

PITUITARY MACROADENOMAS; DEMOGRAPHIC, VISUAL, AND NEURO-RADIOLOGICAL PATTERNS

DR. KHALID FAROOQ

FCPS (Diagnostic Radiology)
Consultant Radiologist & Associate Professor
Department of Radiology
Lahore Medical and Dental College,
Lahore

DR. ANJUM RASHID

FCPS (Medicine)
Associate Professor
Department of Medicine
Lahore Medical and Dental College,
Lahore

DR. TAYYABA GUL MALIK

FCPS Ophthalmology,
Assistant Professor
Department of Ophthalmology
Lahore Medical and Dental College,
Lahore

ABSTRACT... Objectives: To describe the demographic profile, patterns of visual disturbance and imaging studies of patients with Macroadenoma. **Design:** Retrospectively. Reviewed the clinical charts and neuroradiologic imaging of 125 patients who were diagnosed as cases of Macroadenoma. **Duration:** 2000 to 2009. **Subjects and Methods:** 100 patients were selected who had visual disturbances along with Macroadenomas. Age, sex, visual symptoms and other associated systemic problems of these patients were reviewed. The Neuroimaging data (Magnetic Resonance Imaging) was correlated with the clinical picture. The data was analysed using Statistical package for social sciences (SPSS). The Descriptive Statistics were calculated for age and MR findings. **Results:** The age ranged from 9 to 85 years (mean 42.92). Male to female ratio was 1.4: 1. 90% patients had visual disturbances including visual field defects and 10% had ocular motor nerve palsies. Tumour extension on MR studies showed optic chiasma compression in 69% patients, cavernous sinus invasion in 57% and Sphenoidal sinus invasion in 14%. Haemorrhagic foci were seen in 8% and intra tumour necrosis was found in 9% patients. **Conclusions:** The most common path for the extension of pituitary macroadenomas is towards the optic chiasma. Hence majority of these patients present with visual disturbances. MRI is an excellent aid to see the extent and invasion of Macroadenomas to the surrounding structures.

Key words: Macroadenoma, Pituitary Tumours, Optic Chiasma Compression, Visual Field Defects, Bitemporal Hemianopias.

INTRODUCTION

The commonest tumour of Pituitary is Adenoma which accounts for 15-20% of primary brain tumours. It is almost always benign and can present with abnormal pituitary gland hormonal function, loss of vision, headaches and bleeding in or around pituitary. Clinically, they are divided into Secretory and Non secretory Adenomas and visual disturbances are more common with the non functional adenomas¹. According to size they are divided into Microadenomas (<1 cm) and Macroadenomas (>1cm).

The aim of this study is to describe the demographic, ocular and neuroradiological patterns of Macroadenomas. This study shows that pituitary macroadenomas not only present with the typical visual field defects but also with other disturbances of vision and ocular motor nerve palsies.

STUDY DESIGN

Descriptive, retrospective study.

SUBJECTS AND METHODS

We retrospectively reviewed clinical and neuro-radiological data of 125 patients of Macroadenoma from year 2000 to 2009, referred by different physicians and ophthalmologists. Out of these, 100 patients were selected. The inclusion criteria were that, the patients with Macroadenoma confirmed on MRI scan and those who had visual disturbances were included in the study. All patients underwent MR imaging with a 0.35-T clinical imager (opart, OPEN MRI Toshiba). Dedicated head coil was used. The examination was performed with 3-mm section thickness in coronal, axial and sagittal planes. MR imaging was performed by using spin-echo T2-weighted (repetition time msec/echo time msec, 3000/110) and spin-echo T1-weighted (400/14) plain and post contrast images were acquired. 0.1 mmol per

kilogram of body weight Gd-DTPA was given for post contrast component. Sequences were performed with a 256 × 256-pixel matrix and 180-mm field of view. Tumor masses were measured in three dimensions (anteroposterior, side to side and craniocaudal). Involvement of cavernous sinuses, mass effect on optic chiasm and extension into sphenoid sinuses were evaluated through coronal slices.

The data collected was age, sex, type and extent of visual symptoms and associated systemic features. The visual status of the patients was obtained by the history and clinical examination charts. The perimetric records were not available but the MRI records of these patients were reviewed. Multiple long and short axis, T1 and T2 weighted images were studied. Special importance was given to the size of the tumour (vertical, horizontal and anteroposterior diameter), chiasmal compression, lateral extension into cavernous sinuses, sphenoid sinus invasion and intratumoral haemorrhages and necrosis.

RESULTS

In this study, the age range was 9 to 85 years (mean 42.92). Maximum number of patients with Macroadenoma was seen in the 3rd and 4th decades. (For details, see table-I). Male to female ratio was found to be 1.4: 1. The initial clinical presentation was blurring of vision associated with headache and vomiting (38%), visual field defects bitemporal, temporal or total loss of vision in one or both eyes (52%) and cranial nerve palsies (10%).

The associated systemic findings were Acromegaly (8 patients), increased Prolactin levels (8 patients), dizziness and unconsciousness (8 patients) and Panhypopituitarism (1 patient). Optic chiasma compression was the most common complication of tumour extension (Fig-1). The next common tumour extension was in the cavernous sinuses (Fig-2). Other MRI scan findings are summarized in the table-II.

DISCUSSION

Pituitary adenomas are the commonest tumours of pituitary. They are found in all age groups but peak incidence is in the 4th and 5th decades¹. The male to female ratio in the present study was 1.4: 1 showing male

Table-I. Showing different age group with Macroadenoma.

Age of patients with Macroadenoma (years)	No. of Patients	%age (n=100)
Below 20	3	3%
20-29	17	17%
30-39	24	24%
40-49	24	24%
50-59	19	19%
60-69	4	4%
70-79	5	5%
80-85	4	4%

Table-II. Showing MRI findings in patients with Macroadenoma.

Findings on MRI	No of patients	%age (n=100)
Chiasmal compression	69	69%
Cavernous sinus invasion	57	57%
Sphenoid sinus invasion	14	14%
Haemorrhagic foci in tumour	8	8%
Intratumoral necrosis	9	9%

predominance. This is close to the ratio seen in another regional study at Agha Khan University hospital where the ratio was found to be 1.8: 1². However, our ratio was exactly opposite to a study at King Saud University hospital where this male to female ratio was 1:1.4, roughly indicating that pituitary Macroadenomas are more common in males in our society (wider population based studies are required to confirm it)³.

female ratio in the present study was 1.4: 1 showing male predominance. This is close to the ratio seen in another regional study at Agha Khan University hospital where the ratio was found to be 1.8: 1². However, our ratio was exactly opposite to a study at King Saud University hospital where this male to female ratio was 1:1.4,

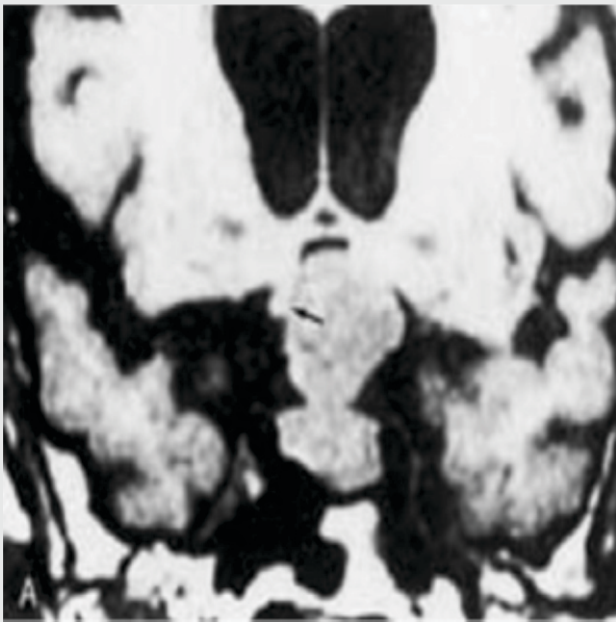


Fig-1. Coronal T1 sequence showing Pituitary Macroadenoma, causing significant mass effect on optic chiasma.

roughly indicating that pituitary Macroadenomas are more common in males in our society (wider population based studies are required to confirm it)³.

In this study, the diagnosis of Macroadenoma was confirmed on MRI studies. Coronal MR Images are helpful in finding the tumour extension to chiasma, third ventricle, cavernous sinus and internal carotid artery. Pituitary Macroadenomas are hypo-intense to iso-intense to the surrounding pituitary on T1 weighted images and iso-intense to hyper-intense on T2 weighted images⁴. Even the normal appearance of the gland varies with age and sex. In young women, the gland may have convex upper margin and height upto 12mm. In older people, the gland is concave or flat at the upper margin⁵.

The visual disturbance in the present study ranged from blurring of vision with or without headache to total loss of vision. The patients with visual field defects were also included in this wide range, bitemporal hemianopias being the commonest visual field defect. The reason for such a wide range of visual problems lies in the anatomical variation in the location of optic chiasma and due to the special arrangement of optic nerve fibres in the chiasma.

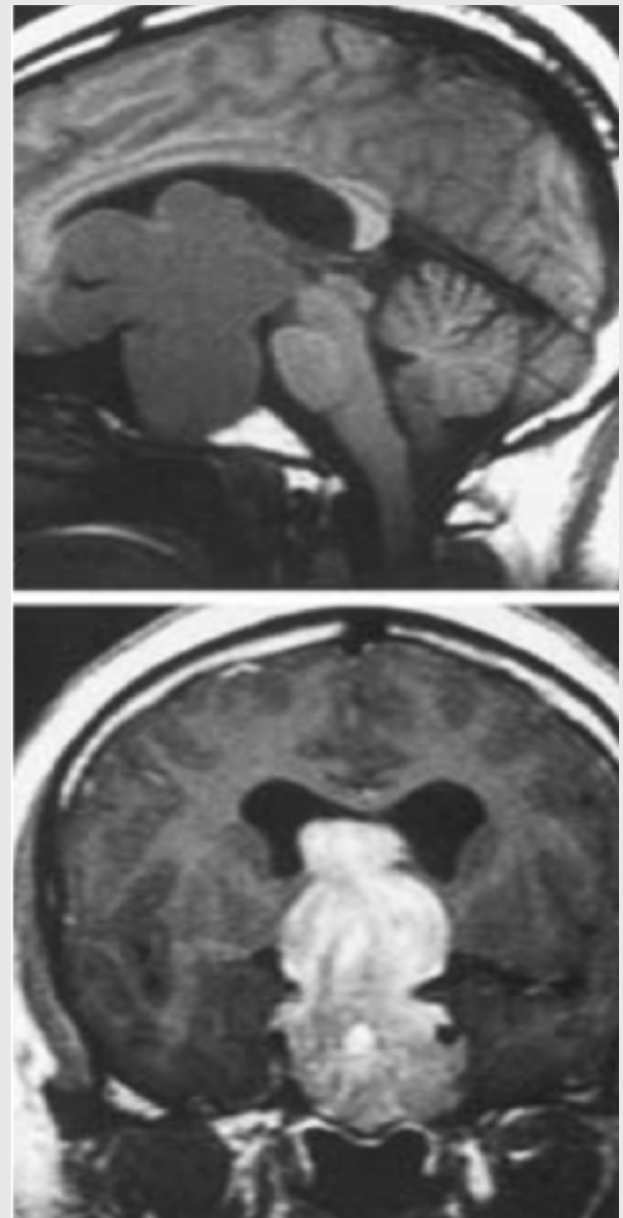


Fig-2. Sagittal T1 (above), coronal T1 post contrast (below) images showing large intensely enhancing Macro-adenoma, extending in 3rd & Lateral ventricles, causing hydrocephalus. Lesion involves both cavernous sinuses specially the left side. Caudally it extends in to sphenoid sinus.

Pituitary gland lies 8-13 mm below the optic chiasma. In optic chiasma, the nasal fibres cross to opposite sides in the centre. Thus tumour compression in this area leads to bitemporal hemianopias. In 80% cases, the chiasma is centrally located over the pituitary sella so the expanding

Macroadenoma will involve the chiasma first and the visual field defect will be bitemporal hemianopias. In 10% population, the chiasma is prefixed (lying anteriorly over the tuberculum sellae). In these cases, the optic tracts are involved first and the visual field defects will resemble the homonymous hemianopias. In other 10%, the location of chiasma is post-fixed (located posterior over dorsum sellae). So the optic nerves are involved first⁶. Important point to be noted here is that visual symptoms have gradual onset and sometimes the patient may not notice them especially, if the peripheral fields are affected and the central macular fibres are undisturbed.

Generally the prevalence of field defects in pituitary Macroadenoma has been reported in various studies as 37 -96%. 52% of our patients had visual field defects including total loss of vision. However, another study by Thomas R⁷ showed that 94.6% patients of Macroadenomas had visual field defects. Severity of these defects increased with tumour volume. Although bitemporal hemianopias are the commonest field defects other types of field defects are also mentioned in various studies⁸. The significance of reporting visual field defects and other visual symptoms is that they form a part of neurological criterion on which the surgical decisions can be taken⁹.

In the present study, 69% of patients had optic chiasma compression. Studies have shown that the degree of compression of optic chiasma is correlated to severity of visual impairment¹⁰. The typical presentation of optic chiasma compression is bitemporal hemianopia but some patients have partial or total loss of vision. In a study by Tokumaru AM, it was emphasized that the hyper intensity of optic nerves ventral to the pituitary Macroadenoma was associated with visual impairment other than bitemporal hemianopias¹¹. In addition to optic chiasma and optic nerve compression, many reports suggest that there is edema like change in optic pathway associated with pituitary adenomas¹².

The visual symptoms can be attributed to direct compression and also to ischemia occurring because of compression to the blood vessels. Arita reported a case in which there was extension of Macroadenoma to encase both optic nerves and the vessels supplying the pathways were also involved¹³.

In the present study 38%, patients had blurring of vision associated with headache. It can be compared with another study where visual symptoms associated with headache were reported in 42.7%². Headache occurs due to involvement of pain sensitive fibers in diaphragma sellae¹⁴. sometimes, pain disappears when the tumour breaks through the sella because the pressure on the sella is released.

Prevalence of ocular motor nerve palsies from Macroadenoma range from 1 -14%¹⁵. (10% in our study). These nerves are involved when the tumour invades the cavernous sinus and the intracavernous part of third, fourth and sixth cranial nerves are affected.

MRI studies showed cavernous sinus invasion in 57% of our patients. It is considered a poor prognostic sign especially when it involves the internal carotid arteries.

Upward growth of Macroadenomas is more common because here the tumour passes the path of least resistance but downward projection is also seen in some cases. 14% patients in our study had sphenoid sinus invasion.

8% patients in the present study had haemorrhagic foci in the tumour while necrotic areas were seen in 9% cases. Necrosis can occur due to previous haemorrhage or infarction within the tumour substance.

CONCLUSION

Pituitary adenomas are more common in males than in females by a ratio of 1.4:1. Decreased visual acuity and Visual field defects can act as important diagnostic and prognostic tools if properly documented. MRI is an excellent aid to see the extent and invasion of Macroadenomas to the surrounding structures.

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Article received on: 14/01/2010

Accepted for Publication: 26/01/2010

Received after proof reading: 23/10/2010

Article received on: 14/01/2010
 Accepted for Publication: 26/01/2010
 Received after proof reading: 23/10/2010
Correspondence Address:
 Dr. Tayyaba Gul Malik FCPS
 Ophthalmology, Assistant Professor
 Department of Ophthalmology
 Lahore Medical and Dental College,
 Lahore
 tayyabam@yahoo.com

Article Citation:

Farooq K, Malik TG, Rashid A. Pituitary macroadenomas; Demographic, visual, and neuroradiological patterns. Professional Med J Dec 2010;17 (4):623-627.

*"Glory is fleeting,
 but obscurity is forever."*

Napoleon Bonaparte (1769-1821)