

# DYNAMIC MR IMAGING IN THE DETECTION OF PITUITARY MICROADENOMA\*

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## ABSTRACT

**Objective:** In this study our purpose was to compare efficiency in detecting microadenoma between conventional unenhanced MRI and contrast-enhanced MRI with dynamic fast spin-echo method.

**Methods:** Thirty-two patients with suspected pituitary microadenoma had unenhanced, dynamic fast spin-echo contrast enhanced and conventional contrast-enhanced MR imaging of the pituitary gland. All MR studies were reviewed for the presence or absence of any pituitary focal pathological intensity consistent with microadenoma.

**Result:** A pituitary lesion consistent in appearance with a microadenoma was detected on dynamic fast spin-echo images in 17 of the 32 patients, on unenhanced images in 8 patients, and on conventional contrast-enhanced images in 11 patients.

**Conclusion:** Dynamic fast spin-echo imaging is a useful supplemental sequence in patients undergoing MR imaging because of pituitary endocrinopathy. It may show lesions that might otherwise escape detection.

**Key Words:** Magnetic resonance imaging, Pituitary microadenoma, Dynamic MRI

## INTRODUCTION

The detection of pituitary microadenomas on MR imaging 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 the detection of microadenomas. Rapid dynamic MR imaging may increase image contrast beyond that of conventional contrast-enhanced imaging (1-4). It has been reported that better contrast between the normal pituitary gland and microadenomas can be seen on images obtained shortly after the administration of gadopentetate dimeglumine, as it accumulates in microadenomas slightly more slowly than in the normal pituitary gland; this contrast may be lost on later images (5-6).

In this study; our purpose was to compare how frequently a microadenoma could be detected with conventional unenhanced MRI, with contrast enhanced MRI and with dynamic fast spin-echo (FSE) MRI.

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## MATERIAL AND METHODS

Thirty-two patients with clinical and biochemical evidence of suspected pituitary adenomas made up the study group. All examinations were performed with 1.5-T superconductive MR units. The imaging technique was the same in all patients. For initial imaging, an unenhanced coronal T1-weighted multislice conventional spin-echo sequence (TR/TE=400/11) and fast spin-echo T2-weighted (TR/TE=3000/95, ET=16) sequence were used. Then, coronal dynamic FSE imaging (TR/TE=350/11, ET=4) started simultaneously with the bolus injection of contrast material (gadopentetate dimeglumine, 0.1ml/kg). Six sets of dynamic images, each consisting of three slice locations, were acquired at 24-sec intervals. Immediately after completion of the dynamic scan, the coronal T1-weighted conventional spin-echo sequence was repeated. All scans had 3-mm slice thickness and 0.3-mm gap.

MR images of the patients were filmed in an identical format. Region-of-interest measurements of pituitary/adenoma contrast were done in all dynamic FSE images. An experienced neuroradiologist reviewed all the unenhanced, contrast-enhanced, and dynamic FSE images for the presence or absence of any pituitary focal pathological intensity consistent with microadenoma.

## RESULTS

A pituitary lesion consistent in appearance with a microadenoma was detected on dynamic FSE images in 17 of the 32 patients, on unenhanced images in 8 patients, and on conventional contrast-enhanced images in 11 patients. Dynamic FSE images showed all microadenoma detected by contrast-enhanced images and unenhanced images. Dynamic FSE images showed microadenomas in 17 patients. Compared to unenhanced and conventional contrast-enhanced MR, dynamic FSE images detected 6 additional microadenomas. The range of microadenoma sizes was 3-10 mm. Illustrative examples of dynamic FSE images and unenhanced and contrast enhanced images of microadenomas are shown in figure 1. and figure 2. Region-of-interest measurement of pituitary/adenoma contrast is seen in figure 3.



a

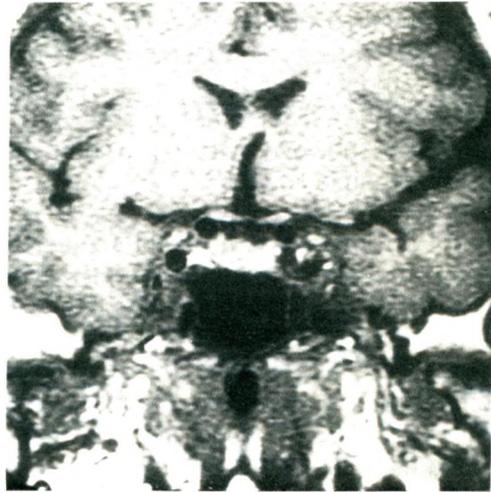


b

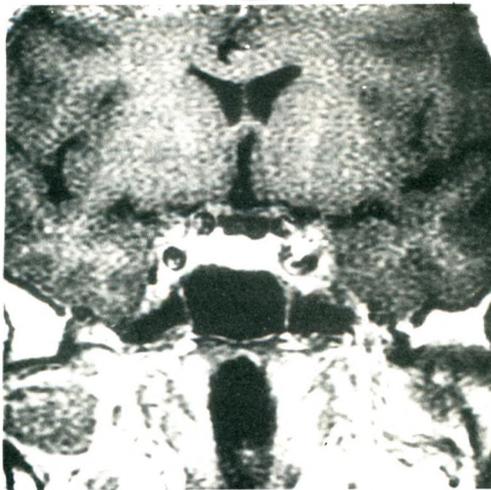


c

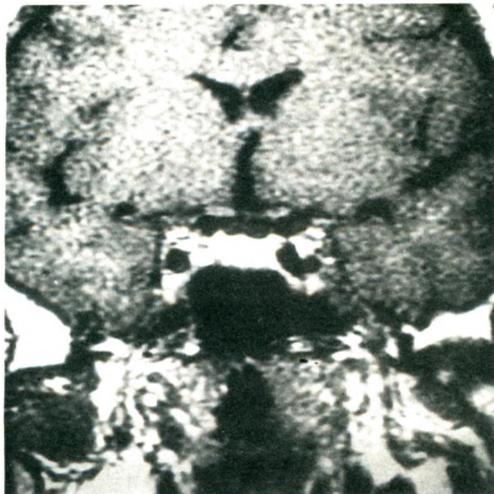
**Fig.1 :** Unenhanced (a), enhanced (b) and dynamic FSE (c) images of the pituitary gland: All sequences show microadenoma.



a

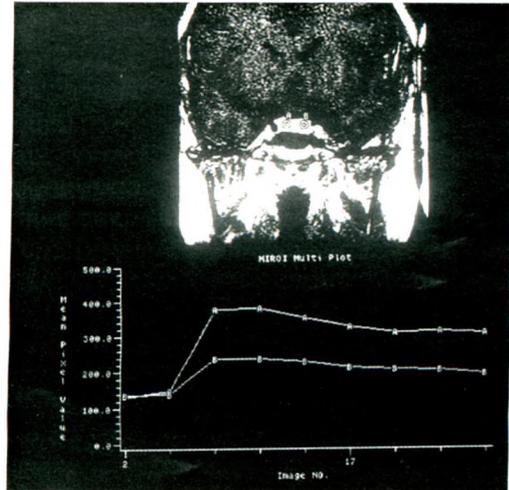


b



c

**Fig. 2 :** Unenhanced (a), enhanced (b) and dynamic FSE (c) images of pituitary gland: Microadenoma is seen best on early phase of dynamic FSE image.



**Fig. 3 :** Dynamic FSE images of pituitary gland: Region-of-interest measurements of pituitary/adenoma contrast is seen. Immediately after contrast injection, normal pituitary gland enhances more than adenoma.

## DISCUSSION

Today MR imaging has largely replaced CT as the preferred technique for initial imaging evaluation of suspected pathologic conditions of the pituitary gland. Optimal MR imaging protocol has not yet been uniformly accepted and will also be expected to vary according to the precise clinical problem being investigated.

Routine use of magnetic resonance imaging has not always provided accurate and sufficient information for the surgical treatment of pituitary adenomas despite application of high-field superconductive MR units. In some patients, routine MR imaging may not reveal abnormalities in the presence of definite hormonal abnormalities.

The optimal imaging strategy for evaluating a patient with a suspected pituitary microadenoma depends largely on the treatment philosophy of the referring endocrinologist or surgeon. At many institutions, small prolactinoma are treated medically; here, the role of imaging is to exclude a macroadenoma or other central process causing increased prolactin level. Conversely, at institutions where most microadenomas are treated surgically, preoperative knowledge of the probable size and location of the adenoma is more important; imaging strategies that allow

even a small fraction of additional microadenoma to be identified may be crucial.

Conspicuity of microadenomas varies from case to case, and therefore no single MR sequence is consistently best for imaging. On unenhanced MR images, the differences in conspicuousness are most likely due to inherent differences in MR relaxation between adenomas. On contrast enhanced images, differences in conspicuousness arise from variations in tissue perfusion, the size of the extracellular space, and the penetration of contrast agents into the extracellular space. These tissue properties cannot be predicted; therefore, if clinical circumstances necessitate localising the adenoma, more than one sequence must be used in order to cover all possibilities. To improve the diagnostic usefulness of MR imaging in pituitary adenomas, gadopentetate dimeglumine-enhanced dynamic MR imaging was introduced to increase the contrast between normal pituitary tissue and pituitary adenomas. A number of investigators used dynamic MR methods for examination of the pituitary gland. Sakamoto et al. (1) used conventional spin-echo images for dynamic MR imaging but reduced the matrix size and number of signals averaged in order to improve temporal resolution. The number of microadenomas visualised increased, but the spatial resolution and signal-to-noise ratio of the images were considerably reduced compared to those of the usual diagnostic sequences. Stadnik et al. (4) used a gradient-echo method. Susceptibility artefacts from the skull base and air-containing sphenoid sinus are inherent disadvantages to this approach. Most recently, T-1 weighted FSE methods have been used. FSE imaging is inherently faster than conventional spin-echo imaging. In our study, dynamic FSE MR images in 32 patients with pituitary endocrinopathies showed 17 focal pituitary lesions which were consistent in appearance with microadenomas. Six of 17 microadenomas were not visible on either conventional unenhanced or

contrast enhanced MR images. On early-phase dynamic MR images, microadenomas were well visualised with clear borders. The differentiation between a normal pituitary gland and the microadenoma, however, was not evident on the late-phase dynamic images.

Dynamic FSE imaging is a useful supplemental sequence in patients undergoing MR imaging because of pituitary endocrinopathy. It may show lesions that might otherwise escape detection. If the laboratory results suggest the presence of an adenoma, and if preferred treatment strategy is generally surgery, dynamic imaging may be performed as a supplemental sequence to other conventional unenhanced and contrast enhanced MR imaging.

## REFERENCES

1. Sakamoto Y, Mutsumasa T, Korogi Y, Bussaka H, Ushio Y. Normal and abnormal pituitary glands: gadopentetate dimeglumine-enhanced MR imaging. *Radiology* 1991;178:441-445.
2. Miki Y, Matsuo M, Sadahiko N, et al. Pituitary adenomas and normal pituitary tissue: enhancement patterns on gadopentetate-enhanced MR imaging. *Radiology* 1990;177:35-38.
3. Finelli DA, Kaufmann B. Varied microcirculation of pituitary adenomas at rapid, dynamic, contrast-enhanced MR imaging. *Radiology* 1993;189:205-210.
4. Stadnik T, Stevennaert A, Beckers A, Luybaert R, Buisseret T, Osteaux M. Pituitary microadenomas: diagnosis with two- and three-dimensional MR imaging at 1.5T before and after injection of gadolinium. *Radiology* 1990;176:419-428.
5. Davis PC, Hoffman JC Jr, Spencer T, Tindall GT, Braun IF. MR imaging of pituitary adenoma: CT, clinical, and surgical correlation. *AJR* 1987;148:797-802.
6. Newton DR, Dillon WP, Norman D, Newton TH, Wilson CB. Gd-DTPA-enhanced MR imaging of pituitary adenomas. *AJNR* 1989;10:949-954.