Original article

Study of correlation between patient symptomatology and incidental paranasal sinus abnormalities detected on CT & MRI Brain imaging

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Abstract:

Introduction: Incidental mucosal abnormalities of the paranasal sinuses are common findings on MRI performed for evaluation of non-sinus related pathologies. Mucosal thickening is the commonest abnormality followed by polyp/retention cyst, sinus opacification and fluid level in decreasing order of frequency.

Methodology: Patients were examined with CT scanner in the supine position and proper positioning and immobilization of the head was obtained. After that sagittal and coronal reformation of axial images was done. And The images were analyzed for the head abnormalities and sino-mucosal abnormalities.

Results: While on MRI imaging 49.2% cases were normal, 0% cases had complete opacification and 50.8% had partial opacification. (P<0.01) There was statistically highly significant difference of detection of opacification in Right (p=0.004) and left (p=0.01) anterior ethmoidal sinus by incidental CT and MRI imaging. There was statistically significant difference of detection of opacification in Right (p=0.026) and left (p=0.007) posterior ethmoidal sinus by incidental CT and MRI imaging.

Conclusion: This study demonstrates that MRI detects incidental sinus abnormality at a higher prevalence when compared to CT imaging, indicating the superiority of MRI. MRI findings are significantly related to the patient’s symptomatology.
Introduction:
Incidental mucosal abnormalities of the paranasal sinuses are common findings on MRI performed for evaluation of non-sinus related pathologies. Mucosal thickening is the commonest abnormality followed by polyp/retention cyst, sinus opacification and fluid level in decreasing order of frequency.\textsuperscript{1} Clinicians need to know how to deal with unexpected findings in order to avoid any undesirable consequences. The absence of convincing evidence from controlled studies leads to unawareness of the prognostic significance and treatment implications for unexpected findings. However, there are some studies describing the frequency of these findings in different clinical settings, using several imaging techniques, and providing some recommendations to deal with them. The aim of present study was to appraise the prevalence of incidental findings in paranasal sinuses in head scan of CT and MRI with correlation with patient symptomatology according to several relevant variables.\textsuperscript{2}

Dental and maxillofacial implants are potentially placed close to the mucosal layer and often this layer is augmented or manipulated during such procedures. Maxillary pathology may impact on the patients airway function and can also be malignant. Incidental mucosal abnormalities of the paranasal sinuses are frequently observed during MRI scan of brain performed for evaluation of non-sinus related pathologies.\textsuperscript{3} Radiological imaging plays crucial role in diagnosis, deciding the treatment option, surgical planning and follow-up for various paranasal sinus pathologies.

Material and methods:
The present study included a total 200 cases referred for MRI and CT head for non PNS related complaints. The study duration was of 2 years from September 2014 September 2016. The study area was patients living in and around Loni village. The simple random sample method was adopted for sample collection. The study was conducted in department of radio-diagnosis and imaging at rural medical college, Loni, district-Ahmednagar, Maharashtra; India.

Inclusion criteria-
All patients referred for CT/MRI for non-paranasal sinus related indication who are above 20 years of age group and all genders. Informed consent was obtained from each participant in the study; the proforma is enclosed in Annexures.

Exclusion criteria-
Patients referred SPECIFICALLY for paranasal sinus imaging. Patients with history of head injury. Prior history of paranasal sinuses surgery/injury/abnormalities. Patients with cardiac pacemakers, ferromagnetic aneurysm clips, other ferromagnetic implants (e.g. cochlear implants) and intraocular foreign bodies were not included in present study. Patients with claustrophobia were not included in present study. Appropriate consent from the institutional ethical and research cell was obtained for this study.

Data was analyzed using SPSS version 16 (Statistical Package for Social sciences) statistical software. Data presented in tabular and graphical form. Age groups of cases were formed with 20 years interval.
Frequency and percentage distribution of discrete data was done such as imaging results of all paranasal sinuses, LM scoring, SNAQ 11 scoring.

**Results:**

Table No 1: Mucosal abnormality according to the modality of imaging technique.

<table>
<thead>
<tr>
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<th>Mucosal Abnormality</th>
<th>Frequency (%)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT (n=22)</td>
<td>Absent (LM score 0-3)</td>
<td>20(90.9%)</td>
<td>70.8% to 98.9%</td>
</tr>
<tr>
<td></td>
<td>Present (LM score &gt;3)</td>
<td>2(9.1%)</td>
<td>1.1% to 29.2%</td>
</tr>
<tr>
<td>MRI(n=178)</td>
<td>Absent (LM score 0-3)</td>
<td>117(65.7%)</td>
<td>58.3% to 72.7%</td>
</tr>
<tr>
<td></td>
<td>Present (LM score &gt;3)</td>
<td>61(34.3%)</td>
<td>27.3% to 41.7%</td>
</tr>
</tbody>
</table>

Table No 2: Comparison of mean age in between the imaging modality.

<table>
<thead>
<tr>
<th></th>
<th>CT n=22</th>
<th>MRI n=178</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age years (mean ± S.D)</td>
<td>44.9±14.9</td>
<td>47.3±17.1</td>
</tr>
<tr>
<td>t value</td>
<td>-.620</td>
<td></td>
</tr>
<tr>
<td>P value</td>
<td>0.536</td>
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</tbody>
</table>
Discussion:
Results of incidental Right Maxillary sinus imaging in 7.5% cases had total opacification while in 54% partial opacification was noted. In Left maxillary sinus of 12.5% cases was total opacification while of 57.5% it had partial opacification finding. Radiological imaging of Right posterior ethmoidal sinus in 14% cases was total opacification and 33.5% it was partial opacification.

Left posterior ethmoidal sinus of 13% cases was total opacification and in 34.5% it was partial opacification. Right Sphenoid sinus of 4% cases was total opacification and 19% cases was partial opacification while Left Sphenoid sinus of 7% cases was total opacification and 18.5% cases it had partial opacification findings.

Christopher G.T. Lima in 2012 reported that Seventy-two patients had incidental pathological changes (27.5%), 44 (16.8%) had mucosal thickening, 20 (8.0%) had polypoid thickening, 6 (2.3%) had partial and another (2.7%) had complete opacification. However this study is done for only maxillary sinus evaluation and no MRI was done.

Fatma Çağlayan, Ümmühan Tozoğlu in 2012 reported that in the maxillofacial region detected by cone beam CT, incidental findings was 92.8%. The highest rate of incidental findings was in the sinus mucosal thickening (31.3%), in this study only presence or absence of mucosal abnormalities measured while in present study all sinuses evaluated separately with grading. Right maxillary sinus on CT imaging of 50% cases were normal, 18.2% cases had partial opacification while complete opacification in 31.8% cases. While on MRI imaging of 37.1% cases were normal, 4.5% cases had complete opacification and 58.4% had partial opacification. Nazri et al in 2013 reported that Right maxillary sinus on CT imaging of 93.6% cases were normal, 6.4% cases had partial opacification while complete opacification in 0% cases. While on MRI imaging 67.2% cases were normal, 1.6% cases had complete...
opacification and 31.1% had partial opacification. (P<0.01).  
On CT imaging of Left Maxillary sinus of 36.4% cases were normal, 31.8% cases had partial opacification or complete opacification while MRI scan in 29.2% cases were normal, 60.7% had partial opacification and 10.1% had complete calcification. Nazri et al in 2013 reported that On CT imaging of Left Maxillary sinus of 87.2% cases were normal, 10.6% cases had partial opacification while 2.1% cases had complete opacification while MRI scan in 52.5% cases were normal, 45.9% had partial opacification and 1.6% had complete opacification. (P<0.001)

There was statistically highly significant difference of detection of opacification in Right (p<0.001) and left (p=0.005) maxillary sinus by incidental CT and MRI imaging. While In present study On CT imaging Left maxillary sinus had highest i.e. .95 mean LM score of mucosal abnormality while it was least in left Sphenoid sinus. NAZRI et al in 2013 reported that on CT imaging the ethmoid sinuses again had the highest scores (0.19-0.28). The osteomeatal complexes were the most frequently unseen. 

In present study On MRI imaging left maxillary sinus had highest i.e. .81 mean LM score of mucosal abnormality and least of Right frontal sinus. NAZRI et al in 2013 reported that on MRI they had a significantly (P<0.05) higher incidence of sinus abnormality in the cases of the maxillary, ethmoidal and left frontal sinuses.

**Conclusion:**

All sinus should be evaluated carefully in all CT and MRI scans as incidental findings are prevalent.

**References:**