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Study of Pituitary Gland for Patients with Visual Disturbance using Magnetic Resonance Imaging (MRI)

دراسة الغدة النخامية للمرضي الذين يعانون من اضطرابات في النظر باستخدام الرنين المغنطيسي

A Thesis Submitted To the University of Sudan for the Award of the M Sc in Medical Diagnostic Radiology

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الآية

قال تعالى:

(وَقُلِ اعْمَلُوا فَسَيَرَى اللّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُون)

صدق الله العظيم

(سورة التوبة الآية 105)

Acknowledgment

I wish to express my sincere thanks to Dr. Caroline Edward, for providing me with all the necessary facilities for this research.

And also I would like to thank everybody have a role in pushing me forward

Dedication

To the person who give a life my husband

To my family

To my friends and colleagues

To all being who helps me to complete this study

ABSTRACT

This study is an attempt to evaluate the pituitary gland for patients with visual disturbance using MRI by measuring size of pituitary gland and signal intensity in T1Weighted image, with and without contrast and T2Weighted image.

The study was conducted at Alzaytouna Specialist Hospital (Khartoum-Sudan) during the period from September 2016 up to February 2017 fifty subjects were selected in both gender and with different ages. All subjects were scanned for brain using MRI Machine 1.5Tesla (Toshiba vantage), T1 and T2 weighted images were obtained in sagital, axial and coronal views

The results showed that, 20 patients (40%) present with macroadenoma, 10 Patients (20%) present with microadenoma. 4 patients (8%) present with craniopharyngioma and one patient (2%) present with epidermoid cyst, and showed that the most common cause of visual disturbance is macroadenoma and the most common affected age is 41-50 years, microadenoma, craniopharyngioma and epidermoid cyst also cause visual disturbance.

The results showed that the signal intensity in T1Weighted image, isointense to normal pituitary gland in macroadenoma and microadenoma and hypointense in craniopharyngioma and epidermoid cyst. The signal intensity in T1Weighted image with contrast**,** in macroadenoma homogenous in 15 patients and heterogeneous in 5patients and in craniopharyngioma, and showed hypointense in microadenoma. The signal intensity in T2Weighted image hyper intense in macroadenoma, microadenoma, craniopharyngioma and epidermoid cyst.

MRI is suitable and recommended method for evaluation and demonstrating the pituitary gland anatomy and pathology.

ملخص البحث

هذه الدراسة محاولة لتقييم الغدة النخامية للمرضي الذين يعانون من اضطرابات في النظر باستخدام الرنين المغنطيسي , عن طريق قياس حجم الغدة النخامية وقياس شدة الإشارة في زمن الراحة الاول وزمن الراحة الاول مع حقن الصبغة وزمن الراحة الثاني .

اجريت هذه الدراسة في مستشفي الزيتونة التخصصي (الخرطوم _السودان) في الفترة من سبتمبر 2016وحتي فبراير 2017, تم اختيار عدد 50 عينة وفق مطلوبات الدراسة لكلا الجنسين وفي مختلف الاعمار, وتم فحص كل العينات بواسطة جهاز الرنين المغنطيسي 1.5تسلا (توشيبا فانتج) تم اجراء صور الرنين المغنطيسي في زمن الراحة الاول والثاني في وضع سهمي, مستعرض وتاجي.

واوضحت النتيجة ان 20 مريض (40%) مصابون بورم حميد كبير,10مرضي (20%) مصابون بورم حميد صغير,4مرضي(8%) مصابون بورم قحفي بلعومي,مريض واحد(2%) مصاب بكيس بشرانية واوضحت ان اكثر مسبب لاضطرابات النظر وجود ورم حميد كبير ويصيب الاعمار بين 41الي 50 سنة ,وايضا وجود ورم حميد صغير ,ورم قحفي بلعومي و كيس بشرانية يؤدي الي اضطرابات النظر .

واوضحت الدراسة ان شدة الاشارة في زمن الراحة الاول مشابهه لشدة الاشارة من الغدة النخامية الطبيعية في حالة الورم الحميد الكبير والورم الصغير واقل من شدة الاشارة الطبيعية في حالة الورم القحفي البلعومي والكيس البشرانية .وان شدة الاشارة في زمن الراحة الاول مع حقن الصبغة متجانسة في 15 مريض وغير متجانسة في 5 مرضي في حالة الورم الحميد الكبيروالورم القحفي البلعومي واقل من شدة الاشارة الطبيعية في حالة الورم الحميد الصغير .وان شدة الاشارة في زمن الراحة التاني اكثر من شدة الاشارة الطبيعية في حالة الورم الحميد الكبير والصغير والورم القحفي البلعومي والكيس البشرانية .

واوضحت الدراسة ان الرنين المغنطيسي انسب طريقة لتقييم الغدة النخامية من ناحية إظهار التشريح الطبيعي والحالات المرضية.

List of abbreviation:

CT	Computerized Tomography
ADH	Antidiuretic Hormone
HGH	Human Growth Hormone
PA	Pituitary Adenoma
PRL	Prolactin
TSH	Thyroid-Stimulating Hormone
FSH	Follicle-Stimulating Hormone
OT	Oxytocin
MRI	Magnetic Resonance Imaging
LH	Luteinizing Hormone
NMV	Net Magnetization Vector
RH	Releasing Hormone
SI	Signal Intensity
T2	T2 Weighted image
T1	T1 Weighted image

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Chapter one

Introduction

Imaging of the pituitary gland has progressed rapidly in recent years. Indirect methods of detecting pituitary gland dysfunction by evaluation of sella turcica on skull films and tomography are being replaced by direct visualization of the gland with CT and MR (Bonneville, Cattin 2009)

The pituitary gland, sellar regions are the site of diverse pathological processes including developmental, inflammatory, vascular pathology and neoplasm masses present with overlapping clinical and radiological features ranging from asymptomatic incidental presentations and hormonal effects to compressive local mass effects

Differentiation among various etiologies may not always be easy, since many of these lesions may mimic the clinical, endocrinologic and radiologic presentations of pituitary adenomas so the diagnosis of sellar lesions involves a multidisciplinary effort and detailed endocrinologic, ophthalmologic and neurologic testing are essential. CT and, mainly, MRI are the imaging modalities to study and characterize normal anatomy and the majority of pathologic processes in this region .Due to the complex anatomy of this region and the small size of the pituitary gland, magnetic resonance imaging (MRI) is the key and the modality of choice for the diagnosis of these lesions in that location (Bonneville, et al 2002).

Magnetic resonance imaging (MRI) is a non- invasive imaging tool that utilizes a strong magnetic field and radio frequency waves to visualize in great detail organs. Unlike conventional x-rays (including computed tomography, there is no exposure to ionizing radiation and at most field strengths (generally below 7Tesla) the procedure is considered safe for

nearly every age group. Because it is non-invasive (i.e., does not break the skin or harm the body) and possesses excellent spatial resolution, the use of MRI as a research tool has increased exponentially over the past decade. Uses have ranged from add-ons to a clinical study (Gilmore JH, et al 2006.) Magnetic resonance (MR) is based upon the interaction between an applied magnetic field and a nucleus that possesses spin, nuclear spin or, more precisely, nuclear spin angular momentum, is one of several intrinsic properties of an atom and its value depends on the precise atomic composition. (Mark and Richard 2003).

1.2 MRI signal intensity:

As a result of resonance, the NMV is processing in phase in the transverse plane.Faraday‘s lows f induction state that if receiver coil or any conductive loop is placed in the area of moving magnetic field, i.e. the NMV precessing in the transverse plane, a voltage is induce in this receiver coil signal is produce when coherent (in phase) magnetization cuts across the coil. As the NMV precesses at the larmor frequency in the transverse plane, a voltage is induced in the coil.This voltage constitutes the MRI signal**.** The frequency of the signal is the same as the larmor frequency – the magnitude of the signal depends on the amount of magnetization present in the transverse plane that which depends upon the characteristic of the tissue under examination. (Catherine and Carolyn 2011)

1.3 Problem Identification:

The lesions that affect the pituitary gland, it lead to serious clinical symptoms such as visual impairment , chronic headache and pituitary insufficiency and often affects the parathyroid glands, pancreatic islet cells, so the correct diagnosis is important to determine the routs of treatment .

1.4 Problem Justification:

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

1.5 Objectives:

1.5.1 General objectives:

To evaluate role of magnetic resonance imaging (MRI) in diagnosis of pituitary gland for patient with visual disturbance

1.5.2 Specific objectives:

-To evaluate the pituitary gland in patients with visual disturbance using MRI

- To measure the pituitary gland size
- To measure the pituitary gland signal intensity

-To found the most common finding that cause the visual disturbance

1.6 Thesis scope

Chapter one included the introduction, problem of the study and objective, chapter tow concerned with literature review, chapter three dialed with the methods and materials that used on this study, chapter four showed the result of\the study. Chapter five discussed the result of the study

Chapter Two

Literature review

2.1 Anatomy, physiology and pathology of Hypothalamus and Pituitary Gland

The hypothalamus is the major integrating link between the nervous and endocrine systems. The hypothalamus and pituitary gland regulate virtually all aspects of growth, development, metabolism, and homeostasis. The pituitary gland is located in the hypophyseal fossa and is divided into the anterior pituitary (glandular portion), the posterior pituitary (nervous portion), and the pars intermedia (a vascular zone in between). Secretion of anterior pituitary hormones is stimulated by releasing hormones and suppressed by inhibiting hormones from the hypothalamus. (Derrckson.B, 2009)

The blood supply to the anterior pituitary is from the superior hypophyseal arteries. Hypothalamic releasing and inhibiting hormones enter the primary plexus and flow to the secondary plexus in the anterior pituitary by the hypophyseal portal veins. The anterior pituitary consists of somatotrophs that produce human growth hormone (hGH); lactotrophs that produce prolactin (PRL); corticotrophs that secrete adrenocorticotropic hormone (ACTH) and melanocyte-stimulating hormone (MSH); thyrotrophs that se- crete thyroid-stimulating hormone (TSH); and gonadotrophs that synthesize follicle-stimulating hormone (FSH) and luteinizing hormone (LH). Human growth hormone (hGH) stimulates body growth through insulin like growth factors (IGFs). Secretion of hGH is inhibited by GHIH (growth hormone–inhibiting hormone, or somatostatin) and promoted by GHRH (growth hormone–releasing hormone). TSH regulates thyroid gland activities. Its secretion is stimulated by TRH (thyrotropin-releasing hormone) and suppressed by GHIH.FSH and LH regulate the activities of the gonads—ovaries and testes. Their secretion is controlled by GnRH (gonadotropin- releasing

hormone). Prolactin (PRL) helps initiate milk secretion. Prolactin-inhibiting hormone (PIH) suppresses secretion of PRL; prolactin-releasing hormone (PRH) and TRH stimulate PRL secretion. ACTH regulates the activities of the adrenal cortex and is con- trolled by CRH (corticotrophin releasing hormone). Dopamine inhibits secretion of MSH. The posterior pituitary contains axon terminals of neurosecretory cells whose cell bodies are in the hypothalamus. Hormones made by the hypothalamus and stored in the posterior pituitary are oxytocin (OT), which stimulates contraction of the uterus and ejection of milk from the breasts, and antidiuretic hormone (ADH), which stimulates water reabsorption by the kidneys and constriction of arterioles. Oxytocin secretion is stimulated by uterine stretching and suckling during nursing; ADH secretion is controlled by osmotic pressure of the blood and blood volume. (Derrckson.B, 2009)

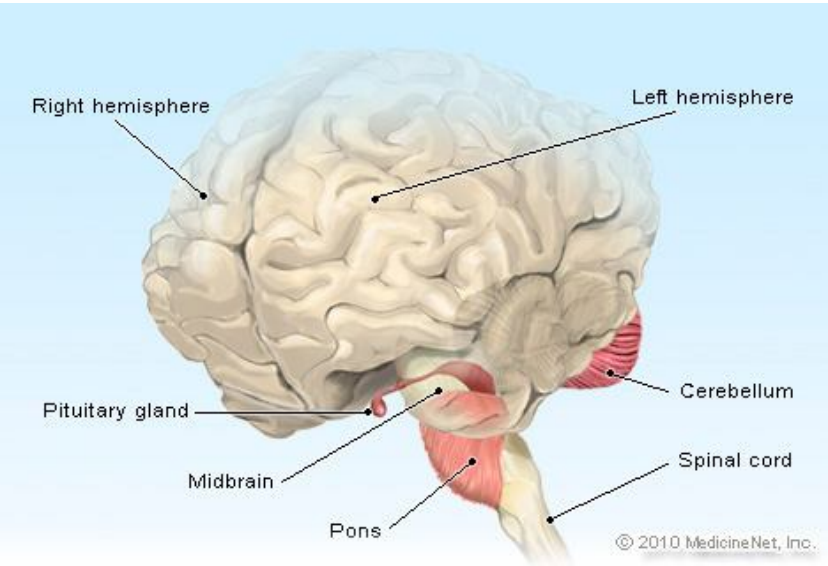

Fig (2.1) shows the picture of pituitary gland(www.medicinenet.com)

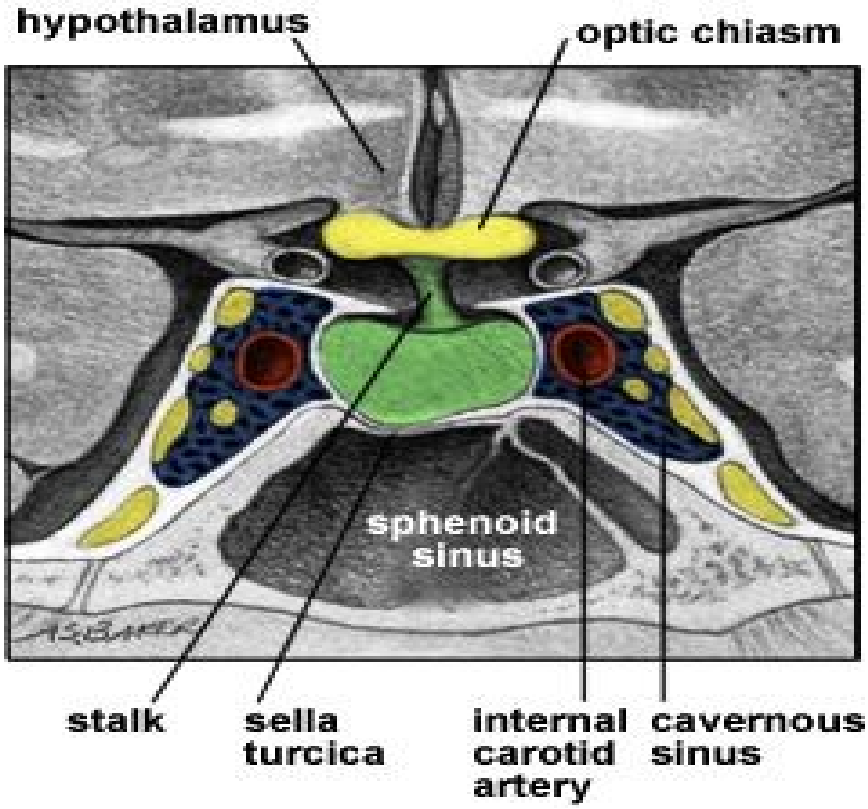

Fig (2.2) shows front view across section of pituitary gland (www.magfield clinic .com)

2.1.1 Pituitary gland pathology

2.1.1.1 Overview of pituitary region tumours

2.1.1.1.1 Tumours within the pituitary gland

Adenoma, Metastatic carcinoma, Carcinoma Secondary lymphoma – leukemia, Cranio-pharyngioma Germ cell tumour (particularly germinoma) Granular cell tumour/spindle cell granular oncocytoma Gangliocytoma/ganglioglioma Pituicytoma Meningioma Lymphoma Non-neoplastic lesions involving the pituitary gland .

Nodular hyperplasia, Epidermoid, dermoid, and Rathke cleft cysts, Abscess, Tuberculoma, Sarcoidosis, Histiocytosis (Langerhans and non-Langerhans) Lymphocytic hypophysitis, (Horvath E, 2002)

2.1.1.1.2 Tumours arising from adjacent structures:

Optic chiasm/nerve: pilocytic astrocytoma, meningioma

Cranial nerves: schwannoma, Hypothalamus: gangliocytoma, pilocytic astrocytoma,

Sella turcica: meningioma, paraganglioma, chordoma/ chondroma/chondrosarcoma.(Horvath E, 2002)

2.1.1.1.3 Pituitary adenoma

Pituitary adenomas, almost all of which arise in the anterior lobe, constitute more than 10% of all intracranial tumors. Most are nonsecreting chromophobe adenomas. As chromophobe tumors enlarge, the adjoining secreting cells within the sella turcica are compressed, leading to diminished secretion and decreased levels of growth hormone, gonadotropins, thyrotropic hormone, and adrenocorticotropic hormone (ACTH). Large chromophobe adenomas can extend upward to distort the region of the optic chiasm, whereas lateral expansion of tumor can compress the cranial nerves passing within the cavern sinus A hormone-secreting pituitary tumor can cause clinical symptoms even if it is too small to have a mechanical mass effect. Hypersecretion of growth hormone results in gigantism in adolescents (before the epiphyses have closed) and acromegaly in adults (after the epiphyses have closed). Excess secretion of adrenocorticotropic hormone by a pituitary tumor results in the hypersecre- tion of steroid hormones from the adrenal cortex andsymptoms of Cushing's disease. Hyper secretion of thyroid-stimulating hormone (TSH) leads to hyperthyroid- ism; excess secretion of prolactin by a pituitary tumor in women causes the galactorrhea-amenorrhea syndrome.(Eisenberg.RL,2012)

2.1.1.1.4 Craniopharyngioma

Craniopharyngiomas are benign tumors that contain both cystic and solid components and usually occur in patients younger than 20 years. They generally originate above the sella turcica, from embryonic remnants, depressing the optic chiasm and extending up into the third ventricle. Less commonly, a craniopharyngioma lies within the sella, where it compresses the pituitary gland and may erode adjacent bony walls.(Eisenberg.RL,2012)

2.1.1.1.5 Pituitary Carcinomas

These extremely rare malignant tumours are identified on the basis of their capacity to metastasise via the cerebrospinal fluid pathway or to extracranial tissues.Brain invasion is not yet considered a criterion for malignancy, but it is likely that this possibility will be reassessed as neuroradiological techniques for the identification of brain invasion improve and that the practicality of brain sampling for the identification of invasion is reconsidered by neurosurgeons (as it has been for the identification of invasive meningiomas).Pituitary carcinomas are usually endocrinologically functional,with ACTH and PRL producing tumours being the most frequent. Carci-nomas show a variable degree of nuclear atypia and cellular pleomorphism, but with significantly higher mitotic rates and cell proliferation indices than adenomas. Vascular endothelial proliferation and necrosis are uncommon features; immu- noreactivity for p53 has been found in some metastatic depos- its, but the primary tumours show a much lower incidence of immunoreactivity. As for invasive adenomas,it appears at present that there are no consistently expressed cellular markers of aggressive biological behaviour for pituitary carci- nomas**.** (Horvath E, 2002)

2.1.1.1.6 Pituitary Hyperplasia

Physiological pituitary hyperplasia occurs in pregnancy and lactation, and primarily involves PRL cells.Non-neoplastic hyperplasia of individual pituitary cell types is an uncommon cause of excess hormone secretion. Two main patterns of pituitary cell hyperplasia may be encountered: diffuse and nodular; these may occur either singly or in combination. Diffuse hyperplasia does not greatly alter the acinar structure of the gland, and thus may be difficult to detect in a fragmented biopsy specimen, particularly because there is a considerable degree of variation in the distribution of cell types in the nor- mal anterior pituitary gland.The most clinically important form of pituitary hyperplasia is nodular hyperplasia, which most often involves a single cell type and is more likely to be associated with clinical features as a result of excess endocrine activity,mimicking a functional adenoma.All cell types can be involved, but PRL hyperplasia is the most common form, and can occasionally result from longstanding pituitary stalk compression by a pre-existing adenoma or another adjacent mass lesion.Reticulin stains are helpful in the assessment of nodular hyperplasia, because the abnormally expanded acinar structures are not uniformly distributed throughout the gland and they may become confluent, resulting in disruption of the normal reticulin framework.. (Horvath E, 2002)

2.2 Previous study

(AMR F. MOURAD, MOHAMED KHALLAF 2012) in the Departments of Radiology, South Upper Egypt Cancer Institute, at Assiut University, had studied the management of sellar tumors using magnetic resonance imaging experience with 50 cases

Preoperative differentiation of histologic etiology of sellar lesions is of profound clinical importance because it determines the use of surgery versus nonsurgical technique, transsphenoidal versus transcranial routes and the degree of surgical resection. Their provide an overview of the most relevant magnetic resonance imaging characteristics together with clinical findings of some lesions found in the sellar region in order to evaluate the role of magnetic resonance imaging (MRI) in the diagnosis of theses lesions.

Their study prospective review with 50 patients with sellar lesion managed at the Department of Neurosurgery, Assiut University Hospital and Department of Radiology, South Upper Egypt Cancer Institute between April, 2010 to July 2012. The demographic data, clinical presentation, MRI radiographic characteristics, and the management of these patients were reviewed. Among the study, 28 patients (56%) have macroadenomata; 9 patients (18%), have microadenoma; 10 patients (20%) have craniopharyngioma; 2 patients (4%) have epidermoid cyst and one patient (2%) have dermoid cyst. Collectively pituitary adenomas are common in females 59% (22/37) while craniopharyngioma are equal in both sex. Dermoid and epidemoid cyst were detected only in males. All patients with micro adenoma were in the 3rd decade, while patients with macro adenoma were mostly older. In patients with craniopharyngioma there were two peaks; the first is 10 years and the 2nd is 40 years. Patients with dermoid and epidermiod cyst were older. The presenting

symptoms were different according to the lesion type. Optic chiasma was stretched in all three cases of dermoid and epidermoid cyst. Optic chiasma was more likely to be stretched in all cases with craniopharyngioma except one (90%); while in patient with macro adenoma it was stretched in only 17 patients (60.7%) however; it is not stretched in all cases with micro adenoma. All cases of macro adenoma in addition to dermoid and epidermoid cyst showed a combined pattern of extension either sellar and supa sellar. All cases of micro adenoma were entirely intra sellar with no supra or Para sellar extension. 2 cases (20%) with craniopharyngioma were sellar while 8 cases (80%) were sellar and supra sellar. Cystic degeneration of the tumor found in 17.5% among cases with macro adenoma and in all cases of craniopharyngioma whiles no cystic degeneration in cases with micro adenoma. Cavernous sinus invasion with encasement ICA was present in 60.7% (17/28) of cases with macro adenoma and in the 100% of cases with dermoid and epidermoid cyst, but not present at all in cases with micro adenoma and craniophayrngioma. In 57.1% of macro adenoma (16/28), sphenoid air sinus was invaded while it was invaded in 40% (4/10) of craniopharyngioma and not affected at all in microaderoma while it was invaded in dermoid and epidermoid cyst. The treatment modalities for theses lesions were individualized according to its pathology. For pituitary micro adenoma, all patients were treated conservatively by anti-hormonal treatment (all of them were prolactin secreting type, treated by bromocriptine). Pituitary macro adenoma were treated by surgical excision and the route of excision was either trans sphenoid (11 cases) or transcranial (17 cases). All patients with craniopharyngioma underwent surgery (trans- sphenoid; 2 cases- transcranial; 8 cases). All patients with epidermoid and dermoid cyst were excised through transcranial routes.

MRI of lesions in the sellar region is useful for the diagnosis and differential diagnosis. Precised preoperative MR imaging as well as proper interpretation of obtained results may contribute to optimize the principles of diagnostic and therapeutic procedures used in the treatment of theses lesions.

(Jeevan A et al, 2008) had studied the evaluation of pituitary adenomas by using magnetic resonance imaging. Pituitary adenoma often presents with non specific symptoms like headache; Dynamic contrast MRI is important not only in confirming the diagnosis but it also provides information which helps to plan surgical treatment and to evaluate response to medical treatment, to evaluate role of MRI in diagnosis of pituitary adenoma.

A prospective case series study on 85 patients with pituitary lesions was conducted at the Department of Radio-diagnosis in a tertiary care hospital in Goa (Goa Medical College) over a period of 3 years using 1.5 Tesla unit- Magnetom Avanto, Siemens unit, by using a head matrix coil. Dynamic contrast enhanced imaging played a crucial role in accurate localization of hormone secreting micro adenomas. MRI precisely assessed the invasion of cavernous sinus by macro adenomas on contrast enhanced imaging.

MRI is undoubtedly an indispensible tool to evaluate hypothalamic-pituitary related endocrine disease. In addition to providing a diagnosis, MRI also helps to plan surgical strategies due to its ability to provide multiplanar information about the anatomical relationship of the gland with adjacent structures. MRI is also a modality of choice for follow-up imaging in order to evaluate response to conservative treatment as well as in post operative cases. (Roberta K et al, 2013) studied the changes of visual function in patients with pituitary adenoma carried at the

Department of Oncology, Medical Academy, Lithuanian University of Health Sciences, department of Ophthalmology. The aim of this study was to evaluate associations between visual functions (visual acuity, perimetry, optic nerve disc condition, and color contrast sensitivity) and pituitary adenoma (PA) diameter.

In the study, 20 patients with PA, which was confirmed by computed tomography or magnetic resonance imaging scans, were examined. The patients were divided into 2 groups: those with a PA diameter of ≤1 cm (14 eyes) and with a PA diameter of >1 cm (26 eyes). The control group comprised 40 healthy age- and gender-matched persons (80 eyes). The diameter of PA, visual acuity, and perimetry were analyzed; the F-M 100 hue test for color discrimination was used in patients with PA.

Visual acuity was better in the control group as compared with both groups of patients (1.0 vs. 0.90 [SD, 0.50] and 0.64 [SD, 0.21]; P=0.01; respectively). The results of the Farnsworth- Munsell 100 hue test were also better in the control group compared with the patients with PA of ≤1 cm and >1 cm (error score of 80.1 [SD, 53.0] vs. 131.8 [SD, 30.6] and 244.68 [SD, 51. 6], respectively; P=0.011). There was a very strong positive correlation between the error score of the F-M 100 hue test and PA diameter (r=0.905), but the correlation between the error score and visual acuity (r=–0.32), perimetry (r=0.21), and eye funds changes (r=0.36) and PA diameter was weak. Their results showed that PA can cause the impairments of visual acuity, perimetry, and color contrast sensitivity. The computerized F-M 100 hue test can be one of the methods for an early diagnosis of chiasm damage in patients with PA.

Chapter Three

Materials and methods

3.1 Materials:

3.1.1 Area of the study:

This is a descriptive analytical study. It was conducted at National Cancer Institute and ALIA Hospital - Wad Medani, Alzaytona Specialist Hospital, Treatment Home Specialist Hospital- Khartoum Sudan from (September 2016- febreuary2017).

3.1.2 Inclusion and exclusion criteria:

Fifty subjects (35 sample, 15 control group, 28 females and 22 males) with different ages (ranges between10- 76 years old) were included in this study, 15 patients with normal MRI pituitary and 35 diagnoses with pituitary lesions, reported by experienced radiologist the report showed changes in pituitary size and texture in patients with pituitary lesions and no changes in normal patients.

3.1.3 Instrumentation:

MRI 1.5 Tesla Toshiba Vantage was used on this study. Neurovascular coil was chosen

3.2 Methods:

3.2.1 Examination technique:

After optimizing all the safety requirements for the subjects to introduced to the MRI room and after full instructions about the nature of the examination ;the subjects lied in supine position on the MRI couch ,with the head first and then the head localized on the neurovascular coil considering the longitudinal centering laser light overlapped with the medial saggital plane and the transverse one localized at the nasion Three

scouts were taken as planning localizer and then pre and post contrast MRI of the brain and pituitary gland using slice thickness 2-3mm and slice gab 0 .1mm in the following sequences ,coronal T2W,with TR 8568 and TE 105 ,T1W,with TR 405 and TE 10, DYNAMIC T1W post contrast ,axial T2W, with TR 5000 TE 105 ,axial T1W with TR 8000 TE 105 &T1W post contrast ,sagital T1Wdelayed post contrast with TR438 TE20 ,after complete these sequences the following findings were carefully assessed , the normal pituitary gland , the shape , size and extension of the lesion, Signal intensity of the lesion in T1WI, T2 WI and post gadolinium injection , Cavernous sinus invasion, Optic chiasma compression.

3.2.2 Data analysis:

Microsoft Excel and SPSS program version 16 were used to analyze the data of this study.

Chapter Four
Results

Table 4.1: the patient classification according to gender

Gender	Frequency	Percentages
Male	22	44
Female	28	56
Total	50	100

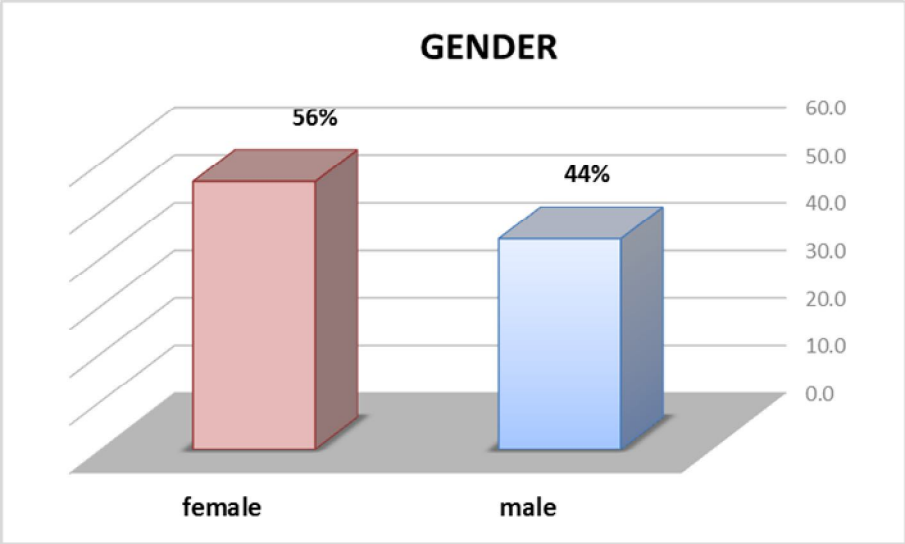

Figure (4-1): the patient classification according to gender

Table 4. 2: calcification calof age group according to pituitary lesion:

Age	Diagnosis	Frequency	Percentages
11>	normal pituitary gland	1	100
11-20	Cranio Pharyngioma	3	50
	Microadenoma	1	16.7
	Normal Pituitary Gland	2	33.3
	Total	6	100
21-30	Epidermoid cyst	1	7.1
	Microadenoma	5	35.7
	Normal Pituitary Gland	8	57.1
	Total	14	100
31-40	Craniopharyngioma	1	11.1
	Macroadenoma	3	33.3
	Microadenoma	3	33.3
	Normal Pituitary Gland	2	22.2
	Total	9	100
41-50	Macroadenoma	11	78.6
	Microadenoma	1	7.1
	Normal Pituitary Gland	2	14.3
	Total	14	100
51-60	Macroadenoma	3	100
61-70	Macroadenoma	2	100
71+	Macroadenoma	1	100

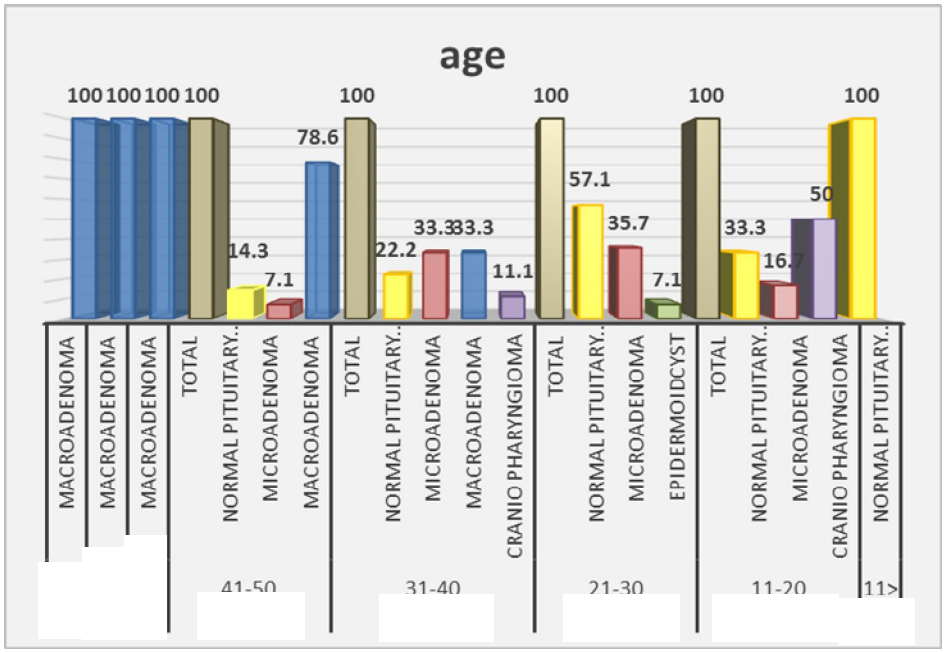

Figure :(4-2) shows calcification of age group according to pituitary lesion

Table 4. 3: the sample classification according to age classes

Age Classes	frequency	Percentages
11>	1	2
11-20	6	12
21-30	14	28
31-40	9	18
41-50	14	28
51-60	3	6
61-70	2	4
71+	1	2
Total	50	100

Table 4.4 : Distribution of Patient gender among Pituitary lesion

Type	Male		Female		Total	
	frequency	percentages	frequency	percentages	frequency	Percentages
Macroadenoma	11	50	9	32.1	20	40
Microadenoma	5	22.7	5	17.9	10	20
Cranio Pharyngioma	3	13.6	1	3.6	4	8
Epidermoidcyst	1	4.5	0	0	1	2
Normal Pituitary Gland	2	9.1	13	46.4	15	30
Total	22	100	28	100	50	100

Table 4.5: Distribution of Pituitary lesion in Patient age

Type	frequency	Percentages	Mean age	Minimum age	Maximum age
Macroadenoma	20	40	49	35	76
Microadenoma	10	20	29	15	43
Cranio Pharyngioma	4	8	22	15	38
Epidermoidcyst	1	2	28	28	28
Normal Pituitary Gland	15	30	27	10	46
Total	50	100	36	10	76

Table 4.6: Differential clinical presentation among the Patients:

Symptoms Type	Presence of headache		presence of visual disturbance		presence of headache/visual disturbance	
	frequency	percentages	frequency	percentages	frequency	Percentages
Macroadenoma	20	100	20	100	20	100
Microadenoma	1	10	10	100	1	10
Cranio Pharyngioma	4	100	4	100	4	100
Epidermoid cyst	1	100	1	100	1	100

Table 4.7: Relation between different pituitary lesion and cavernous sinus invasion / optic chiasm compression

Symptoms Type	Cavernous Sinus Invasion		Optic Chiasm Compression	
	frequency	percentages	frequency	Percentages
Macroadenoma	8	40	15	75
Microadenoma	0	0	0	0
Cranio Pharyngioma	4	100	4	100
Epidermoidcyst	0	0	0	0

Table 4.8: signal intensity inT1W

Signal intensity T1			
Type of lesion		frequency	Percentages
Macroadenoma	Isointense	19	95
	low signal intensity	1	5
	Total	20	100
Microadenoma	Homogenous	1	10
	Isointense	9	90
	Total	10	100
Cranio Pharyngioma	low signal intensity	4	100
Epidermoidcyst	low signal intensity	1	100
Normal Pituitary Gland	Isointense	15	100

Table 4.9: signal intensity in T1W with contrast

T1 with contrast			
Type of lesion		frequency	Percentages
Macroadenoma	hetrogenously enhancing	5	25
	homogenous	15	75
	Total	20	100
Microadenoma	hypointense	10	100
Cranio Pharyngioma	hetrogeneous enhancement	4	100
Epidermoidcyst		1	100
Normal Pituitary Gland	homogenous	15	100

Table 4.10: signal intensity in T2W

Signal intensity T2			
Type of lesion		Frequency	Percentages
Macroadenoma	hyper intense	19	85
	Isointense	1	5
	Total	20	100
Microadenoma	hyper intense	10	100
Cranio Pharyngioma	hyper intense	4	100
Epidermoidcyst	high signal intensity	1	100
normal pituitary gland	hyper intense	15	100

Table 4. 11: relation between diagnosis and pituitary size

Diagnosis	Pituitary size	Frequency	Percentages
macroadenoma	10*12mm	1	5
	14*8mm	1	5
	18*10mm	1	5
	20*12mm	1	5
	20*15mm	2	10
	20*17mm	1	5
	20*20mm	1	5
	22*18mm	1	5
Macroadenoma	22*20mm	1	5
	25*22mm	1	5
	26*22mm	1	5
	32*22mm	1	5
	33*22mm	1	5
	35*20mm	3	15
	35*30mm	1	5
	39*22mm	1	5
	45*40mm	1	5

	Total	20	100
Microadenoma	10*8mm	1	10
	7*5mm	1	10
	7*6mm	2	20
	7*7mm	1	10
	8*5mm	1	10
	8*6mm	1	10
	8*7mm	2	20
	9*7mm	1	10
	Total	10	100
Cranio Pharyngioma	34*25mm	1	25
	60*35mm	1	25
	65*50mm	2	50
	Total	4	100
Epidermoid cyst	14*11mm	1	100
Normal Pituitary Gland	7*6mm	5	33.3
	8*6mm	4	26.7
	8*7mm	4	26.7
	9*7mm	2	13.3
	Total	15	100

Table 4. 12: Type of treatment

Type of lesion	frequency	Treatment
macroadenoma	12	Trans-nasal-trans-sphenoidal surgery
	5	Trans-cranial & radiation therapy
	3	Radiation therapy
microadenoma	10	Anti-hormonal
craniopharyngioma	4	Trans-cranial surgery
Epidermoid cyst	1	Trans-cranial

Chapter five

Discussion, conclusion and recommendations

5.1 Discussion:

This study includes 50 patients 15(30%) normal 35(70%) with pituitary lesions, 20 (40%) patients with macroadenoma, 11males and 9females.10 (20%) Patients with microadenoma, 5males and 5females. 4 (8%) patients with craniopharyngioma and one (2%) patient with epidermoid cyst. The mean age of macroadenoma is 49, the mean age of microadenoma 29; the mean age of craniopharyngioma 22 and epidermoid cyst 28 .the presenting symptoms were different according to lesion type in macroadenoma, craniopharyngioma and epidermoid cyst the combined headache and visual disturbance are present, in microadenoma present with visual disturbance.

Optic chiasma was compressed in all cases of craniopharyngioma, epidermoid cyst and in 15 patients (75%) with macroadenoma and it is not compressed in all cases of microadeboma. The cavernous sinus invasion present in 8 patients (40%) with macroadenoma and in all cases of craniopharyngioma and epidermoid cyst but not present in all cases of microadenoma.

Macroadenoma, craniopharyngioma, epidermoid cyst showed with extension either sellar and supra sellar. All cases of microadenoma were entirely intra sellar with no supra or Para sellar extension. The signal intensity in T1W, in normal pituitary iso intense, in macroadenoma 19 patients (95%) is iso intense, low signal in one patient (5%), microadenoma 9 patients (90%) iso intense, one patient (10%) homogeneous, in craniopharyngioma and epidermoid cyst low signal in

all cases. The signal intensity in T1W with contrast, macroadenoma in15 patients (75%) homogeneous, 5 patients (25%) heterogeneous, microadenoma all cases hypo intense and craniopharyngioma all cases heterogeneous. The signal intensity in T2W, macroadenoma 19 patients (95%) hyper intense, one patient (5%) iso intense and all cases of micro adenoma, craniopharyngioma, epidemoid cyst hyper intense

This study agree with (AMR F. MOURAD, and MOHAMED KHALLAF, 2012) study which result in that all patients with micro adenoma were in the 3rd decade, while patients with macro adenoma were mostly older. In patients with craniopharyngioma there were two peaks; the first is 10 years and the 2nd is 40 years. The presenting symptoms were different according to the lesion type

Compared to normal pituitary gland size which measured 7x6mm up to 9x7mm the macroadenoma increased in pituitary gland size which measured 20x17mm up to 45x40mm, in microadenoma no changes in pituitary gland size which measured 8x6 up to 9x7, in craniopharyngioma the size of pituitary gland increased which measured 34x25mm up to 65x50mm and also increased in epidermoid cyst which measured 14x11mm, and this agree with (AMR F. MOURAD AND MOHAMED KHALLAF 2012) which result in that all cases of macroadenoma, craniopharyngioma and epidermoid cyst showed increased in pituitary gland size with extension either sellar and supra or para sellar , all cases of microadenoma intra sellar.

The treatment depends on many factors, the tumor size and relationship to normal anatomy, patient age and medical condition, for majority of patients with macroadenoma and craniopharyngioma are able to offer combination of medical surgical and radiation therapies that can control their symptoms and prevent tumor progression, the old patients treated by radiation therapy and for patients with microadenoma treated by medication (antihormonal therapy).

5.2 Conclusion:

Most common cause of visual disturbance is macroadenoma, 20 patients diagnosed as pituitary macroadenoma, the common age is 41-50 years, microadenoma, craniopharyngioma and epidermoid cyst also cause visual disturbance.

5.3 Recommendations:

1- To use MRI in evaluation of pituitary gland for patient with visual disturbance

2-To increase sample size for further studies

3- To use dynamic contrast study of pituitary gland because most pituitary adenomas enhance more slowly, while the contrast is being injected the normal pituitary gland will start to enhance before adenoma and the adenoma showing more accurately as dark shadow within the brightly enhancing normal pituitary gland.

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(Medicina (Kaunas) 2013;49(3)

. Appendices 1

Images

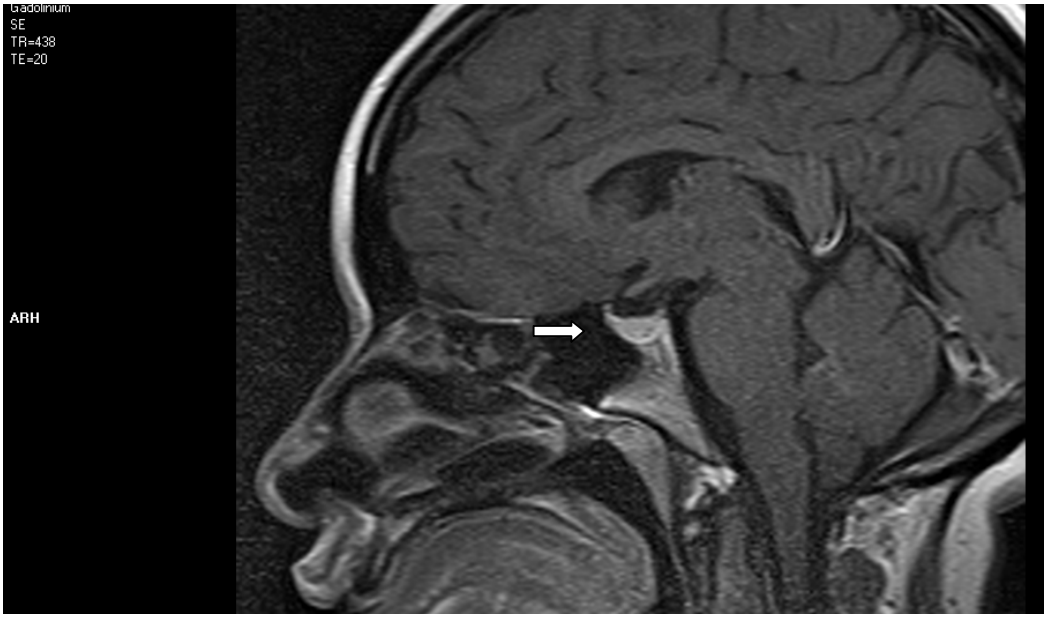

Image (1) MRI Brain sagital T1 WI with contrast showing Normal pituitary for 25 years old female

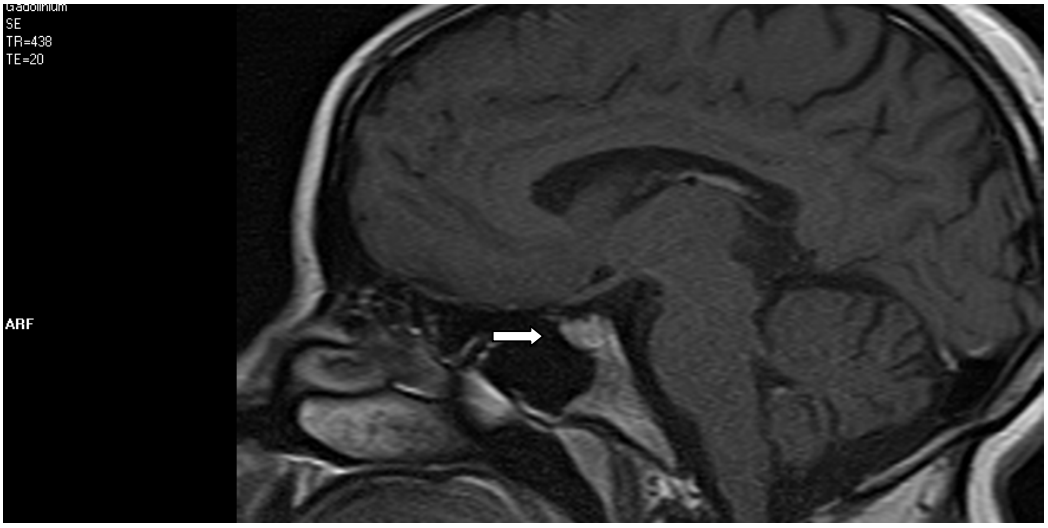

Image (2) MRI Brain sagital T1 WI with contrast showing microadenoma for 32 years old male

Image (3) MRI Brain sagital T1 WI with contrast showing microadenoma for 30 years old male

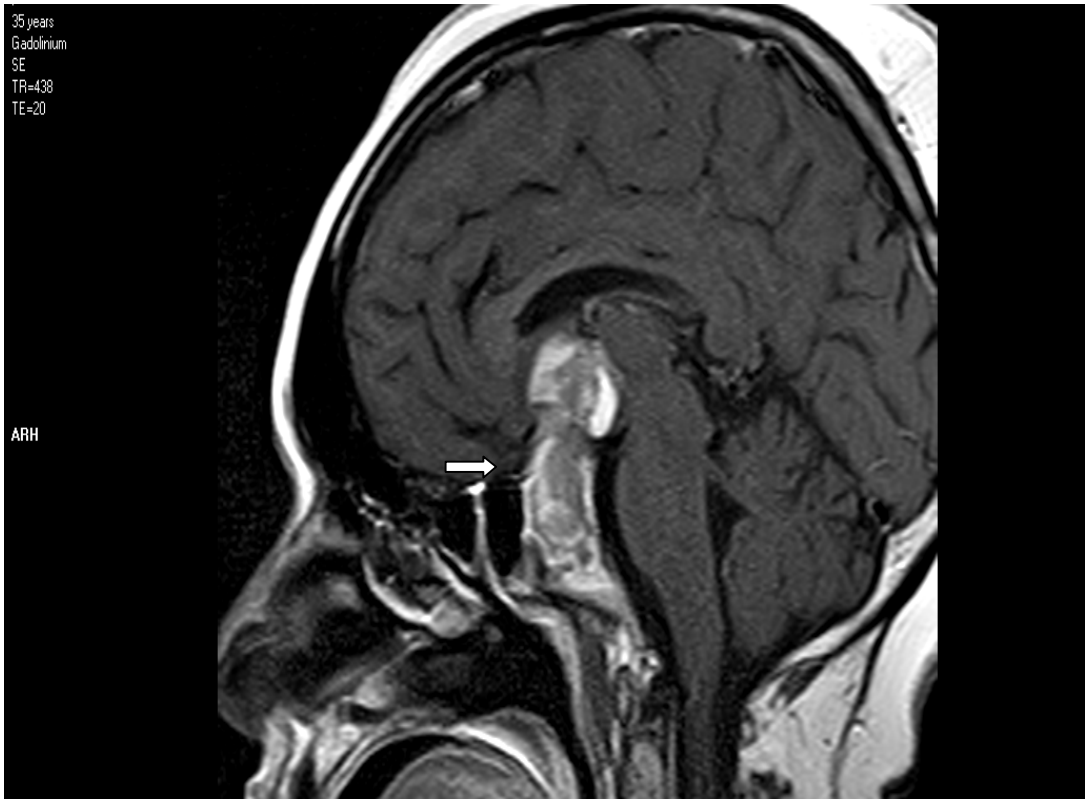

Image (4) MRI Brain sagital T1 WI with contrast showing macroadenoma for 35 years old female

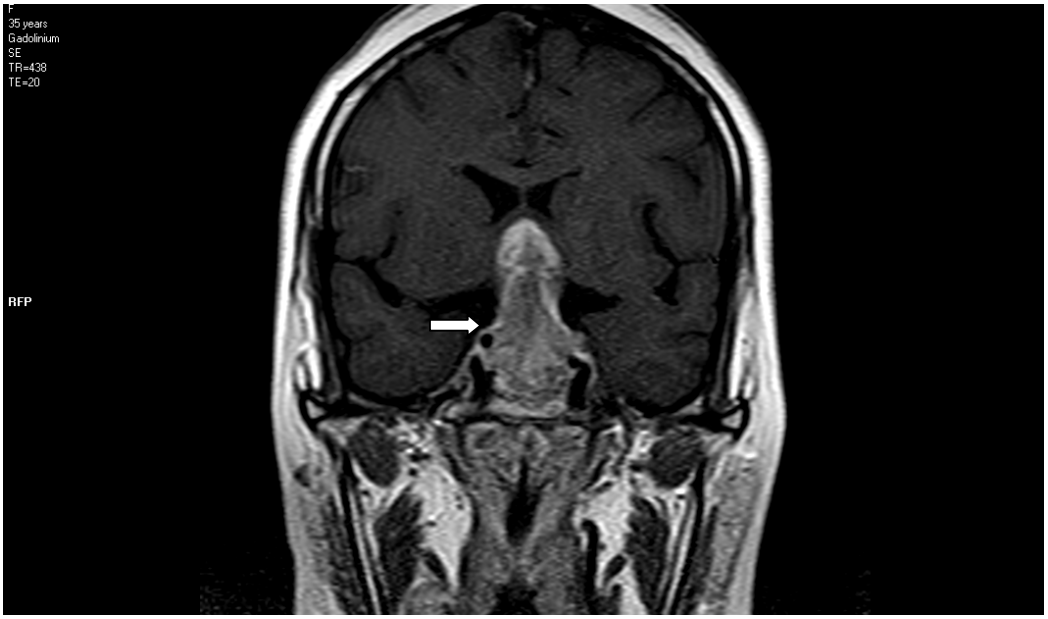

Image (5) MRI Brain Coronal T1W with contrast showing macroadenoma for 35 years old female

Image (6) MRI Brain sagital T1 WI with contrast showing macroadenoma for 44 years old female

Image (7) MRI Brain Coronal T1W with contrast showing macroadenoma for 44 years old female

Appendices 2

Sudan University of Science and Technology

College of Graduate Studies

M.Sc in Medical Diagnostic Radiology

Questionnaire

Research Title: - Evaluation of pituitary gland for patient with visual disturbance using MRI

Thesis submitted for partial fulfillment of requirements of MSc in Medical Diagnostic Radiology

Date:-…….. "sample " /control group

Patient Age:-…….years Patient Sex male ☐ female ☐

Age of onset ……month/year

Duration of disturbance

Pituitary size ……

Presence of headache ……

Presence of visual disturbance ……..

Presence of headache /visual disturbance ……

Cavernous sinus invasion ……..

Optic chiasm compression ……

Signal intensity T1:-……..

T1with contrast:-……..

Treatment ……

Remarks:-……..

Thank you for your cooperation