A comparison of diagnostic tools for Sjögren syndrome, with emphasis on sialography, histopathology, and ultrasonography

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Objective. The present study examined the reliability and correlation of sialography, salivary gland biopsy, and ultrasonography for Sjögren syndrome (SS) and evaluated the usefulness of ultrasonography as a diagnostic tool for SS compared with sialography and histopathology.
Study design. Seventy-three patients who underwent sialography, ultrasonography, and salivary gland biopsy were included in this study. The study evaluated the diagnostic reliability and correlation of each kind of examination with SS.
Results. There was a statistically significant difference in the sensitivities of sialography and histopathology, in the specificities of sialography and ultrasonography, and in the accuracies of sialography and both ultrasonography and histopathology. The correlation coefficient (r) between sialography and ultrasonography was significantly higher than the others and indicated a good correlation.
Conclusions. Ultrasonography can be used as a diagnostic tool for SS, with its advantage of noninvasiveness and ease of use. **(Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2010;109:129-134)**

Sjögren syndrome (SS) is an autoimmune disease involving the exocrine glands as main target organs. The criteria for a diagnosis of SS have been controversial. In Japan, the diagnostic criteria for SS were revised in 1999 by the Research Group for Sjögren Syndrome of the Japanese Society for the Promotion of Science.[1] These criteria are based on the diagnostic criteria for Sjögren syndrome established by the European Community Study Group and consists of 4 items: 1) histopathology of biopsy specimens either from the labial salivary glands or the lachrymal glands; 2) oral examination: (a) sialography or (b) combination of sialometry (chewing gum test or Saxon test) and salivary scintigraphy; 3) ocular examination: (a) combination of the Schirmer test and the rose bengal test or (b) combination of the Schirmer test and fluolescein staining test; and 4) serologic test of anti–Ro/SS-A antibody or anti–La/SS-B antibody.[1,2] The diagnosis of SS can be made when the patients meet ≥2 or more of these 4 items. The oldest imaging procedure, sialography, has maintained its position as the method of choice for exploring the ductal system of the salivary glands, because of its high diagnostic reliability.[3]

Since the 1990s, computerized tomography, magnetic resonance (MR) imaging, MR sialography, and ultrasonography have also been applied to diagnose SS.[4-8] Among these, ultrasonography is the most convenient and economic examination and, furthermore, is noninvasive. Although the criteria for SS in ultrasonography have been established by a few researchers, they have not been applied generally and not included among a global diagnostic examination for SS.[6-9] It has also been reported that the sensitivity of diagnosis of SS by ultrasonography ranged from 40% to 100%, and that it is not necessarily superior to other methods of examination in diagnostic reliability.[6,7] The present study investigated the diagnostic reliability and correlation between a diagnosis using sialography, ultrasonography, and histopathology and evaluated the usefulness of ultrasonography as a diagnostic tool for SS.

MATERIALS AND METHODS

From April 2001 through April 2007, 244 patients who visited the Department of Oral and Maxillofacial Surgery and Dental Radiology, Hokkaido University Hospital, constituted the patient population. All of the patients had undergone ocular examinations and serologic tests for Sjögren syndrome at the Division of Rheumatology, Department of Internal Medicine, or

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Table I. Revised Japanese criteria for Sjögren syndrome (1999)

1. Histopathology: positive for at least 1 of (a) or (b):
   (a) Focus score 1 (≥50 periductal lymphoid cell infiltration) or above in a 4-mm^2 minor salivary gland biopsy.
   (b) Focus score 1 (≥50 periductal lymphoid cell infiltration) or above in a 4-mm^2 minor lacrimal gland biopsy.
2. Oral examination: positive for at least 1 of (a) or (b):
   (a) Abnormal findings in sialography, stage 1 or above.
   (b) Decreased salivary secretion (flow rate ≤10 mL/10 min according to chewing gum test or ≤2 g/2 min according to the Saxon test) and decreased salivary function according to salivary scintigraphy.
3. Ocular examination: positive for at least 1 of (a) or (b):
   (a) Schirmer test, ≤5 mm/5 min; and in the rose bengal test, 3 or above according to van Bijsterveld score.
   (b) Schirmer test, ≤5 mm/5 min and positive fluorescein staining test.
4. Serologic examination: positive for at least 1 of (a) or (b):
   (a) Anti-Ro/SS-A antibody.
   (b) Anti-Ro/SS-B antibody.

Diagnostic criteria: Diagnosis of Sjogren syndrome can be made when the patient meets ≥2 of the above 4 criteria.

Table II. Sialographic classification of Rubin and Holt (1957)[10]

Classification	*Sialographic findings*
Stage 0 (normal)	No contrast media collection
Stage 1 (punctate)	Contrast media collection ≤1 mm in diameter
Stage 2 (globular)	Contrast media collection 1-2 mm in diameter
Stage 3 (cavitary)	Contrast media collection ≥2 mm in diameter
Stage 4 (destructive)	Complete destruction of the gland parenchyma

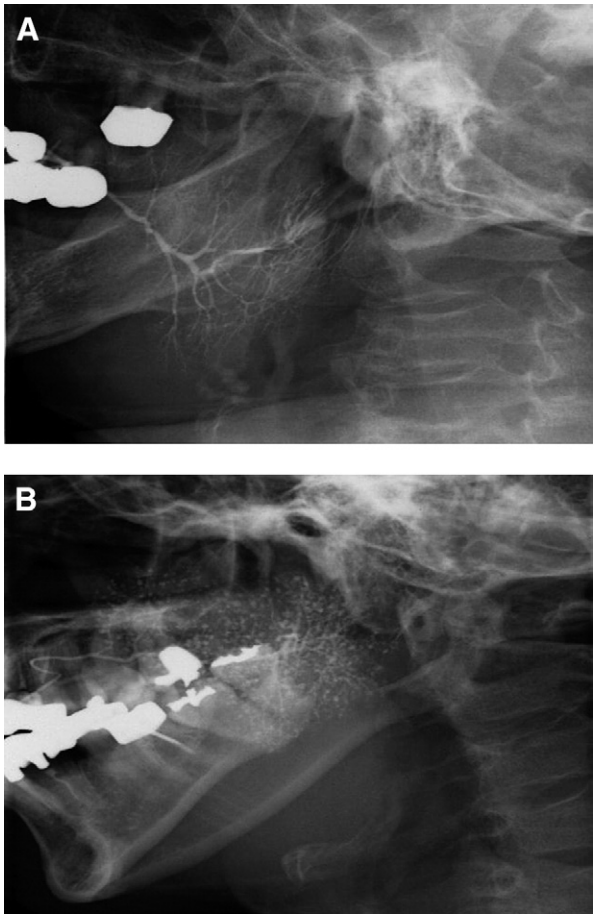

Fig. 1. Sialograms of the parotid glands. **A,** Sialogram of normal parotid gland (stage 0). **B,** Sialogram of stage 1. Punctate sialectasia, <1 mm in size is observed.

the Department of Ophthalmology. The patients were referred to the Department of Oral and Maxillofacial Surgery and Dental Radiology for oral examinations. The patients in this study consisted of 73 patients (4 male and 69 female) aged 13-68 years (mean age 48 years), all of whom underwent 3 oral examinations—sialography, salivary gland biopsy, and ultrasonography—after obtaining the patient's informed consent. Additionally, salivary secretion test (chewing gum test or Saxon test) was carried out in some of the patients for diagnostic work-up purposes. Among 73 patients, 36 had been diagnosed as SS by ocular examination and serologic test, and the remaining 37 had been diagnosed as non-SS but complained of sicca symptom. The diagnosis of SS on sialography and histopathology was made based on the revised Japanese criteria (Table I).

Sialography

Cannulation was performed by a 20-gauge catheter (Therflow; Termo, Tokyo, Japan) into an orifice of the parotid main duct with the help of a fine silver wire. The catheter was ligatured to the buccal mucosa under local anesthesia to prevent the catheter falling off and contrast fluids leaking. An automatic injector (Truth; ATOM Medical, Tokyo, Japan) was used to inject 2 mL 76% diatorizoate sodium (Urografin; Schering, Osaka, Japan) into the Stensen duct at the rate of 0.0125 mL/s. Serial lateral images were obtained continuously during and after the injection to observe the ductal, acinoparenchymal, and functional phases. After removal of the ligature, patients were advised to stimulate salivary gland secretion, massaging the glands and imbibing citric-flavored liquid, to enhance washout of remaining contrast fluid. Two dental radiologists (30 and 10 years' experience) evaluated the sialograms and performed the diagnosis based on the classifications of Rubin and Holt[10] (Table II; Fig. 1). Stage 1 or higher were diagnosed as positive, but when the peripheral ductal dilation was observed, it was assessed as suspicious (possible). Where the diagnosis of the radiologists differed, discussion was made and a diagnosis was agreed on.

Table III. Grading of ultrasonography of Salaffi et al. (2000)[9]

Grade	*Findings*
0 (homogeneity)	Normal glands
1 (slight inhomogeneity)	Small hypoechoic spots
2 (mild inhomogeneity)	Multiple scattered hypoechoic areas (<2 mm)
3 (evident inhomogeneity)	Multiple hypoechoic areas (2-6 mm)
4 (gross inhomogeneity)	Multiple hypoechoic areas (>6 mm)

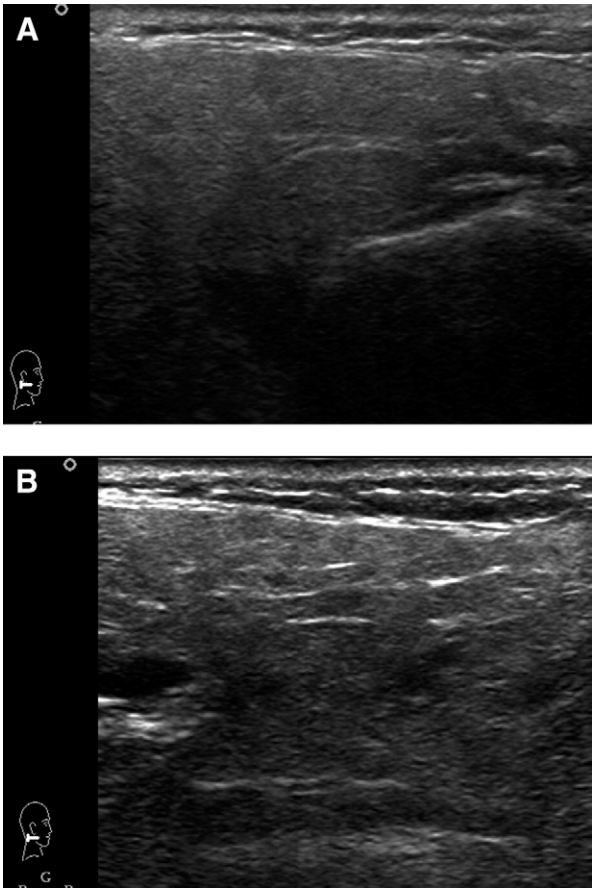

Fig. 2. Sonograms of the parotid glands scanned parallel to the occlusal plane (left = posterior; right = anterior). **A,** Sonogram of normal parotid gland (grade 0). Internal echoes are homogeneous. **B,** Sonogram of parotid gland of Sjögren syndrome (grade 3). Internal echoes are evident and inhomogeneous. Multiple scattered hypoechoic areas (2-6 mm) are observed.

Ultrasonography

Sonographic examinations were performed using HDI 3000 (ATL, Washington, USA). Bilateral parotid and submandibular glands were scanned in the axial and coronal planes. B-Mode multifoci images were taken with the center frequency of 5-12 MHz. Patients were scanned in supine position with their necks extended and heads turned a little toward the opposite side. Sonographic evaluations were performed independently by dental radiologists with 25 years' experience who were not informed of the sialographic diagnosis. Sonographic diagnosis was performed based on the inhomogeneity of the parenchyma of the glands established by Salaffi et al.[9] Grade 3 or higher were diagnosed as SS, and grade 1-2 were assessed as suspicious (possible) (Table III; Fig. 2).

Table IV. Grading of labial salivary gland biopsies of Greenspan et al. (1974)[11]

Grade	*Lymphocytes and plasma cells per 4 mm²*
0	Absent
1	Slight infiltrate
2	Moderate infiltrate or less than one focus* per 4 mm²
3	One focus per 4 mm²
4	More than 1 focus per 4 mm²

*Focus, according to Waterhouse, is an aggregate of ≥50 lymphocytes, histiocytes, and plasma cells (1963).[12]

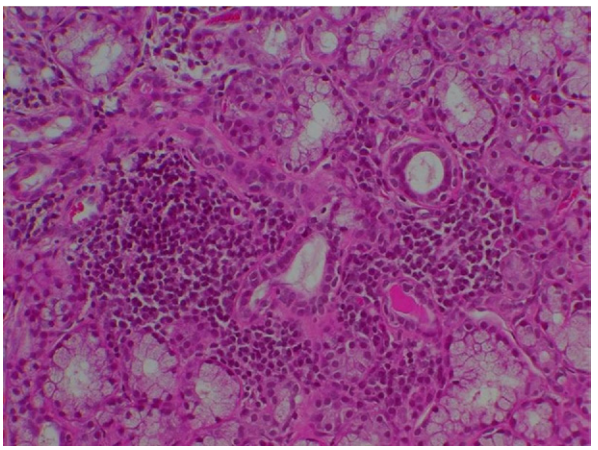

Fig. 3. Histology of the labial glands of a Sjögren syndrome patient. More than one focus per 4 mm² are observed (grade 4).

Biopsy

Labial salivary gland biopsy was performed under local anesthesia by oral surgeons. A lower lip mucosal incision was made between the midline and the commissure and at least 3 labial gland samples were obtained. The histopathologic findings were graded based on Greenspan[11] classification by experienced oral pathologists. Grade 3 or higher were diagnosed as SS, and grade 2 was assessed as suspicious (possible) (Table IV; Fig. 3).

Statistical analysis

Statistical analyses were performed by the chi-squarde test, and a P value of $<.05$ was considered to

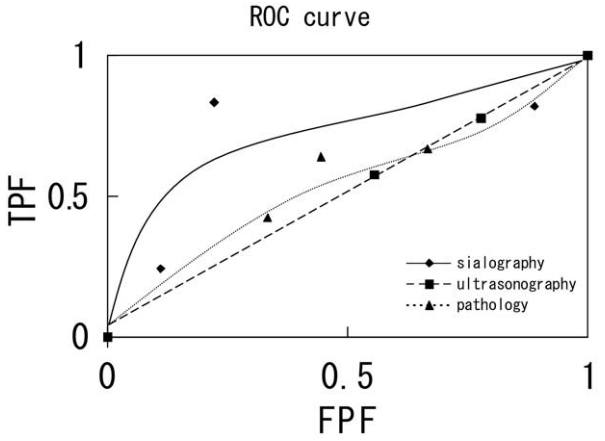

Fig. 4. Receiver operating characteristic (ROC) curves in the differential diagnoses of non–Sjögren syndrome (SS) and SS groups. Sialography showed a superior accuracy to both ultrasonography and pathology. TPF, true positive fraction; FPF, false positive fraction.

Table V. Comparison of diagnostic reliability (%) of sialography, ultrasonography, and pathology

	Sensitivity	*Specificity*	*Accuracy*
Sialography	83.3*	94.6*	89.0*
Ultrasonography	77.8	78.4*	78.1*
Pathology	63.9*	91.9	78.1*

*$P < .05$ (chi-squared test).

be statistically significant. We performed all statistical analyses with SPSS Statistic Base 17.0 (SPSS Japan, Tokyo, Japan).

RESULTS

The sensitivity of sialography was 83.3%, ultrasonography 77.8%, and histopathology 63.9%. There was a statistically significant difference between the sialography and histopathology results ($P < .05$). The specificity of sialography was 94.4%, ultrasonography 78.8%, and histopathology 91.4%. There was a statistically significant difference between sialography and ultrasonography ($P < .05$). The accuracy of sialography was 89.0%, and ultrasonography and histopathology were both 78.1%. There were statistically significant differences between sialography and both ultrasonography and histopathology ($P < .05$). This results showed that sialography was the most reliable diagnostic tool for SS (Fig. 4; Table V).

The incidence of hyposalivation (Saxon or chewing gum test) was 77.8% in SS patients and 54.3% in non-SS patients. Correlation to negative, suspicious, and positive SS was evaluated, and calculations between the diagnostic tools showed that sialography-ultrasonography had the highest correlation (r = 0.58); those of sialography-histopathology and ultrasonography-histopathology were 0.35 and 0.50, respectively (Table VI).

Table VI. Correlation between diagnostic tools

	*r**
Sialography–ultrasonography	0.58
Sialography–pathology	0.35
Ultrasonography–pathology	0.50

*0.0-0.25: little correlation; 0.25-0.5: slight correlation; 0.5-0.75: good correlation; 0.75-1.0: strong correlation.

Complications resulting from the examinations were observed in 4 patients. Two patients developed acute sialadenitis due to the sialography procedure, and this was overcome with the administration of antibiotics. Two patients complained of persistent pain of the lip where the probe was inserted, but the pain disappeared in a few weeks and no neuroparalysis remained. No complications related to the ultrasonographic examination were noted.

DISCUSSION

The reliability of the sialography-based diagnosis in the present study was similar to that reported in a large institutional analysis by Fujibayashi.[13] There the sensitivity, specificity, and accuracy of sialography according to the revised Japanese criteria, were reported as 89.1%, 91.4%, and 89.9%, respectively. The diagnostic reliability of ultrasonography in the present study was equivalent to alternative oral examination results, salivary secretion tests, and salivary scintigraphy, as reported by Fujibayashi.[13] In that study, sensitivity, specificity, and accuracy were 75.7%, 78.7%, and 76.9%, respectively.[11] Salaffi et al.[14] compared ultrasonography of salivary glands in primary Sjögren syndrome with sialography and scintigraphy and indicated that ultrasonography showed the best performance, followed by sialography and scintigraphy. Considering convenience, noninvasiveness, and inexpensiveness, using the ultrasonographic examination has advantages over the salivary secretion test and scintigraphy.

The present study showed comparatively high false positive results with the ultrasonographic examination. One reason may be that the organs examined by ultrasonography include the bilateral parotid and submandibular glands and that the diagnosis of SS was made based on the findings of those 4 glands. If one of the glands presented a finding which met the SS criterion, the case was diagnosed as SS. In contrast, the histopathologic examination showed high false negative results, perhaps because the diagnostic criterion of the biopsy is

quantitative, and cases such as grade 2, where the diagnosis may be in error, were considered to be negative SS. To avoid bias and technical errors related to the histologic procedure, a multilevel examination of the biopsy sample is recommended.[15] The interposition of 200 μm between the evaluated sections is sufficient and a minimum of 3 different section levels are required to score the focus independently. Comparing the multilevel examination of the minor salivary gland biopsy with the American-European Consensus Group criteria, sensitivity was not affected, whereas specificity and accuracy increased 9.8% and 5.9%, respectively. This improvement was mostly due to increased specificity in biopsies with baseline focus scores of >1 to <2 and >2.[15]

This study showed that the correlation between sialography and ultrasonography was higher than the correlations with the other tests. The differences in correlation may arise because the sialographic and ultrasonographic examinations investigate the same glands (the parotid and/or submandibular glands), whereas the histopathologic examination investigates minor salivary glands of the lip. For the reason above, the parotid gland biopsy should be considered, although it is not the organ that yields the criteria for SS. Pijpe et al.[16] compared the parotid gland biopsy with labial biopsy, and found similar sensitivities and specificities. The parotid gland biopsy does not result in loss of motor function or permanent sensory loss, whereas labial biopsy led to permanent sensory loss in 6% of the patients. Pijpe et al. concluded that the diagnostic potential of the parotid biopsy is similar to that of the labial biopsy in the diagnosis of SS; additionally, it offers the potential of detecting malignant lymphomas.

Approximately 50% of the non-SS patients in the present study reported dry mouth symptoms. In addition to SS, dry mouth can be induced by the effects of aging, medication, systemic conditions, such as diabetes mellitus, and psychologic effects.[17,18] It is also reported that lifestyle patterns (alchohol) and mouth breathing are the causes of dry mouth.[19,20]

Sialography is the conventional examination for salivary gland complaints; furthermore, it is the most reliable modality, especially for SS. However, sialography is invasive, because of the necessity of cannulation and injection of contrast materials, and requires radiation exposure. The present authors experienced 2 cases of complications associated with sialography, temporary sialadenitis resulting from cannulation and injection of the contrast materials, which were resolved with antibiotics therapy. Cannulation of the main duct is sometimes difficult, especially when the orifices cannot be identified owing to atrophy and/or hyposalivation.

The present diagnostic accuracy depended on the observer, and interobserver agreement of the diagnosis of sialectasia varied from poor to good with trained and expert observers. The technique and diagnosis of sialography lacks general applicability and requires specific expertise.[3] The present study, similarly to the earlier study, indicated that the diagnostic reliability of sialography for SS is better than other diagnostic tools.[3] Furthermore, its costs are low and it has a relatively low degree of invasiveness, and it is a relatively simple and quick procedure. Sialography is an especially useful tool in monitoring the progress of SS, owing to the similarities in the progress of sialectasia.

Magnetic resonance is a noninvasive examination of the salivary glands, and Izumi et al.[21] reported that a quantitative analysis of MR images for the standard deviation of the signal intensity is useful in the diagnosis of SS. They indicated that the signal intensity on T1-weighted MR images, which represent fat deposits, of the parotid gland in patients with SS increased corresponding to the progression of the disease. The MR examination is more expensive to conduct than sialography and is contraindicated in patients with claustrophobia or cardiac pacemakers.

Ultrasonography is not included among the diagnostic criteria for SS, but the diagnostic reliability is similar to that of histopathology and sialometry combined with scintigraphy, which are components of the examination. Shimizu et al.[22] reported that characteristic sonographic findings (multiple hypoechoic areas, multiple hyperechoic lines and/or spots, multiple hypoechoic areas surrounded with hyperechoic lines and/or spots) could differentiate positive cases of the Sjögren syndrome from negative controls to a very significant degree, and that the findings correlated well with the sialographic grade. Niemela et al.[23] evaluated ultrasonography of salivary glands in primary Sjögren syndrome and compared ultrasonography with parotid MR imaging and MR sialography. They reported that MR sialography was the most sensitive method (96%), followed by MR imaging (81%) and ultrasonography (78%), and that the specificity of ultrasonography was 94%.

Recently, saliva has attracted interest as a biomarker and in sialochemistry as a noninvasive means of diagnosing SS. Kalk et al.[24] reported that the parotid sodium and chloride concentrations combined with the stimulated submandibular and sublingual gland saliva flow rate was the most accurate test for SS, showing a sensitivity of 85% and a specificity of 96%. Hammi et al.,[25] comparing the sensitivity of parotid saliva to that of serum in detecting anti–SSA/Ro and anti–SSB/La autoantibodies in patients with SS, indicated that serum was significantly more sensitive than saliva in detecting SSA/Ro and SSB/La antibodies ($P = .001$). Ultrasonog-

raphy is similarly noninvasive; furthermore, it is inexpensive, concise, and a real-time examination. In conclusion, considering the higher correlation to sialography, ultrasonographic examination can be an alternative modality to histopathology and included as a global diagnostic tool for SS.

REFERENCES

1. Fujibayashi T, Sugai S, Miyasaka N, Toujou T, Miyawaki M, Ichikawa Y, et al. Reviced Japanese Creteria for Sjögren's syndrome. Annual report from a study group on specified immune diseases by Japanese Society for the Promotion of Science (1998). 1999:135-8. Tokyo, Ministry of Health and Welfare.
2. Vitali C, Moutsopoulos HMM, Bombardieri S. The European Community Study Group on diagnostic criteria for Sjögren's syndrome. Sensitivity and specificity of tests for ocular and oral involvement in Sjögren's syndrome. Ann Rheum Dis 1994; 53:637-47.
3. Kalk WWI, Vissink A, Spijkervet FKL, Bootsma H, Kallenberg GGM, Roodenburg JLN. Parotid sialography for diagnosing Sjögren syndrome. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2002;94:131-7.
4. Izumi M, Eguchi K, Nakamura H, Nagataki S, Nakamura T. Premature fat deposition in the salivary glands associated with Sjögren syndrome: MR and CT evidence. AJNR 1997;18:951-8.
5. Tonami H, Higashi K, Matoba M, Yokota H, Yamamoto I, Sugai S. A comparative study between MR sialography and salivary gland scintigraphy in the diagnosis of Sjögren syndrome. J Comput Assist Tomogr 2001;25:262-8.
6. Carotti M, Salaffi F, Manganelli P, Argalia G. Ultrasonography and color Doppler sonography of salivary glands in primary Sjögren syndrome. Clin Rheumatol 2001;20:213-9.
7. Yoshiura K, Yuasa K, Tabata O, Araki K, Yonetsu K, Nakayama E, et al. Reliability of ultrasonography and sialography in the diagnosis of Sjögren's syndrome. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1997;83:400-7.
8. Wernicke D, Hess H, Gromnica-Ihle E, Krause A, Schmidt WA. Ultrasonography of salivary glands—a highly specific imaging procedure for diagnosis of Sjögren's syndrome. J Rheumatol 2008;35:285-93.
9. Salaffi F, Argalia G, Carotti M, Giannini FB, Palombi C. Salivary gland ultrasonography in evaluation of primary Sjögren's syndrome. Comparison with minor salivary gland biopsy. J Rheumatol 2000;27:1229-36.
10. Rubin P, Holt FF. Secretary sialography in disease of major salivary glands. AJR Am J Roentgenol 1957;77:575-98.
11. Greenspan JS, Daniels TE, Talal N, Sylvester RA. The histopathology of Sjögren's syndrome in labial salivary gland biopsies. Oral Surg 1974;37:217-29.
12. Waterhouse JP. Focal Adenitis in Salivary and Lacrimal Glands. Proc Roy Soc Med 1963;56:911-8.
13. Fujibayashi T. Revised Japanese criteria for Sjögren's syndrome. Dent Radiol 2004;44:31-7.
14. Salaffi F, Carotti M, Iagnocco A, Luccioli F, Ramonda R, Sabatini E, et al. Ultrasonography of salivary glands in primary Sjögren's syndrome: a comparison with contrast sialography and scintigraphy. Rheumatology 2008;47:1244-9.
15. Morbini P, Manzo A, Caporali R, Epis O, Villa C, Montecucco C, et al. Multilevel examination of minor salivary gland biopsy for Sjögren's syndrome significantly improves diagnostic performance of AECG classification criteria. Arthritis Res Ther 2005; 7:343-8.
16. Pijpe J, Kalk WW, Wal JE, Vissink A, Kluin M, Spijkervet FKL, et al. Parotid gland biopsy compared with labial biopsy in the diagnosis of patients with primary Sjögren's syndrome. Rheumatology 2007;46:335-41.
17. Gupta A, Epstein JB, Sroussi H. Hyposalivation in elderly patients. J Can Dent Assoc 2006;7:841-6.
18. Moore PA, Guggennheimer J, Etzel KR, Weyant RJ, Orvhard T. Type 1 daibetes mellitus, xerostomia, and salivary flow rates. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2001;92: 281-91.
19. van den Berg I, Pijpe J, Vissink A. Salivary gland parameters and clinical data related to the underlying disorder in patients with persisting xerostomia. Eur J Oral Sci 2007;115:97-102.
20. Almedia PDV, Gregio AMT, Machado MAN, Lima AAS, Azevedo LR. Saliva composition and function: a comprehensive review. J Contemp Dent Pract 2008;9:72-80.
21. Izumi M, Eguchi K, Ohki M, Uetani M, Hayashi K, Nakamura T, et al. MR imaging of the parotid gland in Sjögren's syndrome: a proposal for new diagnostic criteria. AJR 1996;166:1483-7.
22. Shimizu M, Okamura K, Yoshiura K, Ohyama Y, Nakamura S, Kinukawa N. Sonographic diagnostic criteria for screening Sjögren's syndrome. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;102:85-93.
23. Niemela RK, Takalo R, Paakko E, Suramo I, Paivansalo M, Salo T, et al. Ultrasonography of salivary glands in primary Sjögren's syndrome. A comparison with magnetic resonamce imaging and magnetic resonance sialography of parotid glands. Rheumatology 2004;43:875-9.
24. Kalk WW, Vissink A, Stegenga B, Bootsma H, Amerongen AVN, Kallenberg CGM. Sialometry and sialochemistry: a noninvasive approach for diagnosing Sjögren's syndrome. Ann Rheum Dis 2002;61:137-44.
25. Hammi AR, Al-Hashimi IH, Nunn ME, Zipp M. Assessment of SS-A and SS-B in parotid saliva of patients with Sjögren's syndrome. J Oral Pathol Med 2005;34:198-203.

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