Pituitary adenoma diagnostic value of dynamic mr imaging biology essay

Methods: The study included 20 patients suspected to suffer from pituitary adenomas on clinical and laboratory evidences, they were referred to the Radiodiagnosis Department, Faculty of medicine, University of Alexandria. All patients were subjected to: Full history taking and thorough clinical examination, Laboratory investigations (hormonal profile) and Full MRI examination of the sella-MRI was performed on a 1. 5 Tesla closed-configuration Philips Gyroscan Intera (Netherlands, Eindhoven) system using a Head coil

The applied MRI protocols included Coronal T2 weighted turbo spin echo (T2 TSE), Precontrast Coronal and sagittal T1 weighted spin echo (T1 SE), Dynamic Post contrast coronal T1 turbo spin echo TSE (performed with rapid hand injection of a 0. 1 mmol/kg dose of gadopentetate dimeglumine (Magnevist; Bayer Schering Pharma AG, Germany) with the bolus injected over 5 seconds. MR imaging was started at the beginning of the injection. No side effects due to contrast agent injection were noted during the study. Ten sets of images, each consisting of Three anatomic sections through the pituitary gland, were acquired using a T1 weighted turbo spin echo with the following parameters: TR = 400 msec, TE = 10 msec, FOV = 180 mm, 256 Ã- 256 acquisition matrix, 3 mm slice thickness with no intersection gap and the TSE factor is 7, This technique yields an imaging time of 16 sec per set and a total time of 2 min 40 secs.), Post contrast conventional coronal and sagittal T1 Spin echo (TR of 550 msec, a TE of 15 msec, a 256 Ã- 256 acquisition matrix, a field of view of 180 mm, a slice thickness of 3 mm and a gap of 0. 3 mm , given an acquisition time of 3 mn 23 sec.), Brain survey including axial turbo spin echo T2 and axial brain T1 SE post contrast.

Results: Eighteen patients were females (90%), while 2 patients were males (10%). The age range was 18-52 years with a mean of 29. 20 ± 9. 80 year. Based on clinical and laboratory evidence, there were 15 patients of prolactinomas, 2 patients of ACTH secreting adenomas, one patient of GH secreting adenoma, and one case of Gonadotrophin secreting adenoma. MRI studies showed that on T1 Precontrast weighted images, pituitary microadenomas were isointense in 70% of cases and hypointense in 30% of cases. No microadenomas showed a hyperintense signal on T1 weighted images. On T2 weighted images, 60% of microadenomas were isointense, 25% were hyperintense while only 15% showed hypointense signal pattern. Following GAD injection The conventional T1 Postcontrast weighted images showed that 60% of the microadenomas were isointense, 20% of the microadenomas showed faint hypointensity while in 20% showed evident hypointense signal. The dynamic MRI scans showed that on early scans (30-90 sec): The microadenomas showed an evident hypointense signal in 95% of cases while only in 5% of cases, it showed faint hypointense signal. On late scans (> 90sec): 20% of the microadenomas that showed a hypointense signal were found to become isointense to the normal pituitary gland while 80% showed no difference in signal intensity as compared to the early scans. The statistical tests results showed evidence of definite improvement in lesion detection by dynamic sequences whether early or late in comparison to the conventional postcontrast one. Also no statistically significant difference was found between early and late dynamic scans in lesion detection. Comparing the MR signal intensity and the size of the pituitary microadenomas in both conventional and dynamic scans, 60% the microadenomas were depicted only in the dynamic scans. In 20% of cases

the microadenomas were better depicted in both conventional and dynamic scans. Only in 20% of cases the lesions were equally seen in both conventional and dynamic scans.

Regarding the size of the detected pituitary microadenomas, it ranged from 2-9. 5 mm in its maximum diameter. It was found that with increase in the lesion size, the detection in the both early dynamic and conventional scans tend to be equal while in smaller size lesions the early dynamic scan was better than the conventional scan in lesion detection. (r = 0. 542) which was statistically significant (p = 0. 014).

Conclusions: the results of the present study confirmed that dynamic MRI contrast sequences have proved to be more sensitive than the conventional post contrast T1 sequences in detection of microadneomas and should be included in the routine examination of all cases of suspected microadenomas.

Key words: Pituitary adenoma, Dynamic MRI.

Abbreviations: MRI (magnetic resonance imaging)

Introduction

ISSN 1110-0834Magnetic Resonance Imaging is the standard modality of choice for imaging of the pituitary gland; it was found to be superior to the CT for

the assessment of the pituitary region as it has significantly better soft tissue resolution than CT and avoids bony artifacts and ionizing radiation. Also the

multiplanar capability of MRI allows direct imaging in all three planes.(1, 2) It is generally accepted that the coronal plane is the most useful plane or section for imaging the pituitary gland. This plane allows visualization of the pituitary gland free of partial averaging effects from the carotid arteries, sphenoid sinus, and suprasellar cistern. Coronal images are virtually always considered in conjunction with an imaging series in the sagittal plane, primarily for display of midline structures. Practically speaking, most scanning protocols start with a sagittal sequence for localization; for patients imaged for suspected pituitary pathology, this initial sagittal sequence should be performed with a high-resolution technique.(3)

The pulse sequence for best tissue contrast and anatomic display in this region is generally accepted to be T1-weighted imaging, although there may still be some controversy as to what sequences are needed in addition to those. Spin echo (SE) methods were the first to gain widespread popularity and continue to be the most widely used. Several groups have shown that short repetition time, short echo time SE images (i. e., T1-weighted) generate very good contrast for visualizing pituitary pathology. Compared with T1-weighted images, long repetition time, long echo time SE (i. e., T2-weighted) images have been less successful in demonstrating small adenomas. However, there are occasional cases in which only the T2-weighted image has been positive so T2-weighted FSE imaging is sometimes used as a supplementary sequence for pituitary imaging.(3)

Paramagnetic contrast-enhanced images are widely used and can be very useful., It has excellent capability to highlight and delineate pituitary

adenomas which provides crucial informations, several studies have shown that small adenomas may become visible only after contrast injection.(3, 4)

The anterior and posterior lobes of the pituitary gland are easily distinguished on MR images. With the exception of the neonate and in pregnancy, the anterior lobe is similar in signal intensity to cerebral white matter on all pulse sequences, whereas the posterior lobe is distinctly hyperintense on T1-weighted images and referred to as “ bright spot”

The etiology of its increased T1 signal remains controversial. Current explanations include the presence of phospholipids vesicles in the posterior lobe-which enhance the relaxation of water-and

the presence of hormones.(5) Because the bright

spot is absent in patients with diabetes insipidus,

it is believed that vasopressin is responsible for

this high T1 signal in the posterior lobe.(6) Upon administration of I. V. contrast, the anterior lobe, the posterior lobe, and the pituitary stalk all show homogenous intense enhancement, the pituitary stalk is the central landmark in the suprasellar cistern. It is approximately 2 mm thick, wider superiorly and tapering inferiorly. It descends from the inferior hypothalamus, through the diaphragma sellae, to insert onto the superior surface of the pituitary gland at the junction of the anterior and posterior lobes.(3)

The MR image of the pituitary adenoma is characterized by evidence of lengthening of both

T1 and T2 relaxation when compared with

normal pituitary tissue. In 80% to 95% of cases,

T1-weighted images of pituitary microadenomas show a focal hypointense lesion within an otherwise homogeneous adenohypophysis. The remainder

are isointense or hyperintense. Small isointense adenomas constitute the majority of false-negative MR examinations. Many of these can be detected

on contrast-enhanced MR studies. Hyperintensity

in adenomas is accounted for by the presence of

old blood in the tumor. About one third of microadenomas are hyperintense with T2 weighting; most of the remainder are isointense. Those tumors that remain isointense on T2- weighted images are said to have a fibrous consistency.(3, 8)

Secondary signs of microadenomas include lateral deviation of the infundibulum and focal upward convexity of the pituitary gland. There are caveats

in the application of these secondary signs.(9) As patients with normal pituitary glands may exhibit a pronounced infundibular tilt due to eccentric gland position or ectopic infundibular insertion into the gland.(10) The size and shape of the pituitary gland normally vary with age and physiologic

function, such that upward convexity of the gland is common in adolescent girls.(11)

Because of the differential rates of contrast enhancement between adenomas and normal pituitary gland, lesion conspicuity can be optimized by scanning immediately after administration of the contrast agent. Immediately after contrast injection, most adenomas will appear as relatively non enhancing lesions within an intensely enhancing pituitary gland. However, soon afterward this image contrast begins to dissipate and the adenoma may

no longer be detectable . This is because the peak enhancement of adenomas occurs at a time later

than the peak enhancement of the normal gland so

if imaging is delayed too long, the signal from

the delayed enhancing adenoma may be equal to (a source of potential false-negatives), or possibly greater than, that of the surrounding gland (which is diminishing in enhancement), the so-called “ flip-flop” phenomenon.(7) Consequently rapid dynamic MR imaging may increase image contrast beyond that of conventional contrast-enhanced imaging which typically takes several minutes.(12)

As the demonstration of pituitary microadenoma remains a major diagnostic challenge for pituitary imaging. Identification of adenomas less than 10 mm in size demands the highest standards of imaging technique and interpretation. This requires effective MR protocol that considers image

contrast and spatial resolution requirements yet optimizes the scanning time. As in all MR protocols, the overall objective is to obtain the most spatially detailed images in the appropriate plane, best possible signal-to-noise ratio, and highest image contrast within the shortest period of time. And the development of faster and faster imaging sequences has popularized “ dynamic imaging” of the pituitary gland. Dynamic imaging sequences may have temporal resolution as fast as 1 to 2 seconds per set of images.(3)

This study aimed to evaluate the role of dynamic MR imaging in diagnosis of pituitary adenoma

Methods

This study included 20 patients suspected to suffer from pituitary lesions (mostly adenomas) on clinical and laboratory evidences, they were referred to the Radiodiagnosis Department, Faculty of medicine, University of Alexandria.

All patients were subjected to: Full history taking and thorough clinical examination, Laboratory investigations (hormonal profile) which were performed according to the clinical diagnosis and Full MRI examination of the sella. MRI was performed on a 1. 5 Tesla closed-configuration Philips Gyroscan Intera (Netherlands, Eindhoven) system using a Head coil

All patients were subjected to the following MRI protocols:-

1. Coronal T2 weighted turbo spin echo (T2 TSE)

2. Precontrast Coronal and sagittal T1 weighted spin echo (T1 SE)

3. Dynamic Post contrast coronal T1 turbo spin echo TSE

All dynamic studies were performed with

rapid hand injection of a 0. 1 mmol/kg dose of gadopentetate dimeglumine (Magnevist; Bayer Schering Pharma AG, Germany). The injection was performed through an intravenous cannula placed before the start of the study, with the bolus injected over 5 seconds. MR imaging was started at the beginning of the injection. No side effects due to contrast agent injection were noted during the study.

Ten sets of images, each consisting of Three anatomic sections through the pituitary gland, were acquired using a T1 weighted turbo spin echo with the following parameters: TR = 400 msec, TE = 10 msec, FOV = 180 mm, 256 Ã- 256 acquisition matrix, 3 mm slice thickness with no intersection gap and the TSE factor is 7, This technique yields an imaging time of 16 sec per set and a total time of 2 min 40 secs.

4. Post contrast conventional coronal and sagittal T1 Spin echo with the following parameters: A TR of 550 msec, a TE of 15 msec, a 256 Ã- 256 acquisition matrix, a field of view of 180 mm, a slice thickness of 3 mm and a gap of 0. 3 mm, given an acquisition time of 3 mn 23 sec.

5. Brain survey including axial turbo spin echo T2 and axial brain T1 SE post contrast.

Statistical methodology:

The statistical analysis of the date obtained in

the current study wad carried out using SPSS version 15. Quantitative data were expressed in mean and standard deviation while the qualitative data were expressed in frequency and percentage. Pearson coefficient was used to find the correlation between the different variables. Chi square,

Fissure Exact test and Monte Carlo test were used to find the significance of difference between qualitative data.

RESULTS

This study was conducted on 20 patients who presented with clinical and biochemical evidence of a hormonally active pituitary adenoma. Eighteen patients were females (90%), while 2 patients were males (10%). The age range was 18-52 years with a mean of 29. 20 ± 9. 80 years

Regarding the clinical evidence, the most common non specific symptom was headache in 11 patients (55%), while the most common endocrinal

symptom was amenorrhea in 10 cases (50%), also 6 patients complained with galactorrhea (30%), three patients complained of menstrual irregularities (15%), two patients complained of cushing syndrome and weight gain (10%), one complained of acromegalic features (5%), one complained of polyurea and polydepsia which was suggestive of diabetes insipidus (5%), and one complained of hypogonadism with delayed puberty (5%), while one patient has no endocrinal symptoms and was incidentally discovered on biochemical basis (5%)

Laboratory findings in all patients were as following:

Prolactin hormone was found to be elevated in 15 patients (75%).

ACTH and cortisol level were found to be elevated in 2 patients (10%)

Growth hormone was found to be elevated in 1 patient (5%).

FSH was found to be slightly elevated in 1 patient (5%).

Only one patient (5%) showed no laboratory hormonal disturbances.

So regarding the clinical and biochemical findings, there was evidence of 15 patients of prolactinomas, 2 patients of ACTH secreting adenomas, one

patient of GH secreting adenoma, and one case of Gonadotrophin secreting adenoma.

All patients were subjected to the previously mentioned MRI protocols and the following data were obtained:-

MR signal Intensity of the pituitary microadenomas on T1 precontrast and T2 weighted images:-

[Table I]

On T1 Precontrast weighted images, 14 (70%) of the detected pituitary microadenomas were isointense, while only 6 (30%) of the detected microadenomas showed hypointense signal on T1. No microadenomas showed a hyperintense signal on T1 weighted images.

On T2 weighted images, 12 microadenomas (60%) were isointense, 5 (25%) were hyperintense while only 3 (15%) showed hypointense signal pattern.

MR signal Intensity of pituitary microadenomas after IV injection of GAD [Table II]:

On Conventional T1 Postcontrast weighted images, the majority of the microadenomas were isointense (in 12 cases (60%)), in 4 cases (20%) the microadenomas showed faint hypointensity while in other 4 cases (20%) they showed an evident hypointense signal.

On dynamic scans

On early scans (30-90 sec): The microadenomas showed an evident hypointense signal in 19 case (95%) while only in one case (5%) it showed faint hypointense signal.

On late scans (> 90sec): Four (20%) of the microadenomas that showed a hypointense signal were found to become isointense to the normal pituitary gland while the remaining 16 (80%) showed no difference in signal intensity as compared to the early scans.

The statistical tests results show:

Definite improvement in lesion detection by dynamic sequences whether early or late in comparison to the conventional postcontrast one.

No statistically significant difference between early and late dynamic scans in lesion detection.

Value of different MRI protocols in lesion detection:-

Comparing the MR signal intensity and the size of the noted pituitary microadenomas in both conventional and dynamic scans , three groups were differentiated : [Table III]

Lesions ONLY detected on dynamic scans.

Lesions BETTER defined on dynamic scans

Lesions EQUALLY seen on both dynamic and conventional scans.

Lesions only detected on dynamic scans:

In 12 cases (60%) the microadenomas were depicted only in the dynamic scans where the lesions were isointense in conventional postcontrast scans due to progressive lesion enhancement with decreased contrast discrimination between the lesion and the adjacent normal pituitary tissue. (Fig. 2-3)

Lesions better defined on dynamic scans:

In 4 cases (20%) the microadenomas were depicted in both conventional and dynamic scans but they were more pronounced in dynamic scans where it showed a more evident signal hypointensity in 3 cases while in one case the reduced lesion visibility on the conventional scans was due to reduction in size of the lesion caused by partial filling in or enhancement of the lesion at its borders (Fig. 3)

Lesions equally seen in both conventional and dynamic scans :

Only in 4 cases (20%) the lesions were equally seen in both conventional and dynamic scans.

The size of the pituitary microadenomas:

Regarding the size of the detected pituitary microadenomas, it ranged from 2-9. 5 mm in its maximum diameter.

It was found that with increase in the lesion size, the detection in the both early dynamic and conventional scans tend to be equal while in smaller size lesions the early dynamic scan was better than the conventional scan in lesion detection. (r = 0. 542) which was statistically significant (p = 0. 014). [Table IV].

Table I: Distribution of the studied sample regarding signal intensity

on precontrast T1 & T2 weighted images

T1

T2

No

%

No.

%

Isointense

14

70. 0

12

60. 0

Hypointense

6

30. 0

3

15. 0

Hyperintense

0

0. 0

5

25. 0

Table II: Distribution of the studied sample regarding signal intensity following IV injection of GAD in conventional and dynamic scans with correlation between each protocol according to the test of significance

Conventional

Early Dynamic

Late dynamic

No

%

No

%

No.

%

Hypointense

4

20. 0

19

95. 0

15

75. 0

faint hypointense

4

20. 0

1

5. 0

1

5. 0

Isointense

12

60. 0

0

0. 0

4

20. 0

Test of sig. (1)

FET = 25. 458** MCp < 0. 001

12. 001**

MCp = 0. 003

Test of sig. (2)

FET = 4. 409

MCp = 0. 105

FET: Fisher Exact test

MCp: Significance (p) for Monte Carlo test

*: Statistically significant at p £ 0. 05 **: Statistically significant at p £ 0. 01

Test of sig. (1): Between conventional and dynamic sequences whether early or late

Test of sig. (2): Between Early and late dynamic

Table III: Comparison between conventional and early dynamic scans

as regard the lesion detection:-

Lesion detection

No.

%

Only in dynamic scan

12

60. 0

Better in dynamic scan than conventional scan

4

20. 0

Equal in both dynamic and conventional scans

4

20. 0

Table IV: Comparison between conventional and early dynamic scans correlated with lesion size

No.

%

Range

Mean±SD

r (p)

Only in dynamic scan

12

60. 0

2. 00-8. 00

4. 04±2. 26

0. 542*

(0. 014)

Better in dynamic scan than conventional scan

4

20. 0

3. 00-6. 00

4. 00±1. 41

Equal in both dynamic and conventional scans

4

20. 0

5. 00-9. 50

7. 88±2. 02

r : Pearson coefficient for correlation

* : Statistically significant at p £ 0. 05

Fig 1: A. Conventional T1 post GAD image shows no detected lesions B. Early Dynamic scan shows a small 2 mm hypointense lesion on the right side of the gland (arrow). C. Late dynamic scan : progressive lesion enhancement at its periphery has occurred rendering the lesion nearly isointense to the gland

Fig 2: A . Conventional T1 post GAD image shows normal appearance of the pituitary gland. B. Early Dynamic scan shows a small 2 mm central hypointense lesion of the pituitary gland (arrow). Note slightly depressed floor on the left side

Fig 3: A. Conventional T1 post GAD image shows a faint hypointense lesion on the right side of the pituitary gland (arrow). B. Dynamic scan (Both Early and Late) shows a more conspicuous hypointense lesion on the right side of the pituitary gland (arrow).

DISCUSSION

MRI techniques in pituitary adenomas have witnessed rapid evolution ranging from the onset

of non-contrast MRI studies in late 80’s to introduction of contrast MRI scans in early nineties. The early non-contrast MRI studies were primarily considered in a comparative role, more so as an alternative imaging modality to CT scan. MRI was found to be superior to CT scan in the evaluation of pituitary adenomas except in the demonstration of the bony sellar erosion and tumor calcification.(2, 8) Encouraging progress was made during the early 90’s in MR technical refinements and in the application of a variety of MRI sequences in pituitary microadenoma.(13)

As the demonstration of pituitary microadenoma remains a major diagnostic challenge for pituitary imaging, identification of adenomas less than 10 mm in size demands the highest standards of imaging technique and interpretation. This requires effective MR protocol that considers image contrast and spatial resolution requirements yet ptimizes the scanning time. As in all MR protocols, the overall objective is to obtain the most spatially detailed images in the appropriate plane, best possible signal-to-noise ratio, and highest image contrast within the shortest period of time. And the

development of faster and faster imaging sequences has popularized “ dynamic imaging” of the pituitary gland.(3)

Dynamic MRI emerged as a new imaging tool in the mid 90’s because of evolution of the technical advances and refinements in MR imaging. As The detection of pituitary microadenomas on MR images strongly depends on the image contrast between the microadenoma and normal pituitary tissue, contrast-enhanced MR imaging has been extensively used to improve image contrast and hence improve the detection of microadenomas, Image contrast may reach its maximum less than 1 min after the injection of contrast agent Thus, rapid dynamic MR imaging may increase image contrast beyond that of conventional contrast-enhanced imaging which typically takes several minutes to perform.(12)

In the current study our aim was to evaluate the role of dynamic contrast MRI sequences in diagnosis of pituitary microadenomas, as compared to conventional post contrast sequences.

Miki et al.(14) were from the first authors to apply dynamic studies in microadenoma. Subsequently, Sakomoto et al.(15) performed dynamic studies

in microadenoma and macroadenoma. Seven to

ten images were obtained every 20 to 30 seconds while injecting gadolinium. The earliest contrast enhancement of normal structures was seen in the infundibulum and posterior lobe of pituitary gland

at 20 seconds, followed by gradual contrast enhancement of the anterior lobe from the junction of the infundibulum to the peripheral portion of the anterior lobe within 80 seconds after gadolinium injection. The signal intensity of the pituitary gland became homogeneous after 90 seconds. Also Tien(16) described the expected sequence of enhancement of various portion of the pituitary gland on dynamic MR. This was explained as the normal posterior pituitary lobe receives direct arterial blood supply from the inferior hypophyseal arteries; blood is supplied to the stalk from the superior hypophyseal arteries; and the anterior lobe is supplied with blood from the superior hypophyseal arteries indirectly through the pituitary portal system. Therefore, in

the dynamic gadolinium-enhanced MR imaging

of pituitary glands, contrast enhancement was estimated to be in the following order as described in previously-published papers: posterior lobe, stalk, anterior lobe.(17)

Sakamoto et al.(15) and Miki et al.(14) demonstrated that the best contrast for microadenomas was obtained on early phase dynamic images, 30-90

sec and 1-3 min after a gadolinium contrast injection respectively , and that it decreased on the images obtained several minutes later. These preliminary data have been confirmed by several studies (Bishop et al.;(18) Davis et al.;(19) Elster;(20) Kucharczyk et al.(12))

The results of the current study reinforce the findings of previous studies, which have shown that gland and lesion contrast enhancement change

rapidly in the first minutes after contrast injection. Where the best contrast between the gland and the microadenomas obtained on the early phase of dynamic scan 30-90 sec as the microadenomas showed an evident hypointense signal in 19 cases (95%) while only in one case (5%) it showed faint hypointense signal in its early scans (30-90 sec). On late scans (> 90sec) 4 of the microadenomas that showed a hypointense signal were found to be isointense to the normal pituitary gland while the others showed no difference in signal intensity. While on Conventional T1 Postcontrast weighted images, the majority of the microadenomas were isointense (in 12 cases (60%), in 4 cases (20%) the microadenomas showed faint hypointensity while in other 4 cases (20%) they showed an evident hypointense signal.

Better delineation of pituitary adenomas on early-phase dynamic images is due to more remarkable enhancement is seen with normal pituitary glands than with adenomas and the time of peak enhancement of the adenoma is slightly later than that for the normal pituitary gland so they appear as focal hypointense areas. During late-phase dynamic imaging, the wash out of gadopentetate dimeglumine was slightly faster in the normal pituitary gland than in pituitary adenoma. Therefore, images obtained several minutes after gadopentetate dimeglumine injection showed diminished contrast between adenoma and the normal pituitary gland and could lead to equalization in the gland-lesion contrast and reduction in adenoma detection.(15)

In the current study by Comparing the MR signal intensity and the size of the noted pituitary microadenomas in both conventional and dynamic scans, it revealed that in 12 cases (60%) the microadenomas were depicted only in

the dynamic scans where the lesions were isointense in conventional postcontrast scans due to progressive lesion enhancement with decreased contrast discrimination between the lesion and the adjacent normal pituitary tissue, in 4 cases (20%) the microadenomas were depicted in both conventional and dynamic scans but they were more pronounced on dynamic scans where it showed a more evident signal intensity in 3 cases while in one case the reduced lesion visibility on the conventional scans was due to reduction in size of the lesion caused by partial filling in or enhancement of the lesion at its borders, while only in 4 cases (20%) the lesions were equally seen in both conventional and dynamic scans.

These results were matching with the recent study done by Friedman et al. (21) Where almost all patients in this study with Cushing's syndrome have a lesion on dynamic pituitary MRI, a rate much higher than the 50 – 60 % rate reported for non-dynamic MRIs.

In the study of Bartynski et al.(22) The dynamic sequence was judged to be better than the standard enhanced sequence for depicting microlesions in 42% to 47% of patients. Lesions were identified only on the dynamic study in an additional 11% to 14% of patients. Lesions were seen equally well on the standard and dynamic sequences only in 16% to 23% of cases.

Kucharczyk et al.(12) Identified thirteen microadenomas in 18 patients on dynamic imaging four of them (30%) were not evident on conventional imaging. Also Kanou et al(23) in

their study, they depicted three (14. 3%) of 21 microadenomas by dynamic scan which haven't shown by the conventional MR.

In the current study the findings were correlated with the size of the lesion and it revealed that with increase in the lesion size, the detection in both the early dynamic and conventional scans tend to be equal while in smaller size lesions the early dynamic scan was better than the conventional scan in lesion detection which was statistically significant.

These findings were matching with the finding of Chang et al.(24) who also noted the value of dynamic scan in the detection of small lesions less than 5 mm, where they performed their study also on Philips Gyroscan Intera 1. 5T superconducted MRI system and it included 36 cases of microadenomas where they all detected by dynamic scan, all cases had a pathological confirmation after operation, nineteen cases were 3 mm in size while the largest one was 5mm in size. They also noted that the perfect contrast usually between 16. 8-25. 2 sec and contrast decreased after 33. 5 sec.

We chose the spin-echo technique for this dynamic study. We could use the gradient-echo technique to obtain images with better signal-to-noise ratios and shorten sampling times. However, in most of the mentioned studies the peak images occurred 30-60 sec after Gad injection. This suggests that the temporal resolution does not need to be improved far below 30 sec allowing improvement of signal-to-noise ratio that usually decline with more stringent time requirements. Thus, the speed advantage of gradient-echo imaging(13, 25) may be useless for detecting microadenomas. Furthermore, th