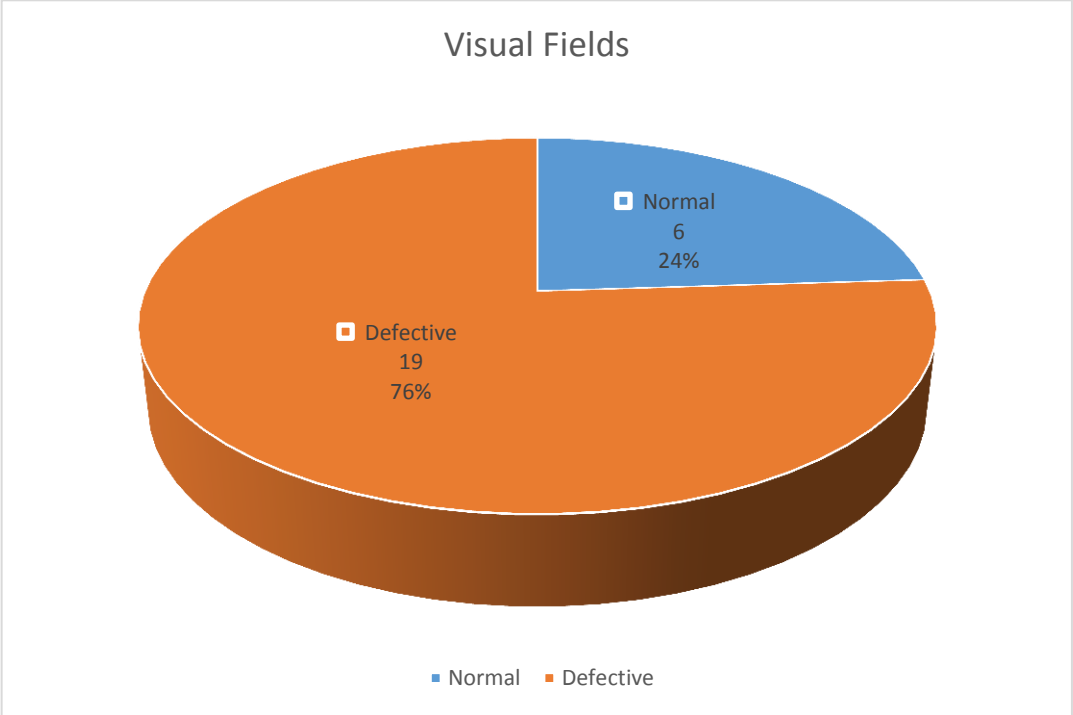


Figure 19

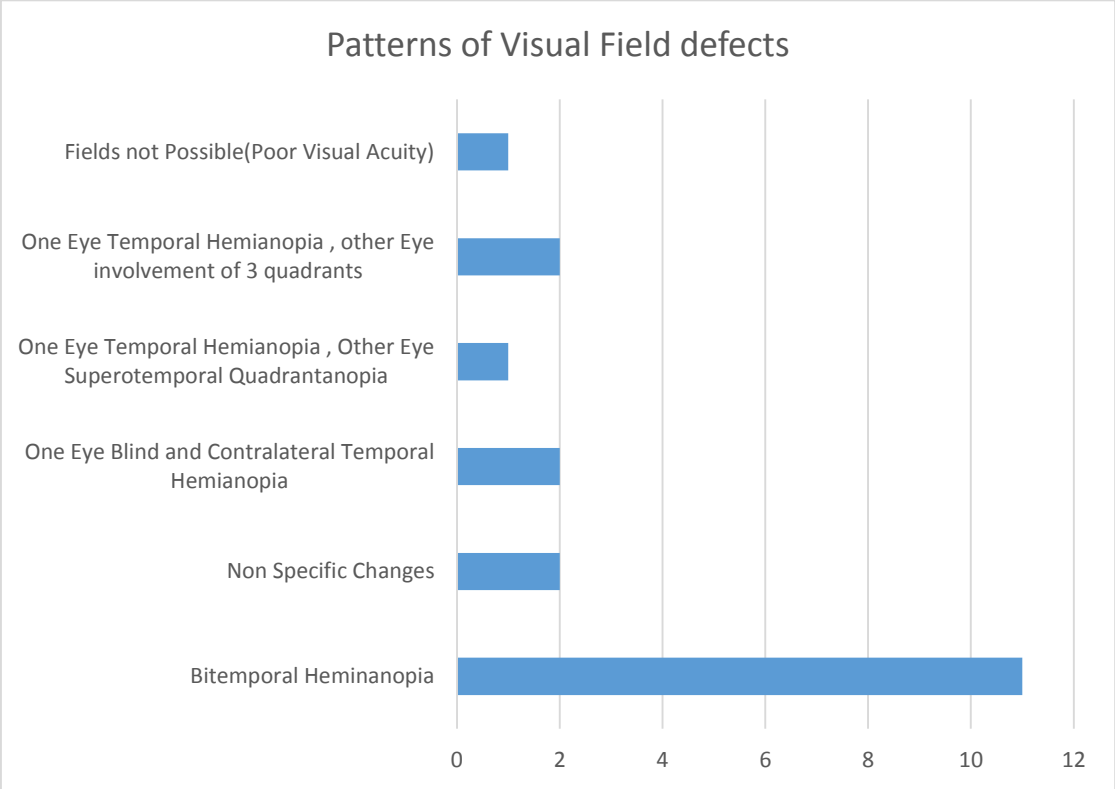

Patterns of Visual Field defects
Fields not Possible(Poor Visual Acuity)
One Eye Temporal Hemianopia , other Eye involvement of 3 quadrants
One Eye Temporal Hemianopia , Other Eye Superotemporal Quadrantanopia
One Eye Blind and Contralateral Temporal Hemianopia
Non Specific Changes
Bitemporal Heminanopia
0
2
4
6
8
10
12

Figure 20

Visual Fields	Frequency	Percentage
Bitemporal Heminanopia	11	57.9
Non Specific Changes	2	10.5
One Eye Blind and Contralateral Temporal Hemianopia	2	10.5
One Eye Temporal Hemianopia , Other Eye Superotemporal Quadrantanopia	1	5.3
One Eye Temporal Hemianopia , other Eye involvement of 3 quadrants	2	10.5
Fields not Possible(Poor Visual Acuity)	1	5.3
Total	19	100.0

Out of 25 patients studied in the present study,76% showed field defects and the remaining 24% had no field abnormalities. The most common visual field defect was bitemporal hemianopia 57.9%).10.5% of patients presented with one eye blind and contralateral temporal hemianopia

6. Number of patients with different types of adenomas

Radiological Diagnosis	Frequency	Percentage
Pituitary Macroadenomas	24	96
Pituitary Microadenomas	1	4
Total	25	100

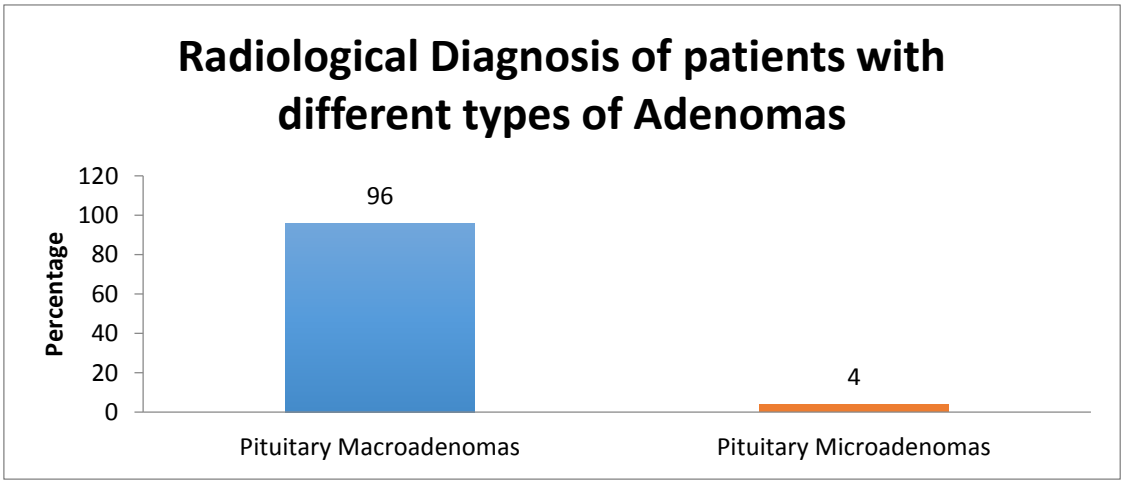


Figure 21

Out of 25 cases of radiologically diagnosed cases of pituitary adenomas studied, 24 cases were macroadenomas and the remaining 1 case was microadenoma.

7. Fundus Examination findings in Patients diagnosed with pituitary adenomas

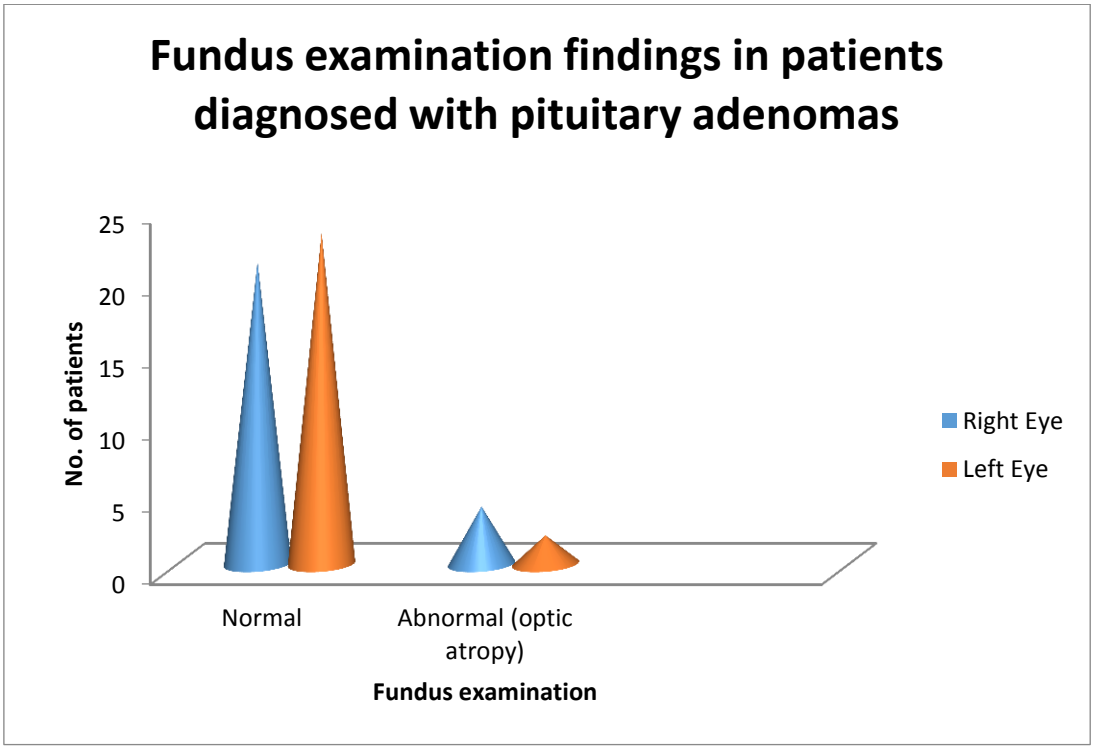


Figure 22

Of the 25 cases 4 cases showed features of optic atrophy on ophthalmoscopic examination of the fundus and the remaining cases were normal

DISCUSSION AND RESULTS

The present study titled “A study on ophthalmic manifestations in pituitary gland tumors” was conducted on 25 patients who were radiologically diagnosed cases of pituitary adenoma and were evaluated for various ophthalmic manifestations .25 patients were recruited in our study according to the inclusion and exclusion criteria.

In the present study, among the 25 patients the vulnerable age group were those above the age of 50 years (60%), followed by age group of 41 to 50 years (20%).The mean age at which the pituitary adenoma was diagnosed was determined as 50.68 years.

The observations regarding the mean age at which pituitary adenoma was diagnosed is in agreement with the mean age of 45.8+/-15.6 years (range 19 to 86 years) reported by Jung Pil Lee,Yun Suk Chung(2011)[22.]

In the reports of Thomas et al (2002)[14], pituitary adenomas were diagnosed in patients of the age group 16 to 69 years and the mean age was reported as 45 years.

Khalid et al(2010)[25] reported that the vulnerable age group was 30 to 49 years and the mean age at which the pituitary adenoma was diagnosed was 42.92 years.

In another study (Elgamal et all 2007 [24]), a mean age of 42 years was observed with a range of 14 to 85 years among 62 patients.

However, Dhasmana et all (2011)[15] reported that among 18 patients in which pituitary adenoma was diagnosed, the mean age at the time of diagnosis was slightly lower than the results observed in the present study (35.1+/= 9 years)

In the present study, out of 25 patients enrolled, 72% were females and 28% were males.

Thus there was a predominance of females in diagnosed cases.

A higher incidence of pituitary adenomas in females has also been reported by Khalid et al (2010)[25] who reported that the incidence in females was about 4 times higher than in males.

A similar higher incidence in females is reported from the studies made at king Saud university by Elgamal et al (2007)[24]

In contrast Thomas et al(2002)[14],reported the incidence of pituitary adenomas to be 2 times higher in males as compared to females.

However, Dhansama et al (2011)[15] observed that the incidence of pituitary adenoma was only slightly higher in males (55.5%) as compared to females (45.5%)

In view of these conflicting reports, it becomes difficult to assess whether the incidence of pituitary adenoma is influenced by the gender. A study involving a larger number of patients would probably give a true picture.

In the present study, among 25 patients studied, the chief presenting complaint was headache (80%).This observation indicated that every patient presenting with a complaint of non-specific headache showed have a detailed ophthalmic evaluation. Four patients (12%) gave complaints of defective vision and 1(4%) had diplopia. This observation indicates that cases of pituitary adenoma can also result in ophthalmoplegia, although at a lower frequency. Oculomotor nerve palsy was also reported by Saul, Robert et al, JAN2011 in 4 out of 5 patients as the only neurological manifestation of pituitary adenoma.

Of the 50 eyes studied, 62% of patients had a visual acuity between 6/6 to 6/12 followed by 28% with visual acuity of 6/18 to 6/36 and the remaining 10% had a visual acuity of less than 6/60.

Thomas et al (2010)[14] also stated that visual acuity was normal in 64.52% of the patients with Pituitary Adenomas. A normal visual acuity was also observed in 61.3% of the patients with Pituitary Adenomas examined at King Saud University (Elgamal et al 2007).[24]

Dhasmana et al (2011)[15] in the study observed that among 18 patients (36 eyes), 28 eyes (77.78%) had normal visual acuity (6/6-6/12)

Meenakshi and Niranjan (2011) reported that in the study on 57 cases – 54.38 %(62 eyes) had a visual acuity of 6/6.

The observations made in present study as well as in the earlier reports seem to suggest that visual acuity remains normal in nearly 2/3rd of the patients with Pituitary adenomas and therefore is not a significant ophthalmological manifestation in patients with Pituitary adenomas.

In the present study visual field defects were observed in 76% (19) of patients. This incidence is similar to the observations made by Jung et al (2011) wherein the incidence of field defects in cases of Pituitary adenomas was reported as 74%. However Thomas et al (2002) observed

the field defects were present in a vast majority of patients with Pituitary adenomas(94.6%). Further typical field defects were observed in 74.2% of the patients while it was atypical in 20.4% of the cases.

In patients with visual field defects, a little over 50%(57.9%) exhibited bitemporal hemianopia. The other field patterns observed were one eye blind with contralateral eye showing a temporal hemianopia (10.5%, 2 patients), temporal hemianopia in the one eye and a three-quadrant involvement in the other eye(10.5%,2 patients) and one eye temporal hemianopia and contralateral eye superotemporal quadrantonopia(10.5%,2 patients). 2 patients showed non-specific field changes and the visual fielding was not possible in 1 patient due to poor visual acuity. However, in 24%(6 patients) of patients with pituitary adenoma, visual fields were normal.

Jung et al (2011)[22] in their study observed the incidence of field defect of 74%. bitemporal hemianopia was the most common field defect (22%)

In a study conducted by Farooq et al (2010)[25] 52 of the total 100 patients had field defects with bitemporal hemianopia being the commonest.

Dhasmana et al (2011)[15] observed that in a total of 36 cases 24 cases (66.67%) had visual field defects of which bitemporal hemianopia was the commonest pattern in 6 patients (33.33%)

In another study conducted at King Saud University (Elgamal et al 2007)[24], 44.4% of cases of Pituitary Adenomas had visual field defects and bitemporal hemianopia was most common defect (69%).

Neuro-ophthalmic examination reaches a maximum importance with the tumors of Pituitary gland not so much because it permits an exact localization but because the symptoms produces by these tumors in the initial as well as fully developed stage are ocular symptoms therefore sooner or later these symptoms will bring the patient to ophthalmologist.

It should be emphasized that symmetrical progressive stages in the deterioration of the visual field of the two eyes are characteristic of Pituitary tumors. In addition, there are other less pathognomonic forms. The field loss for instance may progress more rapidly in one eye than the other as was observed in some cases in the present study. Such as amaurosis of one eye with a temporal hemianopia therefore should be evaluated with great caution.

Nevertheless, the present study clearly observed that visual field defect was the most significant manifestation in patients with Pituitary Adenomas and emphasizes the importance of ophthalmological evaluation in suspected cases of pituitary tumors.

Among the 25 patients in the present study 24 were radiologically diagnosed to have pituitary macroadenoma constituting 96%(24 patients) and 4% (1 patient) had Pituitary microadenoma.

Of the 25 cases in the present study 4 cases showed features of optic atrophy on ophthalmoscopic examination of the fundus and the remaining cases were normal.

SUMMARY

- Commonest Age group was more than 50 years (60%). Mean age 50.6 years.
- Females were more commonly affected (72%)
- Headache was the most common presenting complaint (80%)
- Most of the Patients (62%) had visual acuity between 6/6 to 6/12.
- Patients had Pituitary macroadenomas in 96% of cases compared to microadenomas.
- Bitemporal hemianopia was the commonest visual field defect (57.9%)
- 24% of the patients had no visual field defect.
- 16% Patients had features of Optic Atrophy on Fundus examination.

CONCLUSION

- As the primary goal in the management of pituitary adenoma revolves around restoration of visual loss, a neuro-ophthalmic evaluation is essential for early detection, planning treatment and subsequent follow up.

- Although a bitemporal visual field defect is a pathognomonic ophthalmic finding in cases of pituitary adenomas , various other clinical features like headache, ophthalmoplegia, sensory visual disturbances, and other field defects were also noted in our study. Hence, a thorough clinical evaluation is warranted in pituitary adenomas.

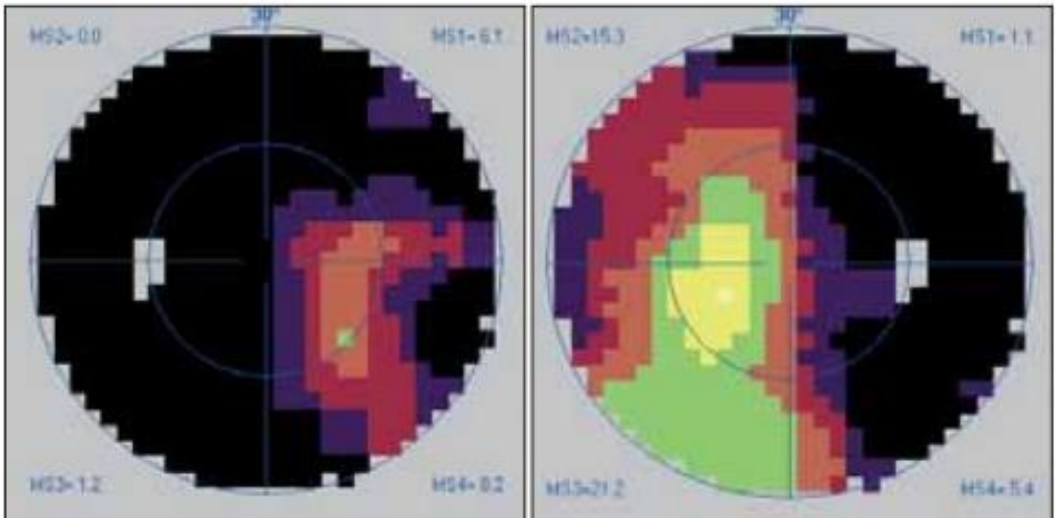


Figure 23 Showing Bitemporal hemianopia

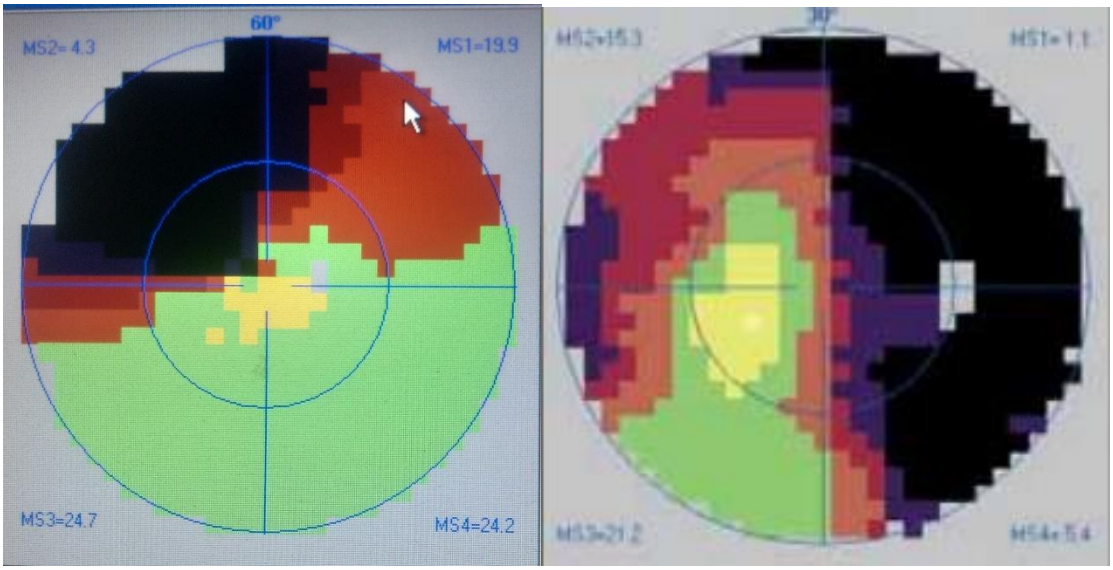


Figure 24 showing RE superotemporal quadrantonopia and LE showing a temporal hemianopia

BIBLIOGRAPHY

1. Ezzat S, Asa SL, Couldwell WT, Barr CE, Dodge WE, Vance ML. The prevalence of pituitary adenomas: a systematic review. Cancer 2004;101(3):613-9.

2. Davis FG, Kupelian V, Freels S, McCarthy B, Surawicz T. Prevalence estimates for primary brain tumors in the United States by behavior and major histology groups. NeuroOncol 2001;3(3):152-8.

3. Kovacs K, Scheithauer BW, Horvath E, Lloyd RV. The World Health Organization classification of adeno hypophysial neoplasms.A proposed five-tier scheme. Cancer 1996;78:502-10

4. Nistor R. Pituitary tumours. NeuroRew 1996;57:264-72.

5. Jagannathan J, Dumont AS, Prevedello DM, Lopes B, Oskouian RJ. Genetics of pituitary adenomas: current theories ant future implications. Neurosurg Focus2005;15:19(5):E4

6. Ramamurthy G. Experience with large pituitary adenomas in India; Neurology India1986;34:195-201

7. Natchiar G. Neuroophthalmic considerations in pituitary tumours; Neurology India;1986;34:165-70

8. Kaur A, Banerji D, Sharma K., Visual status in suprasella pituitary tumours . Indian journal of Ophthalmology; 1995;43;131-4

9. Poon A, McNeil P, Harper A. Pattern of visual field loss associated with pituitary macroadenomas. Australian & New Zealand J Ophthalmol.1995;23:107-14

10. Donahue SP. Perimetry techniques in neuro-ophthalmology. Curr Opin Ophthalmol. 1999;10:420–8.

11. Mills RP. Automated perimetry in neuro-ophthalmology. Int Ophthalmol Clin. 1991;31:51–70.

12. Fujimoto N, Saeki N, Miyauchi O, Adachi-Usami E. Criteria for early detection of temporal hemianopia in asymptomatic pituitary tumor. Eye (Lond). 2002;16:731–8.

13. Bengtsson B, Olsson J, Heijl A, Rootzén H. A new generation of algorithms for computerized threshold perimetry, SITA. Acta Ophthalmol Scand. 1997;75:368–75

14. Strandring S (Editor). Gray's anatomy The Anatomical Basis of Clinical Practice. 40th ed. Spain:Churchill livingstone elsevier; 2008

15. (Yanoff chapter 9.11) Rubin RM, Sadun AA, Piva A. Yanoff & Duker: Ophthalmology.3rd ed. China:Mosby Elsevier; 2008

16. Miller N R, Newman N J. Tumors of the Pituitary Gland. Walsh & Hoyt's Clinical Neuro-Ophthalmology.6th Ed. Lippincott Williams & Wilkins; 2005:

17. Rowe F. Visual fields via the visual pathway. Malden:Wiley-Blackwell; 2006

18. Thomas R, Shenoy K, Seshadri MS, Muliyil J, Rao A, Paul P. Visual field defects in non-functioning pituitary adenomas. Indian J Ophthalmol 2002;50:127-30.

19. Dhasmana R, Nagpal RC, Sharma R, Bansal KK, Bahadur H. Visual Fields at Presentation and after Trans-sphenoidal Resection of Pituitary Adenomas. J Ophthalmic Vis Res 2011;6(3):187-91.

20. Dhar MY , Pehere NK. Unusual Visual Manifestations of Pituitary Tumours. Kerala Journal of Ophthalmology 2007;19(2):147-55.

21. Kedar S, Ghate D, Corbett JJ. Visual fields in neuroophthalmology. Indian J Ophthalmol. 2011 Mar-Apr; 59(2):103–9.

22. Jung Pil Lee, In Won Park, and Yun Suk Chung. The Volume of Tumor Mass and Visual Field Defect in Patients with Pituitary Macroadenoma.Korean J Ophthalmol. 2011 February; 25(1): 37–41.

23. Rubin RM, Sadun AA, Piva A. Yanoff & Duker: Ophthalmology.3rd ed. China: Mosby Elsevier; 2008:986-95.

PROFORMA

NAME

AGE/SEX

I.P NO

CHIEF COMPLAINTS

TREATMENT HISTORY

Medications

Surgery

PERSONAL HISTORY

VISUAL ACUITY AT THE TIME OF EXAMINATION

EXAMINATION: **RE** **LE**

HEAD POSTURE

EXTRA OCULAR MOVEMENTS

DIPLOPIA CHARTING

VISUAL FIELDS

COLOUR VISION

OTHER EXAMINATION

LIDS

CONJUNCTIVA

CORNEA

IRIS

ANTERIOR CHAMBER

PUPIL

SWINGING FLASH LIGHT TEST : To detect RAPD

LENS

FUNDUS

INTRA OCULAR PRESSURE

INVESTIGATIONS

CT/MRI

Medical

Surgical intervention

KEY TO MASTER CHART

M	-	MALE
F	-	FEMALE
RE	-	RIGHT EYE
LE	-	LEFT EYE

SYMPTOMS

MOP	-	MODE OF PRESENTATION
COH	-	COMPLAINTS OF HEADACHE
CODV	-	COMPLAINTS OF DEFECTIVE VISION
COD	-	COMPLAINTS OD DIPLOPIA
COLV	-	COMPLAINTS OF LOSS OF VISION

EXAMINATION

BCVA	-	BEST CORRECTED VISUAL ACUITY
PL	-	PERCEPTION OF LIGHT
CFCF	-	COUNTING FINGERD CLOSE TO FACE
NIP	-	NO IMPROVEMENT WITH PIN HOLE
NIG	-	NO IMPROVEMENT WITH GLASSES
NP	-	NOT POSSIBLE
RTL	-	REACTING TO LIGHT
SRTL	-	SLUGGISHLY REACTING TO LIGHT
RAPD	-	RELATIVE AFFERANT PUPILLARY DEFECT