Tonsillar Calcification, Computed Tomography and Clinical Findings, A Case Study

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Abstract

Introduction: Tonsillar calcification or tonsil stones (tonsilloliths) are foul smelling lumps of whitish or yellowish color. They are usually asymptomatic but can be associated with halitosis and bad taste, foreign body sensation, dysphagia and odynophagia, otalgia, and neck pain. They are a common incidental imaging finding in adults, especially in computed tomography (CT).

Aim of the Work: This is a case study about palatine tonsillar and nasopharyngeal calcifications which require awareness from radiologists, especially in patients with clinical symptoms and signs which may suggest their presence.

Material and Methods: The routine CT studies done for paranasal sinuses or the neck were carefully inspected for presence of tonsillar and/or adenoids calcification. Positive cases with incidentally found calcifications were referred for evaluation by the ear, nose and throat specialists.

Results: Incidental calcifications were found in 31 patients; 30 of them had tonsilloliths and only one patient had calcification within the adenoids remnants without concomitant palatine tonsillar calcification.

Conclusion: Tonsilloliths are tiny stones lodged in the pharyngeal tonsils, incidentally discovered during CT examinations. The awareness of the presence of these calcifications is important for the radiologists to avoid overlooking of these pathological entities which could be of clinical value.

Key Words: Tonsillolith – CT – Adenoids – Halitosis.

Introduction

WALDEYER ring consists of lymphoid tissue that surrounds the opening of the oral and nasal cavities into the pharynx and includes the palatine tonsils, the pharyngeal tonsil or adenoid, lymphoid tissue surrounding the Eustachian tube orifice in the lateral walls of the nasopharynx, the lingual tonsil at the base of the tongue, and scattered lymphoid tissue throughout the remainder of the pharynx, but especially behind the posterior pharyngeal pillars and along the posterior pharyngeal wall. Lymphoid tissue located between the palate-glossal fold (anterior tonsillar pillar) and the palatopharyngeal fold (posterior tonsillar pillar) forms the palatine tonsil. This lymphoid tissue is separated from the surrounding pharyngeal musculature by a thick fibrous capsule. The adenoid is a single aggregation of lymphoid tissue that occupies the space between the nasal septum and the posterior pharyngeal wall [1].

Tonsilloliths are a common incidental imaging finding in adults, in some series it has been detected in up to 16% of patients [3]. On computed tomography (CT), tonsilloliths appear as solitary or multiple clustered "rice grain" like ovoid homogeneous dense calcifications immediately superficial to the lateral oro-pharyngeal airway space [4].

They are usually asymptomatic but can be associated with halitosis and bad taste, foreign body sensation, dysphagia and odynophagia, otalgia, and neck pain. Other symptoms include a metallic taste, throat tightening, coughing fits, and choking [5].

One of the prime clinical indicators of a tonsil stone is bad breath, or halitosis, that accompanies...
a tonsil infection. A study conducted by Stoodley et al., [6] found an association between tonsilloliths and bad breath in patients with a certain type of recurrent tonsillitis. Among those with bad breath, 75% of the subjects had tonsilloliths of patients with a form of chronic tonsillitis used a special test to see if volatile sulfur compounds were contained in the subjects’ breath. The presence of these foul-smelling compounds provides objective evidence of bad breath. The researchers found that 75% of the people who had abnormally high concentrations of these compounds also had tonsil stones.

**Pathophysiology:**

The mechanism by which these calculi form is subject to debate. They appear to result from the accumulation of materials retained within the crypts of tonsils, along with the growth of bacteria and fungi such as Leptothrix buccalis, sometimes in association with chronic purulent tonsillitis. It has been stated that tonsilloliths originate as a result repeated tonsillitis which leads to fibrosis of ducts of crypts and retention of epithelial debris thereof. This epithelial debris forms the ideal media for the growth of bacteria, and fungi such as Leptothrix buccalis and actinomyces. Finally, calcification occurs subsequent to the deposition of inorganic salts and the enlargement of the formed concretion takes place gradually. The tonsilloliths derive their phosphate and carbonate of lime and magnesia from saliva secreted by three major salivary glands and about 400 to 500 minor salivary glands [5,7,8].

The resultant tonsillar calculi are usually of small size, though there have been occasional reports of quite large tonsilloliths which may even ulcerate through the tonsilar surface [9].

Stoodley et al., [6], studied the morphology and biological activity of tonsilloliths extracted from tonsillectomy specimens using histological, bacteriological, and biofilm studies using confocal microscopy and microelectrodes to measure aerobic /anaerobic respiration and acid production. They found that, biologically, tonsilloliths were similar to dental biofilms, containing corncob structures, filaments, and cocci. Microelectrodes showed that the microorganisms respired oxygen and nitrate. The oxygen concentration in the center of the tonsillolith was depleted to approximately one-tenth of that of the overlying fluid. The addition of sucrose resulted in acid production within the tonsillolith, dropping the pH from 7.3 to 5.8. The data showed stratification with oxygen respiration at the outer layer of tonsillolith, denitrification toward the middle, and acidification toward the bottom. The depletion of oxygen and acid production following addition of sucrose may allow the proliferation of anaerobic/acidophilic bacteria, while Fluoride suppressed acid production in the presence of sucrose. This biofilm concept raises the assumption that bacteria form a three dimensional structure; dormant bacteria being in the center serving as a constant nidus of infection. This impermeable structure renders the biofilm immune to antibiotic treatment.

The occurrence of tonsillar or peri-tonsillar calcification can be related to lithiasis in other regions of body, as described by Giudice et al., [10], who described a tonsillolith accidentally detected in a patient with a lithiasis of left submandibular gland. Calculi have been reported in the peri-tonsillar region [11] and lateral pharyngeal wall [12]; and were explained by calcification of peritonsillar abscess, presence of ectopic tonsillar tissue and calcification of saliva in blocked secretory ducts of minor salivary glands [13,14].

**Aim of the study :**

Tonsilloliths are a common cause of calcification in the pharynx, but there is a general lack of awareness of this entity among radiologists [15]. This is a case study about these pharyngeal calcifications. Palatine tonsillolith as well as nasopharyngeal tonsilloliths (adenoidolith) are relatively common incidental findings that require awareness from radiologists, especially in patients who suffer from halitosis or present with other complaints like choking, odontophagia, foreign body sensation in the throat. These tiny calcifications might be overlooked in routine CT examinations of the paranasal sinuses or the neck.

**Material and Methods**

The CT scans of patients referred for examinations that include the oro-/naso-pharynx were reviewed searching for calcifications within the region of the palatine tonsils and or the region of the adenoids. The CT examinations were done using a 16-slice multi-detector CT (BrightSpeed GE, Milwaukee, USA). The detected calcifications were described according to the number (single or multiple), laterality (unilateral or bilateral) and the diameter in mm. Patients with depicted calcifications were referred for evaluation by the ENT specialists.
Results

The age of patients ranges from 29 to 68 years, with mean age and SD of 44.45±10.80 years respectively (Table 1). Incidental tonsillar and/or adenoid calcifications were detected in 31 patients. There were 12 female patients and 19 male patients (Table 2). Among the 30 patients with tonsilloliths, 12 patients had single tonsillolith; unilateral in 7 patients, and bilateral in the other 5 patients. The other 18 patients had two or more calcifications on one side (5 patients) or both sides (13 patients) (Tables 3,4). Thirty patients had tonsillar calcification, 3 of them had concomitant calcification in the adenoids remnants. Only one patient had calcification within the adenoids without associated tonsillar calcification (Table 5). The dimensions of the detected tonsillar calcifications range from 1.5 to 7mm. The detected nasopharyngeal calcifications measured 1.5 to 4.5mm.

Clinically, 24 patients (77.4%) were found to have bad breath, with 14 of them (45.1%) complaining of bad taste. Eleven of the patients (35.4%) had history of recurrent tonsillitis. Three patients (9.6%) experienced difficulty in swallowing of solid food and two (6.4%) patients had foreign body sensation in the throat. On examination, the white-yellowish calcifications could clearly be seen at the region of the palatine tonsils in 8 out of the 31 patients (25.8%). Seven out the 31 patients with incidental tonsillar calcifications had no specific complaints, and showed no abnormal finding on ENT evaluation.

Table (1): Distribution of the studied patients according to age.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>No. (n= 31)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40</td>
<td>11</td>
<td>35.5</td>
</tr>
<tr>
<td>40 - &lt;50</td>
<td>12</td>
<td>38.7</td>
</tr>
<tr>
<td>50</td>
<td>8</td>
<td>25.8</td>
</tr>
<tr>
<td>Mean±SD (Range)</td>
<td>44.45±10.80 (29–68)</td>
<td></td>
</tr>
</tbody>
</table>

Table (2): Distribution of the studied patients according to sex.

<table>
<thead>
<tr>
<th>Sex</th>
<th>No. (n=31)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>19</td>
<td>61.3</td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
<td>38.7</td>
</tr>
</tbody>
</table>

Table (3): Distribution of the tonsiloliths according to affected side.

<table>
<thead>
<tr>
<th>No. (n=30)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilateral</td>
<td>12</td>
</tr>
<tr>
<td>Bilateral</td>
<td>18</td>
</tr>
</tbody>
</table>

Table (4): Distribution of patients according to the number of tonsiloliths.

<table>
<thead>
<tr>
<th>No. (n=30)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>12</td>
</tr>
<tr>
<td>Multiple</td>
<td>18</td>
</tr>
</tbody>
</table>

Table (5): Distribution of the studied patients according to presence of adenoids.

<table>
<thead>
<tr>
<th>Adenoid</th>
<th>No. (n=43)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>4</td>
<td>12.9</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>87.1</td>
</tr>
</tbody>
</table>

![Graph showing the distribution of patients by age and presence of adenoids.]
Case (1): Non-enhanced axial CT; a 32y man with single 2mm calcification in the right palatine tonsil.

Case (2): Non-enhanced axial CT; a 39y lady with multiple bilateral tonsilloliths.

Case (3): Non-enhanced axial CT; a 44y man with right parotid mass (pleomorphic adenoma), with incidental multiple bilateral tonsilloliths.
Case (4): Non-enhanced coronal CT; a 51y man with bilateral multiple tonsilloliths.

Case (5): Non-enhanced coronal CT; a 46y woman with bilateral tonsilloliths.
Case (6): Non-Enhanced coronal CT; a 63y man with adenoidolith and multiple left tonsilloliths, the largest is 7mm.

Case (7): Non-Enhanced coronal CT; a 49y man with adenoidolith and multiple small left tonsilloliths.

Case (8): Non-Enhanced axial CT with sagittal reformatted image; a 66y woman with an adenoidolith without associated tonsillar calcification.
Tonsilloliths are accumulations of bacteria and tissues that collect in the crypts of tonsils. While some cases are entirely asymptomatic, and the calculi constitute casual findings of radiological studies conducted for other reasons, in other cases minor symptoms appear and progressively intensify over time, as halitosis and bad taste, with swallowing pain and foreign body sensation or earache [16].

Panoramic radiographs taken by dentists have been an efficient tool to incidentally show the existence of macroscopic tonsilloliths. CT serves as another source for unexpectedly showing calcifications in the palatine tonsil [17].

The clinical and imaging findings of tonsil’s calculi seem to be a function of the size of these calculi; infra-millimetric calculi are much frequent, according to tonsillectomy specimens, and much often asymptomatic, but are not visible by imaging; small calculi from 1 to 7 mm are frequent and visible by imaging; big ones superior of 7 mm are rare, becoming exceptional and much often symptomatic. When the tonsillar calcifications get large enough, they may irritate the tonsil, make it become enlarged, causing recurrent tonsillitis, bad breath and bad taste in the mouth [18].

The age of the patient population in this study ranges between 29 and 68 years, and the incidentally detected calcifications were found to be single or multiple, unilateral or bilateral. These findings are concordant with those described by other studies [3, 16, 19], who found that tonsilloliths are usually single and unilateral, but occasionally may be multiple or bilateral, and occur between 20 and 77 years of age. The largest tonsillolith found in this study measures 7 mm. Thakur et al., [20] stated that giant tonsillolith is a rare clinical entity.

Although it is relatively easy, especially with CT, to distinguish tonsilloliths from other more important causes of pharyngeal calcifications by demonstrating their typical location, both radiologists and clinicians should consider other pathologies as differential diagnosis [9].

Differential diagnosis of tonsilloliths includes foreign body, calcified granuloma, malignancy, or rarely, isolated bone which is usually derived from embryonic rests originating from the branchial arches [21].

In this study, three patients had concomitant tonsillar and adenoids calcification which might support the postulation of Giudice et al., [10], who stated that tonsillar or peri-tonsillar calcification can be related to lithiasis in other regions of body.

Conclusion:

Tonsilloliths are tiny stones lodged in the pharyngeal tonsils. Some patients have no symptoms or present with fetor oris or odynophagia. It is often during routine imaging procedures that their presence is uncovered. The awareness of their presence is important for the radiologists to avoid overlooking of these pathological entities which could be of clinical value.

References

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