

Distribution of Minor Salivary Glands in the Peritonsillar Space†

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Abstract

Minor salivary glands can usually be found along the mucous membrane of the upper aerodigestive tract. Their presence in the peritonsillar space was of little interest until it was postulated that infection of Weber's gland (minor salivary gland at the superior pole of the peritonsillar space) might be the possible cause of peritonsillar abscess. This study was designed to examine the distribution of minor salivary glands in the peritonsillar space and their role in pathogenesis of peritonsillar abscess. Tonsillectomy specimens from fifty-five patients who were suffering from repeated tonsillitis, obstructive sleep apnea, tonsillar mass and peritonsillar abscess at Srinagarind Hospital from September 1995 to November 1996 were histologically examined. The locations of these minor salivary glands were found at the upper, middle, and lower portions of the peritonsillar space. This small sample study precludes any definitive statement regarding the association of Weber's gland and the pathogenesis of peritonsillar abscess.

Key word : Peritonsillar, Minor Salivary Glands, Weber's Gland

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Minor salivary glands are found in the submucosa of the upper aero-digestive tract. These glands are mucous-secreting glands(1). In 1927, Weber(2) first described a group of salivary glands located in the supratonsillar space, just above the

tonsil in the soft palate. These glands consist of approximately 20 to 25 mucous salivary glandular structures with a common duct from the gland posterior to the midportion of the tonsil that penetrates the capsule of the tonsil and has a ductal system

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to the surface of the tonsil. Their functions are thought to assist digestion of food partially caught in the tonsillar crypts⁽³⁾. Parkinson in 1951⁽³⁾, stated that these salivary masses found in the supratonsillar region appeared to be most important because they were involved in the production of a peritonsillar abscess, also known as Quinsy. However, there was little evidence to support this, and many doctors refused to take notice of this statement until Passy⁽⁴⁾ raised some questions about pathogenesis of peritonsillar abscess in 1994.

Peritonsillar abscess is defined in many textbooks as a localized accumulation of pus within the peritonsillar tissues, which usually results from suppurative infection of the tonsils⁽⁵⁾. Many studies showed that a peritonsillar abscess was mostly a unilateral disease (91-99%), whereas, acute suppurative tonsillitis was mostly a bilateral disease^(4, 6-8). These abscesses appeared in the supratonsillar fossa in about 67-99 per cent of cases^(4,6,8-11). The history of tonsillar infection prior to a peritonsillar abscess was 11-56 per cent⁽¹²⁾. Moreover, most of these studies did not mention the status of the tonsils at the time of the peritonsillar abscess. The exudation of the tonsils during the abscess episode noted in the study of Jokipii *et al*⁽¹³⁾ was as high as 75 per cent, whereas, in the study of Passy⁽⁴⁾ it was as low as 4 per cent.

From these clinical observations, there might be several etiologies for developing peritonsillar abscess. Parkinson stated that Weber's gland may be an etiology of a peritonsillar abscess⁽³⁾. Hibbert suggested that the proliferation of anaerobic organisms around the tonsil was one possible explanation⁽¹⁴⁾. Amari *et al*⁽¹⁵⁾ reported 14 cases of posttonsillectomy peritonsillar abscess. They asserted that a remnant of tonsillar tissue might be the cause of recurrent infection and abscess. However, when the remnant of tonsillar tissue was not found, Weber's gland and other minor salivary glands were postulated as a possible cause. Stankiewicz and Talland⁽¹⁶⁾ reported four cases of peritonsillar abscess after tonsillectomy. They suggested that the most likely causes were retained tonsillar tissue remnants, persistence of Weber's gland, and a second branchial fistula disruption secondary to tonsillectomy.

Passy⁽⁴⁾ reviewed the records of 100 sequential peritonsillar abscesses. He found that 99 per cent of the abscess were located in the supraton-

sillar fossa and tonsillar exudation was found in 4 per cent of cases at the time of presentation. He did not agree with the idea that peritonsillar abscess was secondary to acute exudative tonsillitis. He cited the presence of Weber's gland in the supratonsillar fossa as a possible cause. He was able to identify the inflammatory results of Weber's gland in a patient whose peritonsillar abscess had resolved. However, such evidence was reported from one case report which seemed to be inadequate. To consider this hypothesis, more knowledge about distribution patterns of the minor salivary glands in the peritonsillar space is required.

This study was designed to investigate this problem. Theoretically, the study of distribution patterns of minor salivary glands in the peritonsillar space should be studied in a normal subject, but it was not possible for this study to use a normal person. Therefore, the researchers used specimens from tonsillectomized patients. However, there was inadequate evidence to support direct association of Weber's gland with peritonsillar abscesses.

MATERIAL AND METHOD

A pilot study carried out prior to the study confirmed the histological findings of minor salivary glands in tonsillectomized specimens. Fifty-five patients who had undergone tonsillectomy at Srinagarind Hospital from September 1995 to November 1996 were used in this study. Indications for surgery were recurrent tonsillitis, obstructive sleep apnea, suspected malignancy, and peritonsillar abscess. Patients excluded from the study were as follows:

1. Patients whose friable tonsils were torn into pieces.
2. Patients whose tonsils were not marked after tonsillectomy.

Immediately after tonsillectomy, the tonsil specimens were marked for their location in the peritonsillar fossa. All the tonsils were fixed in 10 per cent buffered formalin for pathological examination. The tonsils were measured and subdivided into 3 portions; upper, middle, and lower. Each portion was serially cut at 2-3 mm thickness in the horizontal plane. All were embedded in paraffin. The paraffin sections were stained with hematoxylin and eosin for pathological studies. All sections were carefully examined for the presence of minor salivary glands. Any inflammatory reaction found in the peritonsillar space was also noted.

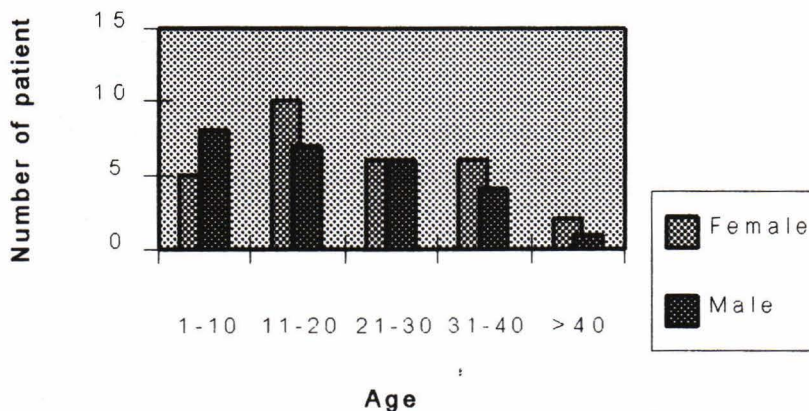


Fig. 1. Distribution of age and sex of the patients.



Fig. 2. Weber's gland found in the superior pole outside the tonsillar capsule (H&E, X40).



Fig. 3. A minor salivary gland in the peritonsillar space shows compound tubuloalveolar mucous secreting gland (H&E, X40).

SPSS and STATA were used for data analysis in this study. Chi-square and Fisher's Exact tests were applied to binary outcome variables. P value < 0.05 was considered statistically significant.

RESULTS

The sample included 55 patients with an average age of 20.2 years (SD \pm 13.2 years; range 3 to 55 years) with 26 males and 29 females. 94.5 per cent of the patients were below the age of 40. The distribution of age and sex is shown in Fig. 1.

The distribution and mean of age in each group (male and female) were not statistically significant (p=0.65).

They were diagnosed as chronic tonsillitis (9.1%), chronic hypertrophic tonsillitis (80%), peritonsillar abscess (5.5%), and tonsillar mass (5.5%). Indications for surgery in these patients were recurrent tonsillitis (63.6%), obstructive sleep apnea (23.6%), peritonsillar abscess (5.5%), suspected malignancy (5.5%), and tonsiloliths (1.8%). The size of the tonsils and the clinical diagnosis of the patients showed no significant difference with respect to age and sex of the patient. Fig. 2 and 3 illustrate the locations and details of the minor salivary glands in the peritonsillar space.

Histological findings. The minor salivary glands in the peritonsillar space were branching

Table 1. Location of minor salivary gland in the upper portion (Weber's gland).

Location	Right	Left	Both	Absence	Total
No. of patients	8	15	22	10	55
%	14.5	27.3	40	18.2	100

Table 2. Location of minor salivary gland in middle and lower portions.

Location	Right		Left		Both		Absence		Total	
	n	%	n	%	n	%	n	%	n	%
Middle	14	25.5	7	12.7	23	41.8	11	20	55	100
Lower	11	20	10	18.2	24	43.6	10	18.2	55	100

Table 3. Distribution patterns of total minor salivary glands.

Location	Right (No.)	%	Left (No.)	%
Upper, middle, and lower	13	23.6	18	32.7
Upper and middle	10	18.2	4	7.3
Upper and lower	3	5.5	6	10.9
Middle and lower	13	23.6	6	10.9
Upper alone	4	7.3	9	16.4
Middle alone	1	1.8	2	3.6
Lower alone	6	10.9	3	5.5
Absence	5	9.1	7	12.7
Total	55	100	55	100

tubuloalveolar mucous-secreting glands and arranged in small lobules. These small lobules were bound together by thin fibroconnective tissue into lobes of the glands. The mucous acini had abundant cytoplasm filled with clear mucous substance and basal nuclei. These glandular masses, ranging from 1 to 5 millimeters in size, were found in the superior portion (also called "Weber's gland"), middle portion, and lower portion of the peritonsillar space, outside the tonsillar capsule. The distribution patterns of the upper minor salivary glands (Weber's gland) are shown in Table 1.

The upper minor salivary glands (Weber's gland) were found in 81.8 per cent of the patients. Nearly half of the upper minor salivary glands were on both sides. There were more glands on the left side (27.3%) than on the right side (14.5%). Regardless of the presence of these glands on either side, there was not significant difference (67.3% *versus*

54.5%, $p = 0.178$). The presence of Weber's gland was not statistically effected by either age, sex, diagnosis, or the size of the tonsils. Table 2 illustrates the location of the minor salivary glands in the middle and lower portions.

Minor salivary glands were found at the middle portion of the peritonsillar space in 80 per cent of the cases. Half of them were on both sides. There was no significant difference between both sides (67.3% *versus* 54.5%, $p = 0.104$). 81.8 per cent of the glands were found at the lower portion and 53.3 per cent were on both sides. There was no significant difference between both sides (63.6% *versus* 61.8%, $p = 0.173$). The distribution patterns of the total minor salivary glands on each side of the tonsils are illustrated in Table 3.

There were varied patterns on both sides of the tonsils. The highest frequency pattern of total minor salivary glands was that they were present

Table 4. Patterns of distribution of total minor salivary glands.

Type	Numbers of patient	%
1. Totally absent	2	3.6
2. Totally present	6	10.9
3. Present elsewhere	47	85.5
Total	55	100

in the upper, middle, and lower portion of the peritonsillar spaces on both the right (23.6%) and left side (32.7%). It was found that the distributions of the total minor salivary glands in each patient were varied and there was no predominant pattern. It might be concluded that there were 3 types of distribution as shown in Table 4.

The minor salivary glands were 96.4 per cent as shown in Table 4. Only 2 patient (3.6%) had no minor salivary glands. A 4-year-old boy diagnosed as chronic hypertrophic tonsillitis had grade 4 of both tonsils, and obstructive sleep apnea symptom. An 11-year-old girl diagnosed as chronic hypertrophic tonsillitis had grade 3 of both tonsils, and recurrent tonsillitis symptoms. There was no significant difference among the distribution patterns (type 1, 2, and 3) regarding age, sex, diagnosis and size of tonsils.

The Weber's gland found in this study showed slight lymphocytic infiltration in the periductal tissues of the intralobular ducts (Fig. 4 and 5). There was also slight infiltration of lymphocytes in the periintralobular ducts in other minor salivary glands (Fig. 6). No fibrosis or inflammatory destructive change was found particularly in cases of peritonsillar abscess. Three cases had peritonsillar abscess. Two cases were female. A 12-year-old girl had no Weber's gland on either side. A 14-year-old girl had Weber's gland on both sides but there was no sign of inflammation or fibrosis. A 28-year-old male had no Weber's gland on the side of the peritonsillar abscess.

DISCUSSION

Minor salivary glands are found in the submucosa of the nose, paranasal sinus, oral cavity, pharynx, larynx and tracheobronchial tree. Minor salivary glands in the oral cavity have a distinctive distribution beginning anteriorly in the labial

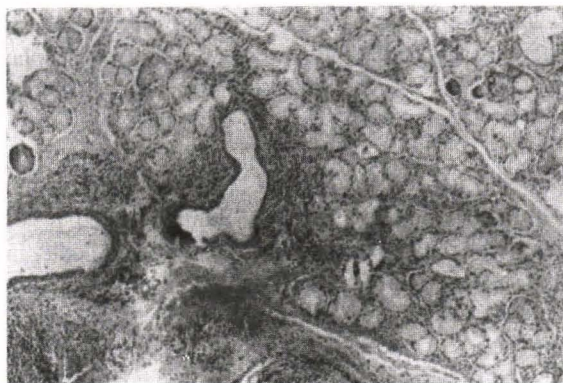


Fig. 4. The interlobular ducts of Weber's gland are surrounded by small amount of lymphocytes and plasma cells (H&E, X100).

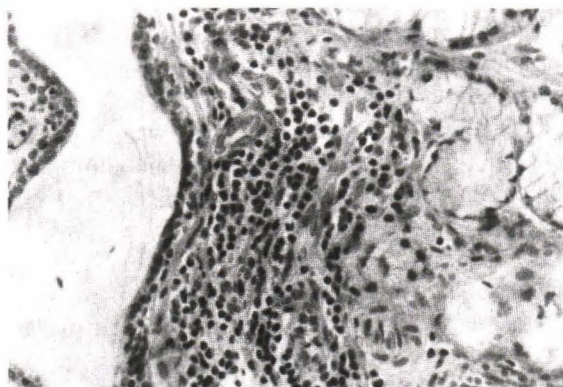


Fig. 5. A periductal area contains small lymphocytes and plasma cells (H&E, X400).

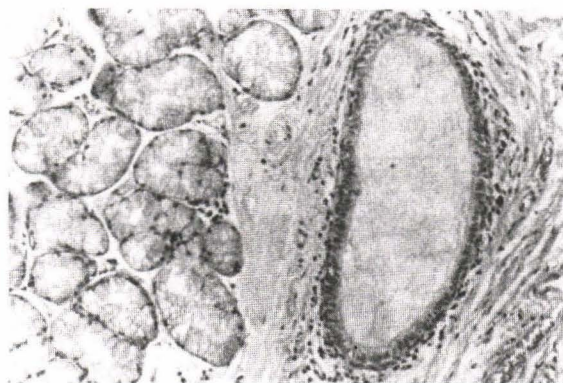


Fig. 6. Small amount of lymphocytes in the periductal area of the minor salivary gland (H&E, X200).

mucosa to the buccal mucosa, posterior-lateral hard palate, soft palate, uvula, tonsillar pillars, retromolar trigone, posterior two-thirds of the tongue, anterior ventral tongue, and floor of the mouth⁽¹⁾.

Weber in 1927 first described the mucous salivary glands resting on the tonsillar capsule within the tonsillar space⁽²⁾. Baum⁽¹⁷⁾ and Keleman⁽¹⁸⁾ confirmed that these glands are mucous in type, and are similar to the sublingual salivary gland. Mucous glands are located peripheral to the tonsil, but can also drain within the tonsillar crypts or onto their surface mucosa⁽¹⁹⁾. There is no mention of other locations of minor salivary glands in the peritonsillar space or the incidence of Weber's gland in the literature.

This study showed that there were minor salivary glands in other portions of the peritonsillar space, not only in the superior portion. The incidence of minor salivary glands found in the upper portion was not significantly different from those in the middle and lower portions (81.8%, 80%, 81.8% respectively). Minor salivary glands were found in 96.4 per cent of the cases. The distribution of these glands was varied and had no predominant patterns on either side.

In this study, inflammation of Weber's gland was not found in the three cases of peritonsillar abscess. There was one case of peritonsillar abscess on the left side without the presence of Weber's gland on both sides, as well as a peritonsillar abscess on the right with the presence of Weber's gland only on the left side.

One could claim that the absence of the minor salivary glands did not mean they never existed. There may be other factors involved; e.g., atrophy of the minor salivary glands caused by repeated infection of the tonsils, the age of the subjects, the surgical technique for obtaining specimens, and the methodology for histological exami-

nation. Regarding atrophy of the minor salivary gland, it is not possible to take specimens from normal subjects. Regarding the age of the subjects, we have also demonstrated in Fig. 1 illustrating that only a few elderly patients were studied. So one could expect fewer incidences of minor salivary glands in this group of people. Regarding the surgical technique for obtaining specimens, tonsillectomy specimen must include the entire peritonsillar space. Regarding the methodology for histological examination, the minor salivary glands might not be found if their size was less than 1 millimeter. This small sample study precludes any definitive statement regarding the association of Weber's gland on the pathogenesis of peritonsillar abscess. Moreover, our three cases of peritonsillar abscess suggest that there may be no association between the presence of Weber's gland and peritonsillar abscess.

SUMMARY

The distribution patterns of the minor salivary glands found in this study were varied. Forty-five of 55 cases (81.8%) of Weber's gland were found in this study. The incidence of minor salivary glands in the middle and lower portions was not significantly different from those in the upper portion. Further investigation into the pathogenesis of peritonsillar abscess is recommended.

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REFERENCES

1. McClatchey KD. Periodontium, Minor Salivary Glands and Maxillary sinus. In Stenberg SS, ed. 1st ed. *Histology for Pathologists*. New York: Raven Press 1991: 432.
 2. Weber EH. In : *Handbuch Der Mikroskopischen Anatomie des Menschen*. Berlin : J Springer, vol 1, 1927.
 3. Parkinson RH. The excised tonsil and tonsillar fossa. In : *Tonsil and Allied Problems*. New York: Macmillan 1951.
 4. Passy V. Pathogenesis of Peritonsillar Abscess. *Laryngoscope* 1994; 104: 185-90.
 5. Kornblut AD. Non-neoplastic diseases of the tonsils and adenoids. In Paparella, MM, Shumrick DA, Glukman JL, eds *Otolaryngology*, 3rd ed. Philadelphia: WB. Saunders 1991: 2137.
 6. Spires JR, Owens JJ, Woodson GE, Miller RH. Treatment of peritonsillar abscess. A prospective study of aspiration vs incision and drainage. *Arch Otolaryngol Head Neck Surg* 1987; 113: 984-6.
 7. Lockhart R, Parker GS, Tami TA. Role of quinsy tonsillectomy in the management of peritonsillar abscess. *Ann Otol Rhinol Laryngol* 1991; 100: 569-71.
 8. Weinberg E, Brodsky L, Stanievich J, Volk M. Needle Aspiration of Peritonsillar Abscess in Children. *Arch Otolaryngol Head Neck Surg* 1993; 119: 169-72.
 9. Yung AK, Cantrell RW. Quinsy tonsillectomy. *Laryngoscope* 1976; 86: 1714-7.
 10. Stage J, Bonding P. Peritonsillar abscess with parapharyngeal involvement : incidence and treatment. *Clin Otolaryngol* 1987; 12: 1-5.
 11. Patel KS, Ahmad S, O'Leary G, Michel M. The role of computed tomography in the management of peritonsillar abscess. *Otolaryngol Head Neck Surg* 1992; 107: 727-32.
 12. Herzog FS. Peritonsillar abscess : incidence, current management practices, and a proposal for treatment guidelines. *Laryngoscope* 1995; 105: 1-19.
 13. Jokipii AM, Jokipii L, Sipila P, Jokinen K. Semi-quantitative culture results and pathogenic significance of obligate anaerobes in peritonsillar abscesses. *J Clin Microbiol* 1988; 26: 957-61.
 14. Hibbert J. Acute infection of the pharynx and tonsils. In Kerr, AG, Stell, PM, eds. *Scott-Brown's Otolaryngology* 5th ed. London: Butterworth 1987: 78.
 15. Amari C, Schroder W, Galiz R. Posttonsillectomy peritonsillar abscess. Program and Abstracts of the XII World Congress of Otorhinolaryngology, Miami Beach, Florida, May 26-31, 1985: 113.
 16. Stankiewicz JA, Talland C. Peritonsillarlike lateral oropharyngeal abscess after tonsillectomy. *Arch Otolaryngol Head Neck Surg* 1988; 114:1181-3.
 17. Baum HL. Mucous glands of the palate in relation to the upper pole of the tonsils. *Ann Otol Rhinol Laryngol* 1926; 35: 87.
 18. Keleman G. The Palatine tonsil in the sixth decade. *Ann Otol Rhinol laryngol* 1943; 52: 431.
 19. Bloom W, Fawcett DW. Oral cavity and associated glands. In : Bloom W and Fawcett DW, eds. *A Textbook of Histology*. 10th ed. Philadelphia: WB. Saunders 1975: 616.
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การกระจายตัวของกลุ่มต่อมน้ำลายย่อยๆ บริเวณรอบต่อมทอนซิล†

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กลุ่มต่อมน้ำลายย่อย ๆ สามารถตรวจพบได้ตลอดทางเดินอาหารและทางเดินหายใจส่วนบน โดยเฉพาะบริเวณรอบ ๆ ต่อมทอนซิลซึ่งไม่เป็นที่สนใจมากนัก จนกระทั่ง Weber's gland (กลุ่มต่อมน้ำลายย่อย ๆ ที่พบบริเวณส่วนบนรอบต่อมทอนซิล) ถูกอ้างว่าเกี่ยวข้องกับการเกิดโรค peritonsillar abscess การศึกษานี้ได้ออกแบบเพื่อค้นดูการกระจายตัวของกลุ่มต่อมน้ำลายย่อยๆ บริเวณรอบต่อมทอนซิล เพื่อหาความสัมพันธ์กับโรค peritonsillar abscess ดังกล่าว ก่อนต่อมทอนซิลจำนวน 55 คู่ จากผู้ป่วยที่มีปัญหาต่อมทอนซิลอักเสบบ่อยๆ หรือสงสัยเป็นเนื้องอกหรือก้อนโตจนนอนหายใจขัดที่ได้รับการผ่าตัดทอนซิลตั้งแต่เดือนกันยายน 1995 ถึงเดือนพฤศจิกายน 1996 ที่โรงพยาบาลศรีนครินทร์ คณะแพทยศาสตร์ มหาวิทยาลัยขอนแก่น ได้นำมาศึกษาดูตำแหน่งการกระจายตัวตั้งแต่ส่วนบน ส่วนกลาง และส่วนล่าง บริเวณรอบต่อมทอนซิล

ผลการศึกษาพบว่าไม่สามารถยืนยันความเกี่ยวข้องของ Weber's gland กับโรค peritonsillar abscess

คำสำคัญ : รอบทอนซิล, ต่อมน้ำลายย่อย ๆ, ต่อมเวเบอร์

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