Endoscopic and Computerized Tomography approach to para nasal sinus disease

Mithag Abdelraheem Gismalla Mohammed[1], Caroline Edward Ayad[1]

[1]Sudan University of Science and Technology- College of Medical Radiological science- Sudan –Khartoum
Corresponding Author: Mithag Abdelraheem Gismalla Mohammed

Abstract: *This study was carried to find out the common sinuses diseases and evaluate the significance of computerized tomography (CT) scan in diagnosing sinus lesions and to determine the correlation between radiological and endoscopic findings as well to evaluate diagnostic value of nasal endoscopy and CT in diagnosing sinuses disease.*

The current study was obtained during the period extended from 2015 to 2017, at Prince Abdalazeez hospital - Arar -Saudi Arabia. A total of 98 patients with clinical evidence of sinonasal diseases were evaluated. All patients were subjected to thorough ENT examination. Nasal Endoscopy was done. CT of paranasal sinuses was performed in patients whose symptoms, examination and clinical picture were sufficient to warrant the procedure. 63 (64.3%) were females and 35(35.7 5%) were males. Their ages were between <10 and 50-60 years old. With the maximum affected age were the ages between 21-30 years old constituting 37(37.8%). After a detailed history and thorough clinical examination, they were investigated using standard protocol of investigations, which included CT scan for paranasal sinuses (axial and coronal sections) protocol.

Participant's clinical history was: headache, nasal obstruction and nasal discharge. The most CT findings of 98 patients (196 sinuses) were noted and classified as normal, Acute Rhinitis, Acute Sinusitis, Chronic Sinusitis, Polyp ,Mucocels and Masses; where the endoscopic findings were: hypertrophy of nasal turbinates, mucosal thickening, polypoid mucosa, sinonasal polyposis. Hence, the present study was carried out to assess the relevance of CT radiological method in diagnosing maxillary sinus lesions and to determine the correlation between radiological and endoscopic findings; Chi square test was performed and showed that there were significant association between the two methods Since P= 0.000 indicates there is a high association between diagnostic endoscopy and CT scan.

Using CT examination is an important tool in detecting pathology. The study recommended using both CT scan and Diagnostic nasal endoscopy when evaluating patients with sinus diseases.

Keywords: *CT, Paranasal sinus, Endoscope*

I. Introduction

The clinical diagnosis of sinusitis is based on symptoms .But this is unhelpful with the burden on the examinations obtained presently .Standard paranasal sinus radiographs can readily demonstrate maxillary and frontal sinus disease but incompletely delineate ethmoid sinusitis [1-4] and also it has poor sensitivity and low specificity [5]. Computerized Tomography (CT) is not acknowledged in diagnosing rhinosinusitis. Many authors have found a high rate of mucosal thickening and opacification on CT in asymptomatic patients [6,7]. Antroscopy allows full inspection of the diseases in the sinuses. Biopsies can be taken and specimens for culture and sensitivity can be obtained. There are many studies concerning the correlation between the endoscopic and radiological findings [8,9]. To the best of our knowledge, the clinical as well as radiologic recognition of the interrelationships between sinus diseases has not been studied in our hospitals. Hence, the present study was carried out to find out the common sinuses diseases and evaluate the significance of CT scan in diagnosing sinus lesions and to determine the correlation between radiological and endoscopic findings.

II. Materials and methods

The current study was obtained between November 2015 and December 2017, at Prince Abdalazeez hospital - Arar Saudi Arabia. 98 patients were selected from CT department, suspected of having maxillary sinus pathology. 63 (64.3%) were females and 35(35.7 5%) were males. Their ages were between <10 and 50-60 years old. With the maximum affected age were the ages between 21-30 years old constituting 37(37.8%). After a detailed history and thorough clinical examination, they were investigated using standard protocol of investigations, which included CT scan for paranasal sinuses (axial and coronal sections) protocol. Distribution of study sample according to participant's clinical history was: headache, nasal obstruction and nasal discharge.

The most CT findings of 98 patients (196 sinuses) were noted and classified as normal, Acute Rhinitis, Acute Sinusitis, Chronic Sinusitis, Polyp ,Mucocels and Mass; where the endoscopic findings were: hypertrophy of nasal turbinates, mucosal thickening, polypoid mucosa, sinonasal polyposis.

2.1CT-scanning techniques for sinus imaging:

CT imaging of the sinus has been acquired in the axial and coronal planes, using non-contrast high-resolution 3-mm thick contiguous scans. Axial images were obtained with the patients were positioned in supine on the scanning table and maintaining normal position of the scanning gantry. This differs from the coronal scans, which are enabled by extension of the patient's neck in either prone or supine position and angling of the scanning gantry to approximate the sinus coronal plane. The coronal imaging plane offers best visualization of the drainage pathways of the sinuses, whereas some drainage pathways: sphenoid sinus ostia and sinus walls oriented close to the coronal plane are better seen on axial images.

The initial scanning data are typically reconstructed with two different imaging algorithms .The bone, edge algorithm enhances the interface between tissues of substantially differing densities, so that osseous margins and intact bone are easily distinguished from dematerialized or eroded bone.

Scan with IV contrast are only obtained in patients having complication of subpreiosteal abscess or when malignant disease is suspected to enhance the visibility of certain tissues ,those cases were spatially prepared (fasting for 6hours before injecting CM).Next, the table was moved quickly through the scanner to determine the correct starting position for the scans. Then, the table was moved slowly through the machine as the actual CT scanning is performed. Depending on the type of CT scan (axial, coronal) . Patients were asked to hold breath during the scanning to reduce artifacts

2.2 CT machine:

The CT machine used was Brilliance 16 slice, high frequency generator using kv rang (90-120-140) and mA range (20-500), the tube MRC600, the detector type was solid state array made of gadolinium oxysulphide. The real time image display less than 5 s after scan, the CT uniformity HU ±3, (HU -1024+3072), Ram GB 4 and power 480v.

III. Results

Table 1 : shows the endoscopic findings VS CT diagnosis of the RT maxillary sinuses cross tabulation

Endoscopic findings versus CT diagnosis of the right maxillary sinuses cross tabulated									
		CT findings							
		Normal	Acute Rhinitis	Acute Sinusitis	Chronic Sinusitis	Polyp	Mucocels	Mass	Total
Endoscopic Finding	Normal	3	-	-	-	-	-	-	3
		3.1%	-	-	-	-	-	-	3.1%
	Hypertrophy of Nasal Turbinate	-	-	14	3	7	6	-	30
		-	-	14.6%	3.1%	7.3%	6.2%	-	31.2%
	Mucosal Thickening	-	5	11	14	4	3	2	39
		-	5.2%	11.5%	14.6%	4.2%	3.1%	2.1%	40.6%
	Polypoid Mucosa	-	-	2	3	6	-	-	11
		-	-	2.1%	3.1%	6.2%	-	-	11.5%
	Sinonasal Polyposis	-	-	-	-	13	-	-	13
		-	-	-	-	13.5%	-	-	13.5%
Total		3	5	27	20	30	9	2	96
		3.1%	5.2%	28.1%	20.8%	31.2%	9.4%	2.1%	100.0%

Table 2 : shows the Linear-by-Linear Association of endoscopic findings versus CT diagnosis of the right maxillary sinuses cross tabulation

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	156.149[a]	24	.000
Likelihood Ratio	90.177	24	.000
Linear-by-Linear Association	10.593	1	.001

Table 3 : shows the endoscopic findings VS CT diagnosis of the Left maxillary sinuses cross tabulation

		Endoscopic finding versus CT diagnosis of the left maxillary sinuses cross tabulated							
		CT findings							
		Normal	Acute Rhinitis	Acute Sinusitis	Chronic Sinusitis	Polyp	Mucocels	Mass	Total
Endoscopic finding	*Normal*	13	-	-	-	1	-	-	14
		13.8%	-	-	-	1.1%	-	-	14.9%
	Hypertrophy of Nasal Turbinate	-	3	4	4	5	1	1	18
		-	3.2%	4.3%	4.3%	5.3%	1.1%	1.1%	19.1%
	Mucosal Thickening	-	6	11	12	4	7	1	41
		-	6.4%	11.7%	12.8%	4.3%	7.4%	1.1%	43.6%
	Polypoid Mucosa	-	-	-	1	5	-	1	7
		-	-	-	1.1%	5.3%	-	1.1%	7.4%
	Sinonasal Polyposis	-	-	-	-	14	-	-	14
		-	-	-	-	14.9%	-	-	14.9%
Total		13	9	15	17	29	8	3	94
		13.8%	9.6%	16.0%	18.1%	30.9%	8.5%	3.2%	100.0%

Table 4 : shows the Linear-by-Linear Association of endoscopic findings versus CT diagnosis of the Left maxillary sinuses cross tabulation

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	141.499[a]	24	.000
Likelihood Ratio	125.337	24	.000
Linear-by-Linear Association	32.768	1	.000

IV. Discussion

All the included patients in our study underwent diagnostic nasal endoscopy followed by CT scan. Among the parameters that were correlated:the diagnostic endoscopy was found to be: for the left sinus9(9.6%) of the cases were diagnosed to have acute rhinitis by CT scan, however endoscopic results showed that of the 9; 3 (3.32%)have Hypertrophy of nasal turbinate and 6 have mucosal thickening constituting (6.4%).15(16.0%) of the cases were diagnosed to have acute sinusitis by CT scan, however endoscopic results showed that of the 15 ;4 (4.3%)have hypertrophy of nasal turbinate and 11 have mucosal thickening constituting (11.7%).

17(18.1%) of the cases were diagnosed to have chronic sinusitis by CT scan, however endoscopic results showed that of the 17 ; 4 (4.3%)have Hypertrophy of nasal turbinate and 12 have mucosal thickening constituting (12.8%) and 1(1.1%) has polypoid mucosa .CT scan was found to give positive result as polyps in 1(1.1%) patient which was found to be normal in the endoscope, 5 (5.3%)have Hypertrophy of nasal turbinate and 4(4.3%) have mucosal thickening and 5(5.3%) have polypoid mucosa and 14(14.9%) have sinonasal polyposis. Mucocele and mass were found in 2 patients 2.2% when diagnosed by CT and were diagnosed to have Hypertrophy of nasal turbinate in the endoscope test. CT showed that 7(7.4%) of the patients with mucocele and 1(1.1%) patient with mass, have polyploidy mucosa in the endoscope results.

for the right sinus :5 (5.2%) of the cases were diagnosed to have acute rhinitis by CT scan, however endoscopic results showed that they have mucosal thickening .27(28.1%) of the cases were diagnosed to have acute sinusitis in CT scanning ,however endoscopic results showed that of the 27 ;14 (14.6%) have hypertrophy of nasal turbinate and 11 have mucosal thickening constituting (11.5%) and 2(2.1%) have polypoid mucosa.20(20.8%) of the cases were diagnosed to have chronic sinusitis by CT scan, however endoscopic results showed that of the 20 ; 3 (3.1%)have Hypertrophy of nasal turbinate and 14 have mucosal thickening constituting (14.6%) and 3(3.1%) has polypoid mucosa .

CT scan was found to give positive result as polyps in most of the patients which was found to have different results in the endoscope, 7 (7.3%)have Hypertrophy of nasal turbinate and 4(4.2%) have mucosal thickening and 6(6.2%) has polypoid mucosa and 13(13.5%) have sinonasal polyposis. Mucocele was found in 11 patients 11.5% when diagnosed by CT and were diagnosed to have hypertrophy of nasal turbinate and

mucosal thickening in the endoscope test. CT showed that 2(2.1%) of the patients with mass, have only mucosal thickening in the endoscope results. These were presented in tables (1,3)

Hence, the present study was carried out to assess the relevance of CT radiological method in diagnosing maxillary sinus lesions and to determine the degree correlation between radiological and endoscopic findings; Chi square test was performed and showed that there were significant association between the two methods (table 2,4) Since $P= 0.000$ indicates there is a high association between diagnostic endoscopy and CT. Hence, the advantages of diagnostic endoscopy are optical intensity, clear field of vision, easy handling, low cost. Yet various parameters could not be visualized during our study at diagnostic endoscopy as: middle turbinate, middle meatus,bulla ethmoidalis, hiatus semilunaris, frontal recess and sphenoethmoid recess. This is because in some of the cases it was impossible to pass the endoscope beyond certain point due to presence of gross pathology like extensive polyposis . CT scan proved to be very helpful in these cases as well giving the contrast media give the CT scan great value in evaluation and differentiation between the masses and mucosal thickening in most of the cases.

CT scans provided most of the information required for an endoscopic clearance. Advantages of CT scan are it shows progressively deeper structures as uncinate process, bulla ethmoidalis, and sphenoid sinus. CT scan delineates the extent of disease, anatomical and pathological results.

CT scan should be used to provide supplementary clinical data to the history and assist in directing acknowledged treatment to the affected areas.Studies have mentioned that the primary task of CT scan in sinuses, it is considered as a planning method for patients necessitating functional endoscopic sinus surgery. The pre-operative scan is used to highlight any potential surgical hazards, and to delineate the extent of disease reducing unnecessary intervention in disease-free areas. White et al, [10] believed that it is unsuitable for CT to be used purely as a diagnostic investigation for sinus disease. On the other hand ; studies firmed that endoscopy should be performed prior to scanning to reduce unnecessary CT demand. [11]

However according to Kasapoglu et al ; CT and nasal endoscopy are added to each other in preoperative assessment of patients with chronic sinusitis.[12] Anatomic variations situated at the middle meatus can easily be identified with nasal endoscopy but information on their anatomic details and expansion of the sinus disease cannot be obtained. On the other hand, CT examination permits relating anatomic information and development of the sinus diseases.

Studies have mentioned that the endoscope is a helpful implement to spot the origin of the soft tissue pathology and also reduce unnecessary scanning procedures. The results of endoscopy and CT comparison in our study indicated that although for most of the findings, there was almost perfect to substantial level of agreement between the results of the two methods, some differences existed in some of the patients. 1 patient had normal endoscope findings based on the ENT doctor report, while demonstrated nasal polyps during CT evaluation. On another study reported by Zojaji et al in his study, in which patients who had negative CT scans, showed endoscopic exams with nasal polyposis was documented.[13]

V. Conclusion

This study was undertaken with the objective of correlating the endoscope and CT findings in patients with different maxillary sinus pathologies .All patients underwent diagnostic endoscopy followed by CT scan. Association were calculated using Chi square test with overall P value less than 0.05 signifying that there is a high association between both CT and endoscopy results. In the overall assessment, following conclusions can be drawn: CT of sinuses is an important evaluation tools in detecting pathology. The study recommended CT scan should be used with endoscope and both must be used prior to sinus surgery.

Acknowledgements

References

[1].   Weiss. AR, Lapavoss'ker MS. (1978) inflammatory disease of the paranasal sinuses. ContempDiagn Radiol; 17:1-5.
[2].   Carter LB. Bankoff MS. Fisk JD. (1983) Computed tomographic detection of sinusitus responsible for intracranial and extracranial infectiOfls. Radiology; 147:739-742.
[3].   Som PM. (1984) The paranasal sinuses head and neck imaging. In: Bergeron RT. Oshorn AG,Som PM, eds. Head and neck imaging esclud' ing the brain. St. Louis: Moshv.; 5-143.
[4].   Beck TL. Rosenhaum AE. Miller NR. (1981)Orbital computed tomographs: technical aspects mtOphthalmol Clin, 22:7-43.
[5].   Jones N. S. (1999): Current concepts in management of pediatric rhinosinusits. Journal of Laryngology & Otology 113 (1) : 1-9.
[6].   Manning S., Biavati M. J. and Philips D. L. (1996): Correlation of clinical signs and symptoms to imaging findings in pediatric patients. International Journal of Pediatric Otorhinolaryngology 37 : 65-74

[7].   Jones N. S., Strobl A. and Holland I. (1997) : C. T. Findings in 100 patients with rhinosinustitis and 100 controls. Clinical Otolaryngology 22 : 47-51.
[8].   IiIum P, Jepessen F., and Langenbeck E. (1972) : X-ray examination of and sinoscopy in maxillary sinus disease. Acta Otolaryngology 74 : 287-292.
[9].   Pfleiderer A. G., Croft C. B. and Llyod G. A. S. (1986) : Antroscopy : its place in the clinical practice. A comparison of antroscopic findings with radiographic appearance of the maxillary sinus. Clinical Otolaryngology 11 (6) : 455-461.
[10].   White PS, Maclennan AC, Connolly AA. (1996)Analysis of CT scanning referrals for chronic rhinosinusitis. J Laryngol Otol.;110(7):641-3.
[11].   Sushant Tyagi, Mohit Srivastava, Vandana Singh,(*2016)* Diagnosis of chronic rhinosinusitis: can nasal endoscopy be the new gold standard in developing countries? International Journal of Otorhinolaryngology and Head and Neck Surgery *Srivastava M et al. Int J Otorhinolaryngol Head Neck Surg. Jan;2(1):30-34*
[12].   Kasapoglu F, Onart S, Basut O. (2009)Preoperative evaluation of Chronic Rhinosinusitis patients by conventional radiographies, computed tomography and nasal endoscopy. Kulak BurunBogazIhtisDerg.;19(4):184-91.
[13].   Zojaji R. Mirzadeh M, Naghibi S. (2008)Comparative Evaluation of Preoperative CT Scan and Intraoperative Endoscopic Sinus Surgery Findings in Patients with Chronic Rhinosinusitis. Iran J Radiol.;5(2):77-82.