Haziness in X-Ray Paranasal Sinus Water's View in Sinusitis: A Fact or Fiction

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Abstract It is a clinical dilemma whether patients having no symptoms of sinusitis but sinus haziness in X-ray should be considered as sinusitis or not and patients clinically having sinusitis and do not have radiological evidence should be considered as case of sinusitis or not. This study is an attempt to discuss this issue in details. To study diagnostic efficacy of conventional X-ray para nasal sinus water's view in sinusitis. To study the proportion of asymptomatic individuals showing haziness in conventional X-ray para nasal sinus water's view. Sensitivity and specificity of sinus X-ray in combination (conventional + digital) is 95 and 44%, respectively. Proportion of asymptomatic individuals showing haziness in conventional X-ray and digital X-ray paranasal sinus water's view are 52.4 and 75%, respectively. X-ray paranasal sinus water's view undoubtedly yields valuable information regarding sinus pathology. However it should not be accepted as a diagnosis in itself, but considered in the light of patient's history and clinical findings.

Keywords Sinusitis · Water's view · Haziness · Sensitivity · Specificity

Introduction

Respiratory tract infections are the most common infections managed by general practitioners. In the recent report from centre for disease control, respiratory tract infections

like URTI, ear infections, pharyngitis etc. account for 16% of all OPD visits [1].

Of all the respiratory infections, sinusitis is one of the most common infections that affect high proportion of population. According to the National Ambulatory Medical Care (NAMC) survey sinusitis is the fifth most common diagnosis for which antibiotics are prescribed [2]. The true prevalence rate of sinusitis varies considerably because of diagnostic criteria used by different institutions and not all individuals seek medical help for sinusitis.

Hevas et al. [3] found abnormal appearance of paranasal sinus on CT scan in 42.7% of asymptomatic patient. Bolger et al. [4] found similar proportion of 41.7% in patient scanned for non-sinus reason. According to Bolger et al. these abnormalities could be induced by normal variation of normal mucosa, asymptomatic chronic sinus disease or mild to moderately symptomatic undiagnosed sinusitis. Diamant et al. [5] found maxillary and ethmoidal thickening in 50% of patient. Similar figures were found by Gordts et al. [6, 7] who demonstrated in an MRI study of a non-ENT population of adults that there existed on 40% abnormalities of the mucosa, and in 45% of the cases in a non-ENT population of children.

So it is a clinical dilemma whether patients having no symptoms of sinusitis but sinus haziness in X-ray should be considered as sinusitis? And patients clinically having sinusitis and do not have radiological evidence should be considered as case of sinusitis or not. This study is an attempt to discuss this issue in detail.

Aims and Objectives

1. To study diagnostic efficacy of conventional X-ray paranasal sinus water's view in sinusitis.

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2. To compare sensitivity and specificity of conventional and digital X-ray paranasal sinus water's view in sinusitis.
3. To study the proportion of asymptomatic individuals showing haziness in conventional and digital X-ray paranasal sinus water's view.

Study Design

- This is a case control study.
- The study period extends from January 2009 to June 2010.
- This study was conducted at Dr. Shankarrao Chavan Government Medical College, Nanded.
- This study was approved by Local Ethical Committee.
- In this study, haziness in X-ray paranasal sinus water's view in symptomatic patient and asymptomatic individuals was studied.
- Patient having symptomatology of sinusitis were X-rayed in conventional water's view, subjects/volunteers having no symptomatology of sinusitis were submitted to X-ray PNS water's view.
- Proportion of symptomatic cases and asymptomatic individuals showing haziness in conventional and digital X-ray paranasal sinus water's view were compared.

Methodology

Subject Selection

Cases (n = 100) Collected from ENT OPD and ward with nasal and paranasal sinus complaints suggestive of sinusitis.

Controls (n = 100) Patient coming to OPD for other reasons or normal asymptomatic individuals/relatives of patients coming to OPD.

Exclusion Criteria

- i. Children below 12 years of age;
- ii. nasal bleed as sign or symptom;
- iii. facial trauma;
- iv. nasal masses;
- v. uncooperative, non willing candidates.

Inclusion Criteria

Symptomatic Patient attending ENT outpatient department or indoor patients.

- Having symptoms of sinusitis (TFR criteria) [8];
- diagnosed and under treatment cases of sinusitis.

Asymptomatic Patients attending ENT outpatient department or inpatient department.

- Having symptoms other than nasal pathology;
- non ENT patients;
- healthy individuals, willing to participate in the study.

Personal data like age, sex, address and occupation etc. are collected. Symptomatology, clinical examination and radiological evaluation entered in case proforma (Table 1). Cases and controls were submitted to conventional or digital X-ray PNS water's view randomly (Fig. 1).

Grading of haziness in the X-ray PNS water's view was done as follows:

Grade	Description
–	Well aerated antrum i.e. normal.
+	Mucosal thickening i.e. a halo of increased density surrounding a central air collection.
++	Haziness i.e. loss of translucency of most of the maxillary antrum which is preferably more than orbital haziness.
+++	Complete opaque antrum i.e. more than or equal to bony opacity.

Observations

Table 2 shows opacity in maxillary antrum in 47.6%, and haziness in maxillary antrum in 38.1% in symptomatic patients. Proportion of symptomatic patients showing haziness (haziness + mucosal thickening + opacity) in conventional X-ray paranasal sinus water's view are 41/42 i.e. 97.6%. Proportion of symptomatic patients showing normal conventional X-ray paranasal sinus water's view is 1/42 i.e. 2.4%.

In asymptomatic group 47.6% of individuals showed normal X-ray. But 48.8% of individuals showed

Table 1 Showing age-wise study population submitted to conventional or digital X-ray PNS

Age group	No. of candidates		
	Total	Conventional X-ray	Digital X-ray
12–21	61	37	24
22–31	71	37	34
32–41	33	30	3
42–51	23	15	8
52–61	9	6	3
62–71	3	1	2
Total	200	126	74

66% of our patients were in early 3rd decade of life. 57.5% were males and 42.5% were females

Fig. 1 Bar diagram showing sample size

Table 2 Showing conventional X-ray abnormalities in symptomatic and asymptomatic groups

Finding	Symptomatic patients		Asymptomatic patients	
	Frequency	%	Frequency	%
Normal	1	2.40	40	47.60
Mucosal thickening	5	11.90	18	21.40
Haziness	16	38.10	23	27.40
Opacity	20	47.60	3	3.60
Total	42		84	

abnormality on X-ray PNS in form of haziness or mucosal thickening or opacity. Proportion of asymptomatic patients showing haziness in conventional X-ray paranasal sinus water's view are 44/84 i.e. 52.4% (Table 3).

Similarly digital X-ray paranasal sinus water's view in symptomatic patients showed haziness in maxillary antrum in 43.1% and mucosal thickening in 25.9%.

Proportion of symptomatic patients showing haziness in digital X-ray paranasal sinus water's view are 54/58 i.e. 93.1%. Proportion of symptomatic patients showing normal digital X-ray paranasal sinus water's view are 4/58 i.e. 6.9% (Table 4).

Using Digital X-ray, Asymptomatic individuals showed mucosal thickening in 56.25% cases and normal findings in 25% and proportion of asymptomatic patients showing haziness in digital X-ray paranasal sinus water's view are 12/16 i.e. 75% (Table 5).

Discussion

The present study entitled "X-ray paranasal sinus water's view in sinusitis a fact or fiction" is conducted in the department of ENT, Govt. Medical College; Nanded from 01/01/2009 to 30/06/2010. The study includes 100 cases with complaints suggestive of sinusitis and 100 controls.

Table 3 Showing normal/abnormal findings in symptomatic/asymptomatic individuals using conventional X-ray

	Conventional X-ray findings	
	Abnormal*	Normal
Symptomatic	41	1
Asymptomatic	44	40

"True positives" = 41; "true negative" = 40; "false positive" = 44; "false negative" = 1. Calculating the sensitivity and specificity: sensitivity = 97.6%; specificity = 47.6%; positive predictive value = 48.2%; negative predictive value = 95.6%

* Abnormal includes mucosal thickening, haziness, opacity

Table 4 Showing normal/abnormal findings in symptomatic/asymptomatic patients using digital X-rays

	Digital X-ray findings	
	Abnormal	Normal
Symptomatic	54	4
Asymptomatic	12	4

Sensitivity = 93.1%; specificity = 25%; positive predictive value = 93.1%; negative predictive value = 25%

Table 5 Showing normal/abnormal findings using conventional and digital X-rays in symptomatic/asymptomatics

	X-rays (digital + conventional)	
	Abnormal	Normal
Symptomatic	95	5
Asymptomatic	56	44

Sensitivity = 95%; specificity = 44%; positive predictive value = 62.9%; negative predictive value = 89.8%

Age Distribution

In our study age of patients varied between 12 and 71 years with the maximum number of patients between 12 and 31 years of age, i.e., 66% of patients are in early 3rd decade of age.

Sex Distribution

In the present study 115 patients i.e. 57.5% were males while 85 patients i.e. 42.5% were females.

Sensitivity of X-ray is the statistical index of diagnostic accuracy [9]. It is the ability of X-ray paranasal sinus water's view to identify correctly all those who have the sinusitis i.e. true positives. Specificity of X-ray is the ability of sinus X-ray to identify correctly those who do not have sinusitis i.e. true negatives.

The ideal test should have 100% sensitivity and 100% specificity but in matter not a single test is 100% sensitive and 100% specific [9].

Table 6 Review of previous studies

	Author	Sensitivity (%)	Specificity (%)
Matching studies	Present study (2010)	95	44
	Ahmad B [10]	77	37
	Reider JM and Nashelsky J [11]	41–90	61–85
	Fagnan LJ [12]	88	
Non-matching studies	Hou S [13]	94	
	Garcia DP [14]	76	81
	Burke TF [15]	70	96–100
	Chen LC [16]	81.10	72.70
	Konen E [17]	67.70	87.60

In our study, the sensitivity and specificity of sinus X-ray is 95 and 44%, respectively. Hence conventional or digital X-rays have high sensitivity but low specificity. It means they would incur Type I error. So, percentage of false positive cases would be more. It means it over detects the cases of sinusitis. Use of digital X-ray too has not altered the picture significantly. Rather the identification of true negative cases has reduced in digital X-rays (Table 6).

The results in the present study shows that the X-ray paranasal sinus water's view (conventional + digital) has sensitivity of 95% and specificity of 44%, it means that the X-ray paranasal sinus has more sensitivity but less specificity.

This is consistent to the study of Ahmad et al. [10] who showed that the X-ray PNS (water's view) had a sensitivity of 77% and specificity of 37% in chronic maxillary sinusitis. The study by Reider and Nashelsky [11] showed that the sinus x-ray had high sensitivity and low specificity and which is matching approximately with present study. Also Fagnan [12] study showed that the sensitivity of sinus radiography was 88%. According to Hou et al. [13] sensitivity of X-ray paranasal sinus water's view was 94%.

The study does not match with work of Garcia et al. This may be because.

1. Inclusion criteria may be different or more specific.
2. Environment pollution might be causing mucosal reaction without giving symptoms.

Summary and Conclusions

- Diagnostic efficacy of conventional X-ray paranasal sinus water's view i.e. sensitivity is 97.6% and specificity is 47.6%.
- Sensitivity and specificity of digital X-ray paranasal sinus water's view is 93.1 and 25%, respectively.

- Sensitivity and specificity of sinus X-ray in combination (conventional + digital) is 95 and 44%, respectively.
- Proportion of sinusitis cases showing haziness in conventional X-ray paranasal sinus water's view is 97.6%.
- Proportion of sinusitis cases showing haziness in digital X-ray paranasal sinus water's view is 93.1%.
- Proportion of asymptomatic individuals showing haziness in conventional X-ray paranasal sinus water's view is 52.4%.
- Proportion of asymptomatic individuals showing haziness in digital X-ray paranasal sinus water's view is 75%.
- Conventional or digital X-ray has high sensitivity but low specificity. It means they would incur Type I error. So, percentage of false positive cases would be more. It means it over detects the cases of sinusitis.
- We can thus conclude that X-ray paranasal sinus water's view undoubtedly yields valuable information regarding sinus pathology. However it should not be accepted as a diagnosis in itself, but considered in the light of patient's history and clinical findings.

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