

# SINUS RADIOGRAPHY: IS WATER'S VIEW HELPFUL IN THE MANAGEMENT OF CHRONIC MAXILLARY SINUSITIS?

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## ABSTRACT

**Background:** Maxillary sinusitis is a common problem presenting in the ENT OPD. Traditionally plain radiography in the form of Water's view is in vogue to diagnose sinusitis. This study aimed to determine the reliability of Water's view in the initial management of chronic maxillary sinusitis.

**Methodology:** This study was conducted at ENT Department, Postgraduate Medical Institute, Hayatabad Medical Complex Peshawar from January 1, 2008 to June 30 2009. A total of 120 cases were included in the study after detailed history taking and clinical examination. All the patients underwent sinus radiography (Water's view) and antral lavage. A correlation of radiographic with antral lavage findings was made.

**Results:** All the cases had radiological evidence of maxillary sinusitis. The radiological findings on sinus radiography were; Opacification (40.83%), Mucosal thickening (23.33%), Haziness (19.16%) and Air fluid levels (16.66%). The antral lavage was positive in: Air fluid levels: 100%, Opacification: 81%, Haziness: 61%, and Mucosal thickening 39%. On the whole, there was a 71% positive correlation of sinus radiography with antral lavage in the study.

**Conclusion:** The presence of air fluid levels and sinus opacification on plain radiography are more reliable evidences of maxillary sinusitis as compared to haziness and mucosal thickening. Water's view of the paranasal sinuses gives important information regarding maxillary sinus pathology but it should be interpreted in the light of history and clinical findings.

**KEY WORDS:** Chronic maxillary sinusitis, Antral lavage, Sinus radiography, Water's view.

## INTRODUCTION

Sinusitis, more appropriately called as rhinosinusitis, is characterized by inflammation of the nasal mucosa and paranasal sinuses. Acute sinusitis usually results from secondary bacterial invasion after viral rhinitis.<sup>1</sup> Chronic inflammation is the one persisting for a period of 12 weeks or more.

The 1996 diagnostic criteria for clinical usage as defined by the Rhinosinusitis Task Force requires 2 or more major factors or 1 major factor and 2 minor factors persisting for longer than 12 weeks to constitute a diagnosis of the chronic rhinosinusitis. Major factors for diagnosis include facial pain, nasal obstruction, nasal or postnasal discharge, hyposmia or anosmia, purulence in nasal cavity, and fever (for acute rhinosinusitis only). Minor factors are headache, fever (for chronic rhinosinusitis), halitosis, fatigue, dental pain, cough, and ear pain, pressure, or fullness. How-

ever facial pain requires another major factor associated with it for diagnosis.<sup>2</sup>

In the modern era, CT scanning, MR imaging, ultrasonography and a variety of nasal and sinus endoscopes are used to diagnose sinusitis. However sinus radiography still remains an important and a cheaper diagnostic tool in the initial management of both acute and chronic sinusitis<sup>4</sup>. Occipitomeatal or Water's view is the commonest projection requested by the clinician to diagnose sinusitis. This view shows the maxillary sinuses clearly. The frontal sinus is projected obliquely. The ethmoid air cells are seen along the medial walls of the orbit and within the nose. The sphenoid sinus is seen through the open mouth. Pathological processes affecting the paranasal sinuses encroach on the air in sinuses and are seen on the radiograph as alteration in the translucency of the sinus. The findings suggestive of sinusitis on plain radiography are air-fluid levels, opacification, haziness and mucosal thickening.

Most studies have demonstrated that about 90% of cases of sinusitis involve the maxillary sinuses and, therefore, most cases of sinusitis would be diagnosed using only the Waters view.<sup>5,6</sup>

There are certain pitfalls associated with sinus radiography which must be kept in mind while interpreting the films. Asymmetry of the paired sinuses will usually result in the smaller sinus appearing more opaque because of its thicker bony wall and little amount of air. Rarely one maxillary sinus fails to develop altogether and consequently the maxilla looks denser on plain x-ray films. Post-operative changes such as after the Caldwell-Luc procedure will also render the maxillary sinus opaque.<sup>1</sup> Cellulitis with swelling of the cheek produces clouding of the antral air space on Water's view and can mimic true clouding due to sinus disease. Moreover the differentiation of infection, tumor, polyp, and allergic mucosal thickening may be difficult, and all of these conditions can lead to a false-positive diagnosis. Sinus mucosal thickening or opacification may also occur in hematological disorders, fibrous dysplasia, Wegener granulomatosis and Paget's disease.<sup>1,2</sup> Such findings should alert the observer and more accurate means of diagnosis such as CT scan, MR imaging, nasendoscopy and sinuscopy may be employed if doubt persists. However cost, availability and expertise limit their use.

Antral lavage is both diagnostic and therapeutic procedure. For instances where medical management fails, antral lavage may be needed to treat maxillary sinusitis.

In our circumstances it is a common practice to obtain plain sinus radiographs before instituting any form of treatment. Therefore it shall continue to have its role in the initial management of chronic maxillary sinusitis because of its efficacy, low cost and easy availability. However it must have a high degree of accuracy to justify its continued relevance.

The objective of this study was to correlate the findings of sinus radiography (Water's view) with operative findings on antral lavage in the management of chronic maxillary sinusitis.

## MATERIAL AND METHODS

This descriptive study was conducted in the ENT Department of Postgraduate Medical Institute, Hayatabad Medical Complex Peshawar from January 1, 2008 to June 30, 2009.

A total of 120 cases were included in the study. Sampling technique was non-probability, convenience sampling.

Patients belonging to both sexes, age 18 years & above, undergoing antral lavage after pre-

liminary sinus radiography were included in the study. Those in need of other diagnostic imaging modality (CT/MRI) for sinusitis or other co-existing diseases, cases of isolated sinusitis not involving at least one of the maxillary sinuses and those having no radiographic evidence of maxillary sinusitis, were excluded.

The study included 120 patients who presented to the ENT Department with signs and symptoms of sinusitis from January 1, 2008 to June 30, 2009. Appropriate patients were selected and included in the study using the Rhinosinusitis Task Force 1996 diagnostic criteria for clinical usage. In all the patients a standard occipitomeatal/Water's view was obtained. The sinus radiographs were examined for the presence of evidence of the maxillary sinusitis and standard criteria of air-fluid level, haziness (reduced transparency), sinus opacification and mucosal thickening (greater than 5 mm as measured at mid point of the lateral wall of maxillary sinus) was used to diagnose sinusitis.

Antral lavage was carried out within a period of three days after obtaining a radiograph. The antral lavage findings were categorized as either 1. Positive: when the discharge was purulent, mucopurulent & turbid or contained debris and 2. Negative: when the return was clear. Final diagnosis of sinusitis was made on the basis of operative findings on antral lavage and the percent accuracy of the sinus radiography (Water's view) was calculated.

## RESULTS

A total of 120 cases were included in the study. The ages of the patients ranged from 18 to 70 years with the mean age of  $35.74 \pm 15.70$  years. The male to female ratio was 1.26:1. Males are affected more than female but found to be statistically insignificant by applying chi-square test with  $p\text{-value}=0.162$  at 5% level of significance as shown in Table 1.

Sinus opacification was the commonest radiological finding (40.83%). The radiological findings on plain x-ray film (Water's view) are shown in Table 2.

The antral lavage findings were positive in 85 cases and negative in 35 cases which shows that positive cases are significantly more than negative cases by applying non parametric chi square test with  $p\text{-value}$  0.000 as shown in Table 3.

The maximum positive correlation (100%) was found in cases where the radiograph showed air fluid level followed by opacification (81.5%). The correlation of radiographic with antral lavage findings is shown in Table 4.

**Table 1: Age and sex distribution of patients.**

Age range (years)	Gender		Total
	Male	Female	
18-30	18 15.0%	23 19.2%	41 34.2%
31-40	24 20.0%	20 16.7%	44 36.7%
41-50	16 13.3%	7 5.8%	23 19.2%
51-60	7 5.8%	3 2.5%	10 8.3%
61-70	2 1.7%	0 0%	2 1.7%
Total	67 55.8%	53 44.2%	120 100.0%

**Table 2: Radiological findings on Water's view.**

No.	Radiological findings	Number of cases	Percentage
1	Opacification	49	40.83
2	Mucosal thickening	28	23.33
3	Haziness	23	19.16
4	Air fluid levels	20	16.66

**Table 3: The antral lavage findings.**

Antral lavage findings	Number of cases	Percentage	P-value
Positive	85	71	0.000
Negative	35	29	

## DISCUSSION

Sinusitis is a common disease and more than 90% of such cases involve the maxillary sinuses. Most cases of acute sinusitis would respond to medical treatment. Only a few cases of acute complicated maxillary sinusitis and the majority of

chronic maxillary sinusitis would require surgical treatment. Antral lavage with saline irrigation of maxillary sinus is both diagnostic and therapeutic procedure and is commonly performed in chronic maxillary sinusitis. However it is an invasive procedure & is not without hazards.<sup>1,2,3</sup> It is therefore important to be reasonably sure that the patient would be benefited by the procedure. Water's view of the paranasal sinuses has been suggested as the best single view for diagnosing sinusitis.<sup>4,8</sup> Retained secretions in the sinus are suggestive of impaired drainage. Such secretions are usually infected and consequently need to be drained.

Mucosal thickening is seen in more than 90% of patients with sinusitis whereas air-fluid levels and complete opacification are seen in only 60% of cases of sinusitis.<sup>7</sup> The findings of our study are in agreement with most of the authors who agree that haziness and mucosal thickening are less reliable whereas air-fluid levels and sinus opacification are useful features on radiographs and it is generally accepted that they will make a positive prediction in 80-100% of cases.<sup>9-12,16,17</sup>

In this series, all the sinuses with air-fluid levels yielded a positive antral lavage followed by those that showed radiologic evidence of sinus opacification (81.5%). In 'haziness' and 'mucosal thickenings' lavage was positive in 61% and 39% of cases respectively. Kay et al in a similar study concluded that the presence of mucosal thickening or haziness was a poor indicator of retained secretions.<sup>16</sup> Various studies have been reported in the literature correlating sinus radiography and antral lavage.<sup>11-14,16</sup> They all agree that the only reliable predictors radiographically are sinus opacification and the presence of fluid levels in the diagnosis of maxillary sinusitis.

Vourinen et al in their study of 272 cases of maxillary sinusitis found 73.6% and Sammy Elwany found 100% correct prediction when the radiographic findings were fluid levels. Vourinen et al found 86% and Sammy Elwany et al 75% agreement of a positive antral lavage when x-ray showed sinus opacification.<sup>12,14</sup> McNeil in his study of 242

**Table 4: Correlation of radiographic with antral lavage findings.**

Radiological findings	Number of cases	Antral lavage findings		Positive Percentage
		Positive	Negative	
Air fluid levels	20	20	00	100
Opacification	49	40	09	81.5
Haziness	23	14	09	61
Mucosal thickening	28	11	17	39

sinuses compared opacity with sinus lavage and found in agreement of 81%.<sup>13</sup> McNeil showed that only 37% cases were positive on antral lavage when x-ray showed mucosal thickening. Vourinen et al showed that only 36.4% of such sinuses showed evidence of sinus infection. Whereas Sammy Elwany showed 62.5% and Chikedel et al found 54% of sinuses with mucosal thickening were positive on antral lavage.<sup>12-17</sup> The reliability of antral haziness as a predictor of sinusitis was studied by Sammy Elwany and Chikedel et al who revealed success rate of 12.5 % and 61% respectively.<sup>14,17</sup>

Bashir Ahmed & colleagues in their study on the role of sinus radiography (water's view) found a sensitivity of 77% and specificity of 37% in chronic maxillary sinusitis when compared with the findings of antral lavage.<sup>15</sup> In 2008, OA Sogebi and colleagues in their study found that fluid level and antral opacity on plain sinus radiography had a high specificity (92.3%) each and positive predictive values of 87.5% and 96% respectively on antral lavage whereas mucosal thickening and haziness were found to have a low specificity (36.7%) and a positive predictive value of 29.4%.<sup>18</sup>

This study did not include cases which were normal on sinus radiography. However it will be of interest to note that Vourinen et al found 94% and Evans et al reported that 100% of the radiographically normal maxillary sinuses were also found normal on antral puncture.<sup>10,12</sup>

## CONCLUSION

From our study it is concluded that air fluid levels on sinus radiography is the most reliable evidence of maxillary sinusitis followed by sinus opacification. Haziness and mucosal thickening of the maxillary sinuses are less reliable radiologic features. Water's view of the paranasal sinuses undoubtedly yields important information regarding maxillary sinus pathology to justify its continued use.

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