

Clinical Correlation between X-Ray Paranasal Sinuses and Proof Puncture in the Diagnosis of Maxillary Sinusitis

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ABSTRACT

Background: Maxillary sinusitis is among the most common diseases, which the otolaryngologist comes across in his practice. Maxillary sinus holds a central place in infection of other sinuses and therefore, accurate diagnosis and treatment of maxillary sinusitis likewise plays a pivotal role in the treatment of other sinusitis.

Aims: To make a statistical analysis of the distribution, clinical features and organisms isolated in a series of patients suffering from maxillary sinusitis to find the accuracy of X-ray paranasal sinuses in the diagnosis of maxillary sinusitis.

Methods: The prospective clinical study was conducted at Combined Military hospital, Lahore. The study was conducted over a time period of one year in 960 patients selected out of the patients coming to ENT OPD. The selection criterion was the clinical diagnosis of maxillary sinusitis in these patients. Young patients under the age of sixteen and elderly patients over the age of sixty-five were excluded from the study. All patients then underwent plain X-ray paranasal sinuses (Occipitomental or Water's view) and diagnostic proof puncture/antral lavage under local or general anaesthesia to confirm the diagnosis.

Results: The results obtained from this study led to the following conclusions. Firstly, maxillary sinusitis is predominantly a disease of young males, with higher distribution in winter months, for lower socioeconomic class and for chronic disease. Secondly, maxillary sinusitis is a multifactorial disease with the most common aetiological factors and concomitant diseases being rhinitis and pharyngeal infection. Thirdly, the disease presented with varied symptoms and signs in acute and chronic stages. The most frequent modes of presentation were nasal obstruction and postnasal discharge. The most frequent clinical finding was swollen inferior turbinates. Fourthly, plain X-ray paranasal sinuses were found to be quite accurate in the diagnosis of maxillary sinusitis. Fifthly, diagnostic proof puncture although more reliable diagnostic procedure but being invasive should preferably be used as a therapeutic modality. Sixthly, the commonest organisms isolated from puncture aspirate were, haemophilus influenzae in acute cases while staphylococcus aureus was commonest in chronic cases.

Conclusion: In the end, this study would be incomplete without the finale of recommendations. It is strongly recommended that the clinical diagnosis of maxillary sinusitis should be routinely investigated with cheap and readily available plain x-ray paranasal sinuses. Acute and chronic cases unresponsive to conservative treatment should be the only patients subjected to the invasive procedure of diagnostic proof puncture/antral lavage.

Keywords: Maxillary sinusitis, Diagnosis, X-ray paranasal sinuses, Proof punctures.

INTRODUCTION

Maxillary sinusitis is one of the commonest, potentially debilitating and of the sometimes most frequently overlooked disease entity encountered in the practice of otorhinolaryngology. Maxillary sinusitis is a common precursor of infection in upper and lower respiratory tracts.

Sinusitis results from any condition causing osteal obstruction or from pathophysiologic changes in the mucociliary transport mechanism. It is essential that the cilia of the respiratory epithelium clear the mucus through patent ostia, otherwise stagnation of secretion occurs and ideal conditions for bacterial growth develop.

Obstruction of the narrow osteomeatal complex due to inflammation of sinonasal mucosa, coupled with gravity and decreased mucociliary clearance, an accumulation of secretions in the sinus occurs which is a culture medium for bacterial growth.

Acute sinusitis commonly results from secondary bacterial invasion after viral rhinitis. Viral infection leads to swelling of the lining of the nose and sinuses, blockage of

sinus ostia, interference with the clearance mechanism and stasis.

Obstructive causes include nasal polyp, nasal septal deviation, foreign bodies, hypertrophied turbinates (i.e. from chronic allergic rhinitis), anatomic deformation of the osteomeatal complex, tumors of nasal cavity and nasopharynx.

Once symptoms have persisted for 3 months a chronic state is deemed to exist, although this is based empirically on the history rather than any sound pathological grounds.

The viruses implicated in initial viral rhinitis are rhinoviruses, coronaviruses, influenza and parainfluenza viruses. The bacteria involved in acute maxillary sinusitis are haemophilus influenzae, streptococcus pneumoniae and moraxella catarrhalis.⁵ Staphylococcus aureus and anaerobic bacteria are involved in chronic maxillary sinusitis.

In general practice sinusitis is usually diagnosed on the basis of symptoms and signs resulting in an incidence of 21-25 episodes per 1000 listed patients per year. The symptoms includes headache with facial pain, mucopurulent postnasal discharge and nasal obstruction associated with coughing, pharyngeal irritation. These symptoms may exist in combination or individually.

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Examination reveals tenderness over the involved sinuses. There is generalized swelling and hyperaemia of the nasal mucous membrane. After decongesting the mucosa, it may be possible to see pus extruding into the middle meatus from the involved sinuses.

There are several ways of imaging the patient with suspected maxillary sinusitis. For many years the main stay has been plain radiograph and this continues to be the case. However the radiological picture does not always correlate with the clinical picture or with the findings obtained antral lavage. There can be false positive as well as false negative results on the radiological examination. It is therefore important to define the pathological coordinates between clinical picture and radiological findings. The purpose of this study was to make such a correlation in our indigenous population.

The purpose of undertaking the present study was three folds.

1. To make a statistical analysis of the distribution, clinical features and organisms isolated in a series of patients suffering from maxillary sinusitis over one year period, in our society.
2. To find the accuracy of X-ray paranasal sinuses in the diagnosis of maxillary sinusitis.
3. To make a clinical correlation and statistical analysis between the findings on X-ray paranasal sinuses and the findings on proof puncture for diagnosis of maxillary sinusitis.

MATERIALS AND METHODS

A prospective study was carried out at ENT Department of Combined Military Hospital, Lahore on 960 patients over a period of one year. Patients with acute, and chronic maxillary sinusitis were selected for study from the general population including mostly army personnel and a few civilians referred to the ENT department of Combined Military Hospital, Lahore.

Subjects and Methods

The patients were selected for study from:

- i. All walks of life
- ii. Different areas of the country
- iii. Included civilians as well as army personal.

The children under the age of sixteen and above the age of sixty-five were excluded from the study, as were all those who had any operation on the sinuses previously, except antral lavage.

RESULTS

The study was carried out over a period of one year and included 960 patients, out of which 757 patients yielded a positive aspirate on proof puncture and were followed up for 16 weeks each after initial checkup.

Distribution: The statistical analysis of distribution was considered under the following headings.

Sex: Four hundred and fifty five patients were male (60.1%); three hundred and two were female (39.9%). The male to female ratio was 1.5:1.

Age: The youngest patient was 16 years old while the oldest was 65 years old. Most of the patients were between the ages 16-25 years (40%)

Seasonal Variation: The study showed that maximum patients were seen during the months of December (18.6%), January (16.6%)

Socioeconomic status: The maximum patients with maxillary sinusitis were from lower socioeconomic class (55.1%) of the society.

Stages of Maxillary sinusitis: In this study, distribution of cases in various stages of maxillary sinusitis according to duration of disease was also studied. There was preponderance of patients suffering from chronic maxillary sinusitis (59.2%) while acute maxillary sinusitis had an incidence of 40.8%. The arbitrary division between acute and chronic stages was 12 weeks of duration, based empirically on history rather than on positive pathological findings.

Aetiological factors and concomitant diseases: The study encompassed also the aetiological factors and concomitant diseases. Among them rhinitis (33%) followed by pharyngeal infection (22.1%) were the commonest.

Modes of Presentation: There was a great variation in the modes of presentation of maxillary sinusitis but the commonest presentations were nasal obstruction, followed by postnasal drip, and headache. The duration of symptoms ranged from 02 weeks to 02 years.

Anterior rhinoscopy findings: These findings were subject to considerable variation like the presenting features, however the prominent findings on anterior rhinoscopy were swollen inferior turbinates followed by postnasal discharge.

Radiological Findings: The plain X-rays of paranasal sinuses (occipitomeatal or Waters view) were studied in 960 patients. The radiological findings revealed that in 118(12.3%) patients there was no abnormality although clinically diagnosed as suffering from maxillary sinusitis, while 842(87.7%) patients showed some abnormality. The most common abnormality was opacification (37.4%) of one or both sinuses followed by air fluid level (26.3%) and then mucosal thickening (24%).

Diagnostic Proof Puncture: Diagnostic proof puncture was performed on all patients including those having some abnormality on radiology, either in one or both sinuses, and those patients whose radiological examination revealed no abnormality (i.e. x-ray PNS clear). Seven hundred and fifty-seven patients (78.8%) yielded a positive or productive aspirate/washout, while in two hundreds and three patients (21.2%) proof puncture was negative or clear. The most common findings or positive aspirate was mucopus (35.5%) followed by purulent tap (22.1%) and mucoid washout (19.4%).

Organism isolated: Out of the total patients with positive or productive aspirate culture studies showed that *Haemophilus influenzae* (36.9%) was the commonest in acute cases. While *Staphylococcus aureus* (25%) was the commonest in chronic infection.

Clinical correlation and statistical analysis between radiological findings and findings on proof puncture:

In accordance with the aims of my study, I have evaluated different statistical parameters of x-ray PNS in the diagnosis of maxillary sinusitis in comparison with the accepted standard or gold standard for the diagnosis of maxillary sinusitis, which was proof puncture. The statistical analysis of results of x-ray PNS in the diagnosis of

maxillary sinusitis in my study were carried out under the following parameters namely sensitivity, specificity.

Sensitivity and specificity: Sensitivity and specificity are both measures of a tests validity-its ability to correctly detect people with and people without the disease in question. These two concepts were best understood by four logical possibilities in diagnostic testing.

True Positive (TP): a positive test result obtained in the case of a person who has the disease

False Positive (FP): a positive result obtained in the case of a person who does not have the disease

False Negative (FN): a negative test result obtained in the case of a person who does not have the disease

True Negative (TN): a negative test result obtained in the case of a person who does not have the disease

In my study these statistics of x-ray PNS in comparison with proof puncture (gold standard) were found to be as

TP: 757 patients who had maxillary sinusitis on proof puncture and x-ray PNS also showed positive finding

FP: 114 patients who did not have maxillary sinusitis on proof puncture but the x-ray PNS showed positive finding

FN: 29 patients who actually had maxillary sinusitis on proof puncture but the x-ray PNS failed to show any abnormality

TN: 89 patients who did not have maxillary sinusitis on proof puncture and x-ray PNS also showed no abnormality

Inference: In my study the x-ray PNS was found to be valid or quite accurate for the diagnosis of maxillary sinusitis in comparison with proof puncture (the gold standard in my study). This inference was deduced from the sensitivity (96.3%) and specificity (43.8%) of x-ray PNS.

CONCLUSIONS

1. The statistical analysis of the distribution of maxillary sinusitis in patients coming to ENT OPD of CMH Lahore over a period of one year concluded that the disease was commonest among males with predominance of 16-25 age group. Maximum numbers of cases were received during the winter months from the lower socioeconomic class and with chronic disease.
2. Maxillary sinusitis was multifactorial disease. The most common aetiological factors and concomitant diseases were rhinitis and pharyngeal infection.
3. The most frequent modes of presentations were nasal obstruction and postnasal discharge. The commonest finding on anterior rhinoscopy was found to be swollen inferior turbinates.
4. X-ray paranasal sinuses were found to be quite accurate in the diagnosis of maxillary sinusitis. Thus a reliable general tool for investigation of maxillary disease. Hence the need for continued reliance on this inexpensive and readily available investigation even today in times of modern technologies.
5. Diagnostic proof puncture/antral lavage continued to serve both as a sensitive diagnostic and therapeutic modality. However, keeping in view it being invasive and patient non-complaint it should preferably be used

in only those cases that are found to be unresponsive to conservative treatment.

6. The commonest organisms isolated from positive aspirates were *Haemophilus influenzae* in acute causes while *Staphylococcus aureus* in chronic cases.
7. The results of the present study augment the findings of similar studies carried out by other authors but few disparities were also found which have been elaborated earlier in the study.

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