

CORRELATION BETWEEN RADIOLOGICAL AND ENDOSCOPIC FINDINGS IN CASE OF CHRONIC RHINOSINUSITIS

By

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ABSTRACT

Background: Paranasal sinus diseases are one of the commonest causes of patients visit to an Otorhinolaryngologist. The symptoms are multiple and vague, while an examination is often limited as sinuses cannot be examined directly. Anterior rhinoscopy gives little information about middle meatus and osteomeatal unit. **Objective:** The study was carried out with an objective to compare the Diagnostic nasal endoscopic findings and radiological appearance in patients with paranasal sinus disease. **Methods:** This study included twenty four patients with chronic sinusitis resistant to medical treatment for a period not less than six weeks. The study work was done in Otorhinolaryngology Department in Zagazig University Hospitals for a duration from August 2016 to October 2017. **Results:** Patients' age ranged from 20 to 58 years with a mean of 32.6 ± 10.68 . They were 6 males and 18 females. These patients were divided into two groups: The first group does CT 1-3 months before surgery. The second group repeats CT at the day before operation. Then detection of correlation between CT and intra operative endoscopy findings in both groups. **Interpretation and conclusion:** In our study, a high association is found between both the modalities of investigation , i.e. CT scans and Diagnostic nasal endoscopy with one scoring over the other in different parameter. Diagnostic nasal endoscopy is found to be highly sensitive investigatory modality for parameters like frontal recess, spheno-ethmoid recess and hiatus semilunaris, whereas CT scan is found to be highly sensitive for parameters like maxillary sinus, uncinata process and posterior ethmoids. So, a case of sinus disease should be diagnosed as early as possible using both these modalities as together they complement each other. Early diagnosis and effective management cures the pathology and prevents disastrous complications.

Keywords: Paranasal sinus disease, CT scan, Diagnostic nasal endoscopy, Middle meatus, Osteomeatal unit.

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INTRODUCTION

Chronic rhinosinusitis (CRS) is one of the frequently encountered problems in otorhinolaryngological practice. Diagnosis of CRS depended on Meltzer et al criteria of symptoms that persist more than 12 weeks [1]. Chronic rhinosinusitis is characterized by two or more symptoms, one of which should be either nasal blockage, obstruction, congestion or nasal discharge (anterior or posterior nasal drip) \pm facial pain or pressure. \pm reduction or loss of smell for equal to or more than 12 weeks This should be supported by demonstrable disease either endoscopic signs of: Nasal polyps, and/or mucopurulent discharge primarily from middle meatus and/or oedema, mucosal obstruction primarily in middle meatus and/or CT changes: mucosal

changes within the osteomeatal complex and/or sinuses [2].

CT scan is important in demonstrating predisposing factors of rhinosinusitis like anatomical variation, trauma and tumor, which may lead to narrowing of the osteomeatal complex and sinus drainage channels, It is very essential in providing the plan before endoscopic sinus surgery [3].

Computed tomography (CT) scan acts as a roadmap for functional endoscopic sinus surgery (FESS) but has limitations such as overdiagnosing asymptomatic individuals, the cost factor, and potential radiation hazard for the patients. FESS is the treatment of choice for CRS [4].

Nasal endoscopy is very important in identifying anatomical structural variations

and mucosal changes of middle meatus and ostiomeatal complex that cause the block of drainage leading to CRS both in patients with normal CT and in patients with abnormal CT scans. It was also noted earlier that there was a close association between endoscopy and CT scan in the diagnosis of CRS. However, both nasal endoscopy and CT scan have been performed to establish the diagnosis in routine practice since the relative values of each has not been well established^[5].

Endoscopic sinus surgery (ESS) has considered as an effective treatment option and also is the treatment of choice for medically refractory CRS with excellent success rates. Sinonasal endoscopy provides many useful objective data regarding the sinonasal disorders. Technical developments in computer-assisted tomography such as multidetector CT (MDCT) technique can help the surgeon and increase the diagnostic accuracy^[6].

The two cardinal factors in maintaining normal physiology of the paranasal sinuses and their mucous membranes are ventilation and drainage. Normal drainage of the paranasal sinuses depends on effective mucociliary clearance, which is dependent on the status of sinus Ostia. Mucous transport from the sinuses to the nose is influenced by unipedal nasal airflow making negative pressure within the nasal cavity during inspiration. The secretions of the various sinuses do not reach their respective Ostia randomly, but by definite pathways which are genetically known^[7]. The purpose of this study is aimed to correlate CT scan and nasal endoscopic findings in the assessment of patients with CRS.

PATIENTS & METHODS

This study included twenty four patients with chronic sinusitis resistant to medical treatment for a period not less than six weeks. The study was done in Otorhinolaryngology Department in Zagazig University Hospitals for a duration from August 2016 to October 2017. Patient age ranged from 20 to 58 years with a mean of **32.6 ± 10.68**. They are 6 males and 18 females. These patients are divided into two groups: The first group does CT 1-3 months before surgery. The second group repeats CT at the day before the

operation. Then detection of correlation between CT and intra operative endoscopy findings in both groups.

These patients were subjected to the following:

1. History taking :

1. Personal history: age, sex, marital state, residence and special habits.

2. Nasal symptoms : History about two main complaints (nasal obstruction and nasal discharge) and other nasal symptoms, (sneezing, post-nasal drip, headache and nasal itching, facial pain). According to the guideline recommendation, the patient met symptom criteria for CRS if two or more sinonasal symptoms were positive, (Nasal obstruction, Anterior and/or posterior nasal discharge, Headache/facial pains and/or Abnormalities of smell).

3. Present and past history :

A. Of E.N.T. diseases including: Nose: other nasal symptoms as sneezing, epistaxis, allergy, previous surgery..... etc. Ear: pain, deafness, discharge, tinnitus, vertigo,... etc. Throat and larynx; sore throat, dysphagia, cough, hoarseness of voice..... etc.

B. of systemic disease, drugs or previous operations.

2. Examination:

1. General examination.

2. Nasal examination: Anterior and posterior rhinoscopy: noting any congestion, septal deviation, spurs, turbinate hypertrophy, discharge, polypi, adhesions, etc. Nasal decongestion: to allow a better examination of the nose and to see the response of mucosa to decongestion.

Nasal endoscopy : Specially reporting on:

1. presence of polyp, discharge and edema

2. Exclude other nasal pathologies.

3- Investigations: Diagnostic nasal endoscopy was done using (0° and 30° angle 4-mm Hopkin rods) after decongestion of the mucosa by Oxymetazoline soaked cotton pledgets and topical anaesthesia by xylocain spray. Also radiological evaluation in the form of computing tomographic (CT) scanning was performed with Phillips ICT BRILLIANCE 256 slice, 1 mm cuts. Plain CT scan paranasal sinuses, axial and coronal cuts with sagittal reconstruction,

bone window without contrast was routine for each patient.

4-Treatment before surgery: Pre surgery treatment consisted of a topical steroid for all cases with chronic sinusitis or chronic sinusitis with nasal polyposis and short intermittent doses of oral steroids only for those cases of chronic sinusitis with nasal polyposis, antihistamines and antibiotic if there is an infection.

RESULTS

Table (1) shows that the ages of the studied group ranged from 20 years to 58 years and 75% of them were females. Most of the studied group (58.3%) was from rural areas and 50% was housewives. Only 25% were smokers and 41.7% of them had a negative past history. Table (2) shows CRS symptom among studied group, that 66.7% of the patients presented with nasal obstruction and post-nasal discharge, most of the studied group (83.3%) presented with facial pain or headache and 75% presented with hyposmia. Table (3) shows that only 8.3% of the studied group presented with cough as a related symptom of CRS, while 4.2% presented with asthma. Table (4) shows that the causes of comorbidity among studied group was allergy among 41.7% of them, while no one presented with history of trauma. Table (5) shows the endoscopic score of the studied patients, according to Lund-Kenedy staging [9], 91.7% of the studied patients showed a polyp confined to middle turbinate and only 8.3% showed no polyps, while only 25% showed clear, thin discharge and 75% of the patients showed no discharge. Half of the studied group showed mild degree edema on examination with an endoscope, while 50% showed no changes. Table (6) shows that 8.3%, 8.3%, 8.3%, 58.3% and 33.3% of the studied patients showed no abnormality in maxillary sinus, anterior and posterior

ethmoid sinuses, frontal and sphenoidal sinuses respectively on radiological examination. While 37.5% of the patients give score 1 of the right maxillary sinus on examination (means partial opacification), 41.7%, 25% of both right anterior and posterior ethmoid respectively give score 2 (means complete opacification), 16.7% of both left sphenoidal and frontal sinuses, give score 2 among the studied patients. Table (7) shows that 91.6% of the studied patients presented with maxillary and ethmoidal sinuses, while only 66.6% and 41.6% of the patients presented with sphenoidal and frontal sinus affection respectively. Table (8) shows agreement between CT and endoscopic examination regarding detection of septal deviation, polyp and mass, while there was good agreement between them with a statistical significant difference as regard detection of cyst in maxilla and hypertrophy of inferior concha. Table (9) shows a high statistical significant agreement between CT and endoscopic examination at operation day regarding detection of septal deviation, polyp and mass, cyst in maxilla and hypertrophy of inferior concha, hypertrophy of middle concha, adenoid, mucosal thickening and OMC patency. CT scoring depends on Lund-MacKay scoring system which is used for description of sinus disease. A score of 0, 1, or 2 is given for normal, partial opacification and total opacification, respectively, to five sinuses—1) anterior ethmoid, 2) posterior ethmoid, 3) frontal, 4) maxillary, and 5) sphenoid sinuses—on each side, and a score of either 0 or 2 is given for a patent or obstructed ostiomeatal complex, respectively, on each side of the sinonasal cavity which yields a maximum score of 12 at each side.^[8]

Table (1): Demographic data past history of the studied group.

Variables		Cases N=24	
Age \years		32.6 ± 10.68	
Mean ±SD		20 - 58	
Range			
Variables		(N=24)	Percent %
Sex	Male	6	25
	Female	18	75
Marital state			
	Married	20	83.3
	Single	4	16.7
Residence			
	Urban	10	41.7
	Rural	14	58.3
Occupation			
	Housewife	12	50
	Student	4	16.7
	Worker	8	33.3
Special habits			
	Smoking	6	25
	None	18	75
Past history			
	-ve	10	41.7
	Adeno-tonsillectomy	4	16.7
	Adenoidectomy	2	8.3
	Diabetic	2	8.3
	Hypertensive	2	8.3
	FESS	2	8.3
	Septoplasty	2	8.3

Table (2): CRS symptoms among studied group.

Symptoms	N	%
Nasal obstruction	16	66.7
Facial pain\ headache	20	83.3
Rhino rhea	14	58.3
Hyposmia	18	75
Post-nasal discharge	16	66.7

Table (3): CRS related symptoms among studied group.

Symptoms	N	%
Asthma	2	4.2
Cough	4	8.3

Table (4): Co-morbidities among studied group.

Symptoms	N	%
Allergy	10	41.7
History of trauma	0	0.0

Table (5); Endoscopic score of CRS (lund-Kenedy) among studied group.

Staging	N	%
Polyp		
None	2	
Confined to middle turbinate	22	91.7
Discharge		
None	18	75
Clear and thin	6	25
Edema\scarring \crusting		
None	12	50
Mild	12	50

Table (6); Radiological score CT of CRS (lund-mackay) among studied group.

Staging		N	%	
Maxillary sinus	(No abnormality)	0	2	8.3
	RT	1	9	37.5
		2	2	8.3
	LT	1	20	83.3
		2	0	0.0
Anterior ethmoid	(No abnormality)	0	2	8.3
	RT	1	12	50
		2	10	41.7
	LT	1	7	29.2
		2	8	33.3
Posterior ethmoid	(No abnormality)	0	2	8.3
	RT	1	14	58.3
		2	6	25
	LT	1	16	66.7
		2	6	25
Frontal sinus	(No abnormality)	0	14	58.3
	RT	1	6	25
		2	2	8.3
	LT	1	6	25
		2	4	16.7
Sphenoidal sinus	(No abnormality)	0	8	33.3
	RT	1	8	33.3
		2	4	16.7
	LT	1	10	41.7
		2	4	16.7
OMC	0 (normal)		12	50
	2 (obstructed)		12	50

Table (7): Sinus group involvement among studied patients.

Sinus group	N (n=24)	%
Maxillary sinus	22	91.6
Ethmoid	22	91.6
Sphenoid	16	66.6
Frontal	10	41.6

Table (8): Difference and agreement between endoscopic diagnosis and CT done for studied group one month before operation.

		Endoscope (n=12)		CT (n=12)		Kappa Agree- ment	P-value
		N	%	N	%		
Adenoid	Yes	1	8.3	2	16.7	0.113	0.232
	No	11	91.7	10	83.3		
Mass	Yes	0	0.0	0	0.0	0.43	0.005
	No	12	100	12	100		
Cyst in maxilla	yes	6	50	4	33.3	0.38	0.04
	No	6	50	8	66.7		
Hypertrophy of inf. Choncha	Yes	8	66.7	12	100	0.25	0.03
	No	4	33.3	0	0.0		
Hypertrophy of middle Choncha	Yes	0	0.0	2	16.7	0.08	0.149
	No	12	100	10	83.3		
Septum deviation	Yes	5	41.7	10	83.3	0.415	0.003
	No	7	58.3	2	16.7		
Polyp	Yes	4	33.3	11	91.7	0.583	0.000
	No	8	66.7	1	8.3		
Mucosal thickening	Yes	9	75	8	66.7	0.183	0.05
	No	3	25	4	33.3		
LT OMC patency	Yes	4	33.3	7	58.3	0.25	0.08
	No	8	66.7	5	41.7		
RT OMC patency	Yes	4	33.3	6	50	0.167	0.141
	No	8	66.7	6	50		
Choncha bullosa	yes	0	0.0	1	91.7	0.111	0.196
	No	12	100	11	8.3		
Onodi cell	Yes	0	0.0	1	91.7	0.111	0.196
	No	12	100	11	8.3		

Table (9): Difference and agreement between endoscopic diagnosis and CT done for studied group at day of operation.

		Endoscope (n=12)		CT (n=12)		Kappa Agree- ment	P-value
		N	%	N	%		
Adenoid	Yes	4	33.3	4	33.3	0.63	0.002
	No	8	66.7	8	66.7		
Mass	Yes	0	0.0	0	0.0	0.67	0.003
	No	12	100	12	100		
Cyst in maxilla	yes	4	33.3	4	33.3	0.83	0.007
	No	8	66.7	8	66.7		
Hypertrophy of inf. Choncha						0.76	0.003
	Yes	8	66.7	8	66.7		
	No	4	33.3	4	33.3		
Hypertrophy of middle Choncha						0.98	0.000
	Yes	0	0.0	0	0.0		
	No	12	100	12	100		
Septum deviation	Yes	4	33.3	4	33.3	0.83	0.003
	No	8	67.7	8	66.7		
Polyp	Yes	7	58.3	7	58.3	0.583	0.000
	No	5	41.7	5	41.7		
Mucosal thickening	Yes	8	66.7	8	66.7	0.76	0.003
	No	4	33.3	4	33.3		
LT OMC patency	Yes	5	41.7	5	58.3	0.65	0.008
	No	7	58.3	7	41.7		
RT OMC patency	Yes	5	41.7	5	41.7	0.65	0.008
	No	7	58.3	7	58.3		
Choncha bullosa	yes	0	0.0	1	91.7	0.081	0.112
	No	12	100	11	8.3		
Onodi cell	Yes	0	0.0	1	91.7	0.21	0.08
	No	12	100	11	8.3		

DISCUSSION

Rhinosinusitis with or without polyps is an inflammatory disease of the nose and the paranasal sinuses⁽²⁾. Computed tomography (CT) of the paranasal sinuses has become the test of choice for the radiological diagnosis of chronic rhinosinusitis (CRS). CT is recommended mainly to confirm the diagnosis of CRS in patients whom clinical history and physical examination findings consistent with CRS. In spite of the diagnosis of CRS is relied primary on clinical criteria, CT provides objective evidence for diagnosis and staging of CRS and also is an important "roadmap" for detection of anatomy of paranasal sinus before surgery^[9]. CT has become the standard diagnostic tool in the evaluation of the paranasal sinuses. When coupled with nasal endoscopy, it provides

most of the objective data needed for diagnosing CRS^[10,11]. Functional endoscopic sinus surgery (FESS) is a minimally invasive technique that uses an endoscope to restore the function and physiology of the nose and sinuses. The extent of surgery varies according to the extent of disease and surgeon's individual practice. Advantages claimed over conventional surgery include: permitting a better view of the surgical field; a more precise and thorough clearance of the inflammatory change; fewer complications and lower recurrence rates^[12].

Functional endoscopic sinus surgery (FESS) has become the surgical procedure of choice and the gold standard for the treatment of chronic sinusitis and sinonasal polyposis that is refractory to medical treatment^[13]. The ages of the studied group ranged from 20

years to 58 years and 75% of them were females with mean 32.6 ± 10.68 while 25% of them are male and smoker. In our study the most common presenting symptom was facial pain or headache (83.3%) and 66.7% of the patients presented with nasal obstruction and post-nasal discharge, and 75% presented with hyposmia. causes of co-morbidity among studied group was allergy among 41.7% of them, while no one presented with history of trauma [14]

Zojaji, et al^[15] was found that rhinorrhea and PND were the most common clinical symptoms which were observed in all patients. The most common comorbidity was allergy observed in 18 (35%) patients. Furthermore, the frequency of asthma and a history of head and/or face trauma was six (12%) and eight (16%), respectively.

Using Lund- Mackay scoring shows that 8.3%, 8.3%, 8.3%, 58.3% and 33.3% of the studied patients showed no abnormality in maxillary sinus, anterior and posterior ethmoid sinuses, frontal and sphenoidal sinuses respectively on radiological examination. While 37.5% of the patients give score 1 of the right maxillary sinus on examination (means partial opacification), 41.7%, 25% of both right anterior and posterior ethmoid respectively give score 2 (means complete opacification), 16.7% of both left sphenoidal and frontal sinuses give score 2 among the studied patients. Basu, et al^[16] this study was used the comparison of CT scoring between a surgeon and a radiologist following the Lund-Mackay system. Overall, there was quite a good correlation between the grading by the radiologist and the surgeon, with minimal inter-rater variability. Our study depends mainly on surgeon's scoring also using the Lund Mackay scoring system [8].

The endoscopic score of the studied patients, according to Lund- Kenedy staging, 91.7 % of the studied patients showed a polyp confined to middle turbinate and only 8.3% showed no polyps, while only 25% showed clear, thin discharge and 75% of the patients showed no discharge. Half of the studied group showed mild degree edema on examination with an endoscope, while 50%

showed no changes. Our study depends on Lund- Kenedy endoscopic scoring system [9].

Geminiani, et al^[17] evaluated 17 (48.5%) women and 18 (51.5%) men (average age: 40) and found 18 patients presented positive result on tomographic analysis and 17 presented negative one. Eight patients (23%) presented positive results of endoscopic analysis and on CT scan. Four of them (11.4%) presented positive results on an endoscopy exam , but negative ones on CT. Twelve patients (34.4%) presented positive endoscopic results and 23 (65.6%) presented negative ones. Ten patients (28.5%) presented CT positive results and negative endoscopic ones. Thirteen patients (37.1%), presented negative results for both CT and endoscopy exam.

Jiannetto and Pratt, ^[18] Duarte, ^[19] reported that patients who had negative CT scans, showed endoscopic exams with nasal polyposis and septum deviation. Duarte, ^[19] in which 16 (80%) out of 20 patients showed turbinate hypertrophy evidenced by nasofibrosopy and only nine (45%) of 20 patients showed the same affection at CT scan. In our study there were two groups the first group do CT 2-3 months before operation and the second one do CT at the day before operation The first group : shows a high statistical significant agreement (excellent agreement) between CT and endoscopic examination regarding detection of septal deviation, polyp and mass, while there was good agreement between them with statistical significant difference as regard detection of cyst in maxilla and hypertrophy of inferior choncha.

The second group: shows a high statistical significant agreement (excellent agreement) between CT and endoscopic examination regarding detection of septal deviation, polyp and mass, cyst in maxilla and hypertrophy of inferior choncha, hypertrophy of middle choncha, adenoid, mucosal thickening and OMC patency. Onodi cell and Concha bullosa were detected in 2 cases by CT. Zojaji, et al^[15] found 47 (92%) patients showed abnormality in one or more sinus groups. The maxillary sinuses were most commonly affected, with changes seen in 42 (82%) patients, followed by the

ethmoidal sinuses with changes seen in 28 (54%) patients; the least affected sinuses were the frontal and sphenoid sinuses, with 10 (20%) and 13 (25%) patients, respectively.

In our study, 22 (91.6%)of the studied patients presented with maxillary and ethmoidal sinuses, while only 16 (66.6%) and 10 (41.6%) of the patients presented with sphenoidal and frontal sinus affection respectively. History remains the most important factor in predicting patients undergoing CT. No single intervention, questionnaire, or radiologic study is sufficient to make the diagnosis alone. If CT findings were not interpreted in the light of symptoms, many people who have incidental changes like a mass reported by CT scan turned out to be a bone wax in ESS, will be labeled as having sinus disease and will inadvertently undergo unnecessary surgery. Jones^[20]. When combined with a directed and thoughtful history, endoscopy can yield valuable information regarding anatomic location and severity of the disease^[21]. So sinus endoscopy and CT can be considered complementary techniques for effective demonstration of nasal anatomy and paranasal sinuses.[20]

CONCLUSION

CT is an important tool in diagnosis of chronic rhinosinusitis and when coupled with nasal endoscopy it provides more objective data needed for diagnosis of CRS. Patients who were evaluated by having CRS based on history, CT and endoscopic evaluation and being scheduled for making operation and dated for that must be re -evaluated by another CT scan at the day before operation as either deterioration or relief of previous findings can occur and decision of either doing operation or not depending on new findings. Also, it was found the correlation of endoscopic findings are more consistent with findings of CT that done on the day before the operation than findings of CT done months before the operation.

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