

## Examine the Association between Imaging Technologies (X-ray with CT Scan) of Para-nasal Sinuses in Sinusitis Patients

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### ABSTRACT

**Aim:** To evaluate the association between modern imaging technologies (X-rays and CT scan) of para-nasal sinuses in clinically diagnosed sinusitis patients.

**Study Design:** Comparative/Observational

**Place & duration of study:** Departments of Diagnostic Radiology and ENT, Head & Neck Surgery, Civil Hospital Quetta from 1<sup>st</sup> October 2018 to 31<sup>st</sup> March 2019.

**Methods:** Fifty five patients of both genders, age between 2-55 years whom had resulted acute and chronic sinusitis disorder by clinically examination were included. All patients were referred to department of radiology for examine the diagnostic accuracy of para-nasal sinuses under x-ray and CT scan. Radiological results of X-ray were associated with CT scan in both chronic and acute sinusitis resulted patients.

**Results:** Thirty three (60%) patients were male while rest 22 (40%) were female. 12 (21.82%) patients were aged between 20 to 29 years, 13 (23.64%) patients had ages of 30 to 39 years, 18 (32.72%) patients were aged between 40 to 49 years and 12 (21.82%) patients were ages >49 years. From all 55 patients 26 (47.27%) had found acute sinusitis while 29 (52.73%) had found chronic sinusitis by clinically normal x-ray observation, when these patients were diagnosed by CT scan, from 26 acute sinusitis patients, 18 (69.23%) patients had found acute sinusitis while 8 (30.77%) had found no positive result. From 29 chronic patients, 22 (75.86%) had found positive results while 7 (24.14%) had not found chronic sinusitis.

**Conclusion:** The X-rays plays an important role for diagnosing of para-nasal sinuses, but now-a-days, modern and advanced CT scan and MRI provide an accurate finding for diagnosing para-nasal sinuses of sinusitis patients.

**Keywords:** X-ray, CT scan, Para-nasal sinuses (PNS), Sinusitis patients

### INTRODUCTION

Imaging technologies used in nose study and para-nasal sinuses (PNS) plays an important role in managing of multiple pathologies.<sup>1</sup> A modern or advanced Imaging technique such as Computed tomography and MRI plays a vital role to diagnose para-nasal sinuses more accurately than the conventional X-rays. Computed tomography of nose and PNS helps surgeon to provide better and accurate treatment of the sinusitis patients.<sup>2</sup>

Para-nasal sinuses defined as air filled alveolus, which affect very importantly for resonance of voice and other physiological changes of inspired air to compatible of lower airway. Malignant disorders such as chronic and acute sinusitis are mainly examined on patient's history and physical observation but in different complicated incidences radiology of nose and PNS execute an important role in diagnosing of PNS disorders<sup>3,4</sup>. Inflammatory is most frequent disease that affect nose and PNS.<sup>5</sup> Computed tomography and MRI is the most important imaging techniques used in nose infections and para-nasal sinuses and helps to diagnose the benign and malignant tumor and also helps surgeon to provide better and accurate treatment. Basic or modest radiography is still operating as a diagnostic technique having a deficient role to mark some

areas such as ethmoidal and osteomeatal complex of sinuses in under developing countries. Conventional radiology causes difficulty for diagnosing infection and tumors<sup>6</sup> and polyps in an opaque sinuses<sup>7</sup>. Advance and modern imaging techniques such as CT scan provides more accurate and better information about nose infections and PNS (para-nasal sinuses)<sup>8</sup> Computed tomography execute a very important role to value pathologies in strenuous domains specially in ethmoid and sphenoid sinuses.<sup>9,10</sup> Many researches shows that the radiological results of X-ray of para-nasal sinuses having symptoms like mucosal thickness, air fluid in maxillary sinuses and complete or partially opacification<sup>11,12</sup> Mucosal thickness is found in mostly sinusitis incidences as 90% cases<sup>13,14</sup>.

Modern imaging technology like CT scan provides better result than the plain or basic radiology.<sup>15</sup> Computed tomography scan provides accurate findings for diagnosing inflammatory disorders. In hospital, if CT scan technology is available than should have to perform this technique before any perforated sinus surgery<sup>16</sup>.

### MATERIALS AND METHODS

This comparative/observational study was carried out at Departments of Diagnostic Radiology and ENT, Head & Neck Surgery, Civil Hospital Quetta from 1<sup>st</sup> October 2018 to 31<sup>st</sup> March 2019. Fifty five patients of both genders

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whom had resulted acute and chronic sinusitis disorder by clinically examination were included. All patients were referred to department of radiology for examine the diagnostic accuracy of para-nasal sinuses under x-ray and CT scan. Patients having normal and sinus problems and infections were excluded from this study. Radiological results of x-ray were associated with CT scan in both chronic and acute sinusitis resulted patients. All statistical data was analyzed by SPSS 21. PPV, NPV, sensitivity and specificity and accuracy of X-ray and CT scan were examined.

**RESULTS**

Table 1: Gender & age-wise distribution of patients

Variable	No.	%
<b>Gender</b>		
Male	33	60.0
Female	22	40.0
<b>Age (years)</b>		
20 -29	12	21.82
30 -39	13	23.64
40 -49	18	32.72
>49	12	21.82

Table.2: Clinically X-rays findings and symptoms observed

X-ray findings PNS	Acute Sinus	Chronic sinus
Normal	8	10
Muco thickness	7	7
Haziness	5	6
Complete/partial opacity	6	6
Total	26	29

Table 3: Imaging results of CT scan followed by X-rays findings of acute sinusitis

X-ray	CT scan		Total
	+ ve	- ve	
+ ve	12	5	17
- ve	3	6	9
Total	15	11	26

Sensitivity =  $12/(12+3) \times 100 = 80\%$   
 Specificity =  $6/(6+3) \times 100 = 66.67\%$   
 PPV =  $12/(12+5) \times 100 = 70.59\%$   
 NPV =  $6/(6+3) \times 100 = 66.67\%$

Table 4: Imaging results of CT scan followed by X-rays findings of chronic sinusitis

X-ray	CT scan		Total
	+ ve	- ve	
ve	17	3	20
- ve	4	5	9
Total	21	8	29

Sensitivity =  $17/(17+4) \times 100 = 80.95\%$   
 Specificity =  $5/(5+4) \times 100 = 55.56\%$   
 PPV =  $17/(17+3) \times 100 = 85\%$   
 NPV =  $5/(5+4) \times 100 = 55.56\%$

Thirty three (60%) patients were male while rest 22 (40%) were female. 12 (21.82%) patients were aged between 20 to 29 years, 13 (23.64%) patients had ages of 30 to 39 years, 18 (32.72%) patients were aged between 40 to 49 years and 12 (21.82%) patients were ages >49 years (Table 1). Twenty six (47.27%) had found acute sinusitis with symptoms observed in patients of normal, mucosal thickness, haziness and complete and partial opacity as 8, 7, 5, 6 respectively, while 29 (52.73%) had found chronic

sinusitis by clinically normal X-ray observation with symptoms observed in patients of normal, mucosal thickness, haziness and complete and partial opacity as 10, 7, 6, 6 respectively (Table 2). When these patients were diagnosed by CT scan, from 26 acute sinusitis patients, 18 (69.23%) patients had found acute sinusitis while 8 (30.77%) had found no positive result. From 29 chronic patients, 22 (75.86%) had found positive results while 7 (24.14%) had not found chronic sinusitis (Table 3). In acute sinusitis findings, we observed sensitivity, specificity, positive predictive value and negative predictive value as 80%, 66.67%, 70.59% and 66.67% respectively and in chronic sinusitis patients, we observed 80.95%, 55.56%, 85% and 55.56% as sensitivity, specificity, PPV and NPV respectively (Table 4).

**DISCUSSION**

Several anatomical disorders of nose happens which may be diagnosed not accurately but can diagnosed accurately by using advance radiology like CT scan. These disorders findings may deficient some domains of nasal alveolus which damage nasal air flow and drainage of PNS cause sinusitis. Sinusitis can be divided into acute and sub-acute and chronic sinusitis resulted on duration of mucos membrane inflammation. Acute sinusitis can be defined as having disorder from < 1 month and sub-acute from <3 months and chronic from > 3 months<sup>17</sup>.

Thirty three (60%) patients were male while rest 22 (40%) were female. 12(21.82%) patients were aged between 20 to 29 years, 13(23.64%) patients had ages of 30 to 39 years, 18(32.72%) patients were aged between 40 to 49 years and 12(21.82%) patients were ages >49 years, these results were different to other study done in South Africa in which females ratio was high than the males but in our study males ratio was higher than females it was may be due to the excess use of smoking in males.<sup>17</sup> In this research we observed 26(47.27%) had found acute sinusitis with symptoms observed in patients of normal, mucosal thickness, haziness and complete and partial opacity as 8, 7, 5, 6 respectively, these results were differ from some other studies in which mucosal thickness found in maximum patients as 90% of cases, haziness and total opacity in 60% incidences.<sup>13,14</sup> We observed 29 (52.73%) had found chronic sinusitis by clinically normal x-ray observation with symptoms observed in patients of normal, mucosal thickness, haziness and complete and partial opacity as 10, 7, 6, 6 respectively. These results are also different from other study conducted by Varonen et al<sup>18</sup>. In the present study, modern imaging technology like CT scan provides better result than the plain or basic radiology and these results were same to the some other studies.<sup>15</sup> Computed tomography scan provides accurate findings for diagnosing inflammatory disorders. In hospital, if CT scan technology is available than should have to perform this technique before any perforated sinus surgery<sup>16</sup>.

This study showed that acute sinusitis findings, we observed sensitivity, specificity, positive predictive value and negative predictive value as 80%, 66.67%, 70.59% and 66.67% respectively and in chronic sinusitis patients, we observed 80.95%, 55.56%, 85% and 55.56% as sensitivity, specificity, PPV and NPV respectively. These results were same to the some other studies<sup>19-23</sup>.

## CONCLUSION

X-rays plays an important role for diagnosing of para-nasal sinuses, but now a days, modern and advanced CT scan and MRI provide an accurate findings for diagnosing para-nasal sinuses of sinusitis patients.

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