

# **ROLE OF MRI IN EVALUATION OF INFLAMMATORY DISEASES OF PARA-NASAL SINUSES**

## **Essay**

Submitted for partial fulfillment of the  
Master Degree in Radiodiagnosis

By

**Mohamed Abd Elmooty Zein El-Zamarany**

*M.B., B.Ch.*

Supervised By

**Prof. Dr. Ahmed Abd El-Tawab Mohamed**

*Assist. Prof. of Radiodiagnosis*

*Faculty of Medicine*

*Ain Shams University*

**Faculty of Medicine  
Ain Shams University  
1994**

«بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ»

﴿... قَالَ رَبِّ اشْرَحْ لِي صَدْرِي﴾

وَيَسِّرْ لِي أَمْرِي وَأَحْلِلْ عَقْدَةَ مِنْ لِسَانِي

يَفْقَهُوا قَوْلِي...﴾

«صَدَقَ اللَّهُ الْعَظِيمُ»  
«سورة طه آية ٢٥ - ٢٧»



**To...**

**My Mother  
and Brother**

**I wish to express my thanks and deepest gratitude  
for their tolerant support and appreciable help  
forever.**

## *Acknowledgment*

*I wish to express my respectful thanks to Prof. Dr. Ahmed Abd El-Tarwab Mohamed, Assist. Prof. of Radiodiagnosis, Faculty of Medicine, Ain Shams University, for his continuous encouragement and unforgettable effort. His experienced advice has been of utmost importance, under whose kind supervision this work has been done.*

*I feel a special debt of gratitude to Prof. Dr. Zeinab Abdalla, Chairman of Radiology Department, Faculty of Medicine, Ain Shams University.*

*Also, I thank all my professors, my colleagues, my friends, my family and everyone who has helped in realizing this work.*

## CONTENTS

	Page
Introduction and aim of work	1
Anatomy of para-nasal sinuses	2
Gross anatomy	2
MRI anatomy	22
Pathology of inflammatory diseases of para-nasal sinuses	29
MRI technique of para-nasal sinuses	55
MRI manifestation of inflammatory diseases of para-nasal sinuses	67
Illustrated cases	107
Summary and Conclusion	150
References	154
Arabic Summary	---

## LIST OF FIGURES

<b>Fig. No.</b>	<b>Title</b>	<b>Page</b>
1	Normal gross anatomy of paranasal air sinuses	3
2	Normal gross anatomy of paranasal air sinuses	3
3	Normal gross anatomy of paranasal air sinuses	5
4	Normal gross anatomy of paranasal air sinuses	5
5	Normal gross anatomy of paranasal air sinuses	7
6	Normal gross anatomy of paranasal air sinuses	12
7	Mucociliary passage in frontal and maxillary sinuses	18
8	Normal MRI anatomy of paranasal air sinuses	21
9	Normal MRI anatomy of paranasal air sinuses	23
10	Normal MRI anatomy of paranasal air sinuses	25
11	Normal MRI anatomy of paranasal air sinuses	25
12	Normal MRI anatomy of paranasal air sinuses	27
13	Normal MRI anatomy of paranasal air sinuses	27
14	T1-weighted and T2-weighted curves	65
15	T1-relaxation time curve	65
16	T2-relaxation time curve	66
17	Curves of observed signal intensities of macromolecular protein solution versus protein content.	66
18	Pathologic sinonasal secretion with the protein content rise from 5% to about 25%	68
19	Pathologic sinonasal secretion with the protein content rise above 35%	70
20	Acute sinusitis	72
21	Acute sinusitis	72
22	Chronic sinusitis	74
23	Chronic sinusitis	74
24	Chronic sinusitis	75
25	Chronic sinusitis	77
26	Meningitis	79

f mucocoe	27	Basal meningitis	80
unially and	28	Intracerebral abscess	81
maxillary	29	Venous sinus thrombosis	82
anterior e	30	Venous sinus thrombosis	82
sphenoid s	31	Sphenoid sinus mucocoele secondary to nasal polyp	84
antrochoa	32	Sphenoid sinus mucocoele secondary to an angiofibroma	84
frontal an	33	Anterior ethmoid mucocoele	86
anterior c	34	Anterior ethmoid mucocoele	86
ilateral r	35	Frontal sinus mucocoele	88
inonasal	36	Frontal sinus mucocoele	88
on invas	37	Frontal and ethmoid sinuses polypi that have broken into the anterior cranial fossa	90
nvasive a	38	Ethmoid and nasal polypi	90
	39	Antro choanal polyp	92,93
	40	Juvenile angiofibroma	93
	41	Retention cyst	95
	42	Aspergilloma	97
	43	Invasive aspergillosis	99
	44	Non invasive aspergillosis	101
	45	Cholesterol granuloma	103
	46	MRI of normal sagittal antomy of para nasal sinuses	106
	47	MRI of normal axial anatomy of para nasal sinuses at the level of maxillary sinuses	108
	48	MRI of normal axial anatomy of paranasal sinuses at the level of cavernous sinuses	110
	49	MRI of normal coronal anatomy of paranasal sinuses	112
	50	MRI of chronic maxillary sinusitis	114
	51	MRI of chronic maxillary sinusitis	116
	52	MRI of chronic maxillary and ethmoidal sinusitis	118
	53	MRI of chronic maxillary and frontal sinusitis	120,122
	54	MRI of mucocoele of frontal sinuses	124,126



# **Introduction and aim of the work**

## **INTRODUCTION AND AIM OF THE WORK**

Para-nasal sinuses are air filled cavities surrounded by margins of bone.

The main pathological processes affecting the para-nasal sinuses are inflammatory and neoplastic.

Inflammatory sinus disorders can take the form of acute or chronic sinusitis.

M.R.I playing an increasingly prominent role in assessing sinus diseases due to its inherent high soft tissue contrast resolution as well as its multiplanar capability. It can provide information that reflect the actual composition and structure of tissue being studied.

The aim of work of this study is to determine MRI diagnostic criteria of inflammatory para-nasal sinuses lesion and to assess its effectiveness and possible limitation in diagnosis.

# **Anatomy of para- nasal sinuses**

## GROSS ANATOMY OF PARA-NASAL SINUSES

The anatomic description of the para-nasal sinuses is difficult owing to the great variation within individuals and the inconsistency of the terminology used to describe these areas, (*Rice, Schaefer, 1992; Schechtman et al., 1993*).

The para-nasal sinuses are pairs of air filled cavities within the facial bones lined with mucous membrane and communicating with the upper respiratory tract.

There are four pairs of sinuses:

Ethmoid, frontal, maxillary and sphenoid sinuses.

### **Ethmoid sinuses:**

The ethmoid sinus has the greatest variation and it is found at birth to be fluid filled and difficult to recognize.

As the ethmoid sinus enlarges and pneumatizes, the resultant overgrowth into the frontal bone result in the frontal sinus.



By the 12th year, the ethmoids are nearly of adult size, (*Shechtman et al., 1993*).

The ethmoid bone is a symmetric midline bone (Fig. 1), interposed between the orbits laterally, the frontal bone anteriorly, the sphenoid posteriorly, the anterior cranial fossa above and the nasal cavity below, (*Mattox et al., 1985*).

The adult ethmoid capsule forms a pyramid with its widest base located posteriorly (Fig. 2). The sinus measures 4 to 5 cm anteroposterior, 2.5 cm in height and 0.5 cm wide anteriorly and 1.5 cm posteriorly, (*Shechtman et al., 1993*).

**The fovea ethmoidalis** represent, the roof of the sinus and extend to an average 2 to 3 mm above the more medial cribriform plate, (*Rice and Schaefer, 1992*).

**The lamina papyracea**, located in the medial orbital wall, is the most lateral boundary and also the most constant part of ethmoid bone.

The number of air cells varies greatly, ranging from 4-100, (*Shechtman et al., 1993*).

