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What is This?
Involvement of Minor Salivary Glands in the Pathogenesis of Peritonsillar Abscess

Sabri El-Saied, MD¹, Marc Puterman, MD¹, Daniel M. Kaplan, MD¹, Merav Cohen-Lahav, PhD², and Ben-Zion Joshua, MD¹

Abstract

Objectives. To study the relationship between peritonsillar abscess (PTA) and minor salivary glands surrounding the palatine tonsils.

Study Design. Prospective population-based study.

Settings. Tertiary care university hospital.

Subjects and Method. Prospective study including 41 patients with PTA and 6 patients with a neck abscess. Amylase levels of the pus and serum were measured and compared between the 2 groups. Clinical data regarding hospitalization length and recurrence rate were also collected.

Results. Of the 41 patients with PTA, 7 suffered from recurrent PTA. Average level of amylase in the pus of the PTA group was 3841 U/L versus 7.7 U/L in the neck abscess group (P < .001; median, 62 vs 9.5). Serum amylase was higher in the PTA group (49.3 U/L vs 37.3 U/L; P = .008). There were no recurrences in PTA patients with amylase greater than 65 U/dL in the pus in 0 of 20 (0%) versus 7 of 21 (33%) for amylase lower than 65 U/L (P = .01).

Conclusion. High amylase in the pus lends further support for involvement of minor salivary glands. However, high recurrence rates related to low amylase in the pus imply an additional pathogenesis possibly related to tonsillar infection. It is possible that both minor salivary glands as well as tonsillar infection play a role in the pathogenesis of peritonsillar infections.

Keywords

peritonsillar abscess, minor salivary glands, Weber’s glands, amylase

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routine laboratory test, it was most convenient for this study. We set out to test amylase levels in the pus of patients with PTA to check the hypothesis regarding the connection between minor salivary glands and PTA.

**Materials and Methods**

After approval by the Hospital’s Ethics Committee, we included prospectively all patients diagnosed and hospitalized in our department with peritonsillar abscess between January 2010 and July 2010.

In our department, some of the physicians caring for patients suffering from PTA treat by incision and drainage, while others prefer needle drainage. For the sake of the study, all patients included were treated by an initial needle drainage using an 18-gauge needle followed by intravenous antibiotics (usually amoxicillin/clavulanic acid). If the patients did not improve within 24 hours, then either additional needle drainage or an incision and drainage were performed, depending on the preference of the physician and the patient. Occasionally, steroids were prescribed if the treating physician felt that the patient did not improve as expected. Pus for analysis was aspirated from the peritonsillar abscess upon presentation; approximately 2 mL was sent for amylase analysis, and the rest was sent for bacterial culture. The amylase level of the serum of all patients was measured as well, being measured directly from the pus using the Olympus Au 5400 analyzer. When the pus was too thick for analysis, it was diluted, and the result was corrected appropriately.

Amylase levels from these patients were compared with those of patients with other abscesses in the head and neck. Clinical data regarding, age, sex, hospitalization length, and recurrence rate as well as bacterial culture were recorded.

**Statistical Analysis**

Continuous variables (eg, levels of amylase) were described as average ± standard deviation, median, minimum, and maximum. A nonparametric Mann-Whitney test was used for comparison between the 2 study groups.

Categorical variables were described as percentages and compared by χ² and Fisher tests.

**Results**

Forty-seven patients were included, of whom 41 patients were diagnosed with PTA and 6 patients with other abscesses, from an infected thyroglossal duct cyst (2 patients), a subperiostal abscess of the mastoid (1 patient), and an infected brachial cyst (3 patients). See Table 1 regarding clinical data of the 2 groups. The average amylase level in the PTA group was 3841 U/L (median, 62 U/L; Std 12,610) and a range of 20 to 56,000, compared with 7.7 U/L (Std 5; range, 0-13 U/L) in the neck abscess group (P < .001; Figure 1).

Serum amylase was higher in the PTA group compared with the neck abscess group: 49 U/L versus 37 U/L, with borderline significance (P = .08).

Of the 41 patients with PTA, in 7 (17%) it was a recurrent PTA. Average amylase in the rec PTA group was 32.6 U/L compared with 4625 U/L in the nonrecurrent PTA group (P < .001). High amylase level was associated with a first episode of PTA. If amylase was higher than 65 U/L (20 patients), it was always the first episode. On the other hand, when amylase was lower than 65 U/L, in 33% it was a recurrent PTA.

One patient who originally had an amylase level of 143 U/L later developed 2 recurrences with amylase levels of 3 and 62 U/L.

The bacterial culture was negative in 15 (36%) patients, with the most common bacteria being anaerobes 7 (17%) followed by *Streptococcus pyogenes* 5 (12%). The rest grew different bacteria species, such as *Hemophilus influenzae*, *Streptococcus C*, and *Pseudomonas aeruginosa*.

In the recurrent PTA patients, the bacterial culture was positive in 5 patients (71%), and the most common bacteria were anaerobes (3 [42%]), followed by pseudomonas (1 [14%]) and *S pyogenes* (1 [14%]). The only difference between the recurrent and nonrecurrent group regarding bacteria was a tendency for more infection with anaerobes in recurrent PTA (P = .08).

| Table 1. Clinical Data of Patients with Peritonsillar Abscess and Neck Abscess |
|---------------------------------|-----------------|-----------------|-----------------|
|                                | PTA (n = 41)    | Neck Abscess (n = 6) |
| Male                           | 24              | 4               | Not significant |
| Female                         | 17              | 2               |                   |
| Average age, y                  | 25              | 16              | Not significant   |
| Average amylase pus, U/L        | 3841            | 9               | <.001            |
| Average amylase serum, U/L      | 49.2            | 37              | .008             |

**Figure 1.** Amylase level in the peritonsillar abscess group versus the neck abscess group. NA, neck abscess; PTA, peritonsillar abscess.
There was no correlation between amylase level and hospitalization length.

Of the 41 patients, 29 were treated with antibiotics prior to admission. The most frequent antibiotic was penicillin. Amylase did not differ significantly between preintervention treatment groups. The average amylase for the 29 treated patients was 3089 U/L (Std 10,510) versus 5657 U/L (Std 16,075) for the 12 untreated patients ($P = .55$).

**Discussion**

This is the first study, to our knowledge, measuring amylase in the pus collected from PTA. This study showed that amylase levels are significantly elevated and occasionally highly elevated in the pus in patients with PTA, supporting the theory of the involvement of minor salivary glands in the pathogenesis of PTA.

This observation, however, still does not prove a causal relationship, meaning that it does not prove that blocked minor salivary glands are the reason for PTA. It can still be postulated that they are secondarily inflamed or obstructed from the infectious process originating in the tonsils.

A second interesting and unexpected finding is that recurrent disease was associated with a relatively low amylase level. There was 1 patient who developed PTA for the first time, and his amylase level was 143 U/L. This patient later developed 2 additional bouts of PTA, and the amylase level was 3 and 62 U/L. This patient demonstrates that it is not possible to predict which patient will recur based on amylase levels; however, it is noted that upon recurrence, the amylase level was always low.

The finding that recurrent PTAs had lower amylase levels may be explained according to both paradigms. Possibly, in recurrent PTA, the pathogenesis is different from a nonrecurrent PTA and the pathogenesis is infectious, originating from the tonsil and not from minor salivary gland infection. Alternatively, it is possible that the reason for a low amylase level in recurrent cases is that the minor salivary glands are fibrotic and produce less saliva, as shown by Chen et al\(^9\) in their histopathologic study. A future study with a larger cohort and histopathological examination of the tonsils and minor salivary glands attached to it may help differentiate the 2 explanations.

The serum amylase level in the PTA group was relatively high compared with the serum amylase level in the control group. This may be similar to the inflammation of the major salivary glands as seen occasionally in sialadenitis of the submandibular gland where the amylase level in the serum may be elevated.

One more point that was not addressed was location of the abscess in relation to amylase levels. Future studies testing this either by computed tomography, magnetic resonance imaging, or intraoral ultrasound and comparing to the amylase level may shed further light on the pathogenesis of PTA. Once the pathogenesis of PTA is uncovered, we may be able to predict which patients will suffer recurrent PTAs and treat them appropriately.

**Conclusion**

This study supports the hypothesis that minor salivary glands play a role in PTA pathogenesis. In addition, a relatively low amylase level in recurrent PTA suggests a different pathogenesis. Further studies to understand the pathogenesis of recurrent PTA and to test whether location of PTA is related to the pathogenesis are warranted.

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**Author Contributions**

Sabri El-Saied, substantial contributions to conception and design, acquisition of data; Marc Puterman, contributions to conception and design, drafting the article. Daniel M. Kaplan, revising the article critically for important intellectual content; Merav Cohen-Lahav, acquisition of data or analysis and interpretation of data; Ben-Zion Joshua, substantial contributions to conception and design, analysis and interpretation of data, final approval of the version to be published.

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