



Diagnostic accuracy of parotid CT for identifying Sjögren's syndrome

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ABSTRACT

Purpose: To evaluate the diagnostic accuracy of computed tomography (CT) of the parotid gland for Sjögren's syndrome in comparison with conventional X-ray sialography.

Methods: CT scans and X-ray sialography were performed in 34 patients with confirmed Sjögren's syndrome and 22 symptomatic controls without the disease. CT data from 57 asymptomatic controls were included for quantitative analysis. The CT findings of heterogeneity, abnormal diffuse fat tissue deposition, diffuse punctate calcification, swelling or atrophy, nodularity or cystic changes of the parotid gland were analyzed by two independent blinded readers. The correlation between CT and X-ray sialography findings was evaluated. Diagnostic performance and receiver operating characteristics curves were calculated.

Results: On CT, heterogeneity of the parotid gland was seen in 30/31 (reader 1/reader 2) Sjögren's syndrome patients by the two readers (sensitivity 88.2%/91.2%; specificity 100%/90.9%). Abnormal diffuse fat tissue deposition was seen in 28/28 SS patients by the readers (sensitivity 82.3%/82.3%; specificity 100%/90.9%). Diffuse punctate calcification was seen in 10/12 Sjögren's syndrome patients (sensitivity 29.4%/35.2%; specificity 100%/100%). Stagings of CT findings correlate positively with sialography. The areas under the receiver operating characteristics curves were 0.887 ($P=0.000$) and 0.908 ($P=0.000$) for the maximum and standard deviation (SD) of the CT value.

Conclusions: Parotid CT is accurate and reliable in the diagnosis of Sjögren's syndrome. Heterogeneity, abnormal diffuse fat tissue deposition, and diffuse punctate calcification are specific for Sjögren's syndrome. CT attenuation analysis is helpful in diagnosis.

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1. Introduction

Sjögren's syndrome (SS) is a rheumatic autoimmune disease characterized by lymphocytic infiltration in exocrine glands such as the salivary and lacrimal glands, leading to keratoconjunctivitis sicca and xerostomia [1]. Characteristic pathological changes in salivary gland parenchyma include lymphocyte infiltration, disruption of acini and fibrosis. Comprehensive analysis embraces clinical symptoms, serum tests for antibodies, radiological examinations and biopsy of the minor salivary gland [1].

The classification criteria of the American-European Consensus Group (AECG) in 2002 remain the gold standard for identification of SS, in which X-ray sialography is an important radiological parameter [1]. The presence of diffuse punctate, cavitary or destructive sialiectasia without evidence of obstruction in the major duct strongly indicates the diagnosis of SS and is also espe-

cially useful in its staging of SS [1–3]. Other imaging protocols including MR sialography [4–9], ultrasound sonography [7,10–14] and radionuclide scintigraphy [5,15] have also been established and are of great value for further exploration of its pathological progress.

The adipose tissue inside the parotid gland is distributed homogeneously and contributes to the low attenuation of the gland. With the destruction of the gland parenchyma, the adipose tissue changes significantly. In MRI studies, the parotid gland in SS was shown to be heterogeneous with diffuse fat tissue deposition [16–18]. However, CT diagnosis of this phenomenon has not been fully studied yet. CT was initially reported to be indiscriminative for SS [10]. Later opinions confirmed the positive value of CT for SS [16,19]. As the clinical usefulness of parotid CT for SS is still unclear, we conducted this study to assess its diagnostic accuracy.

2. Materials and methods

This study was performed in accordance with the criteria of the Helsinki Declaration and was approved by the Institutional

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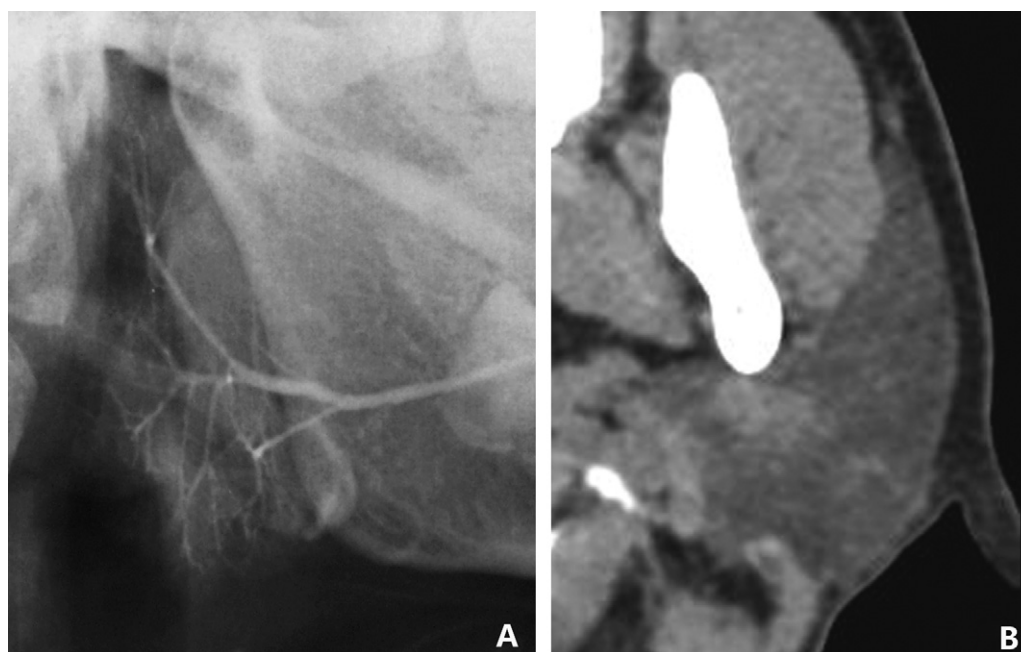


Fig. 1. Normal manifestations of sialogram and CT of parotid gland. Note the absence of sialectasia in the sialogram (A) and homogeneous attenuation of the parotid gland in CT (B) in the same patient (50-year-old, female).

Review Board of Peking University (IRB00001052-10029). All subjects signed informed consents to participate in the study.

2.1. Patients

Between August 2009 and June 2010, 64 consecutive patients in our hospital suspected of having SS because of xerostomia and xerophthalmia, were prospectively enrolled. Patients with systemic diseases, inflammatory diseases, trauma or tumors of the salivary glands were excluded. All patients underwent CT scans before X-ray sialography of the parotid gland.

The other 57 patients (seven males and 50 females, 40–65 years old, mean age of 55) without xerostomia or xerophthalmia, trauma, tumors or inflammation who had undergone CT of the parotid gland were included as the asymptomatic control group for quantitative analysis.

2.2. Diagnostic procedure

The clinical diagnostic procedures for SS were carried out in 64 symptomatic patients. The procedures included subjective symptoms of oral and ocular dryness, sialometry, serum tests (anti-Ro/SSA and anti-La/SSB), Schirmer's test and sialography. The results were collected and the final diagnoses were established according to the classification criteria proposed by the AECG in 2002.

As a result, 34 symptomatic patients (three males and 31 females; 35 to 70 years old, mean age of 58) were diagnosed as SS and 22 symptomatic patients (22 females, 40–65 years old, mean age of 54) were excluded for SS. Eight symptomatic patients were excluded in this study because of inconclusive diagnoses. Oral symptoms, ocular symptoms, ocular signs (Schirmer's test, ≤ 5 mm in 5 min), positive sialometry (unstimulated salivary flow ≤ 1.5 ml in 15 min) and sialography findings were present in all SS patients. Anti-Ro/SSA and/or anti-La/SSB were positive in 19 SS patients. Diagnoses were histopathologically confirmed in five patients, among which three were diagnosed as nodularity type of SS and two were diagnosed as having lymphoepithelial cysts. None

of the 22 symptomatic controls fulfilled the diagnostic criteria of SS and none were positive for anti-Ro/SSA or anti-La/SSB.

2.3. CT protocol

Symptomatic patients were scheduled to undergo parotid CT before sialography, both of which were performed on the same day. CT scans were performed using an 8-slice scanner (BrightSpeed, GE Medical Systems, USA) with patients in the supine position. The CT scans were carried out with a rotation time of 1 s, pitch of 1.375:1, collimation of 1.25 mm, voltage of 120–140 kV and automatic exposure control. No intravenous contrast medium was used. High-resolution axial images of parotid glands with a slice thickness of 1.25 mm were reconstructed using a soft tissue algorithm.

X-ray sialography of the parotid glands was performed with a standardized protocol by the same doctor. All sialograms were obtained in the absence of acute sialadenitis. Non-ionic contrast medium (Iopamiro 370 mg/ml, Bracco) was used. The sialographic staging of SS was determined on the basis of the lateral views by two experienced radiologists (with more than 10 years' experience) in consensus according to the criteria of Rubin and Holt [2]. Stage 0 = normal (Fig. 1A); Stage 1 = diffuse, punctate areas of sialectasis, 1 mm or less in diameter (Fig. 2A); Stage 2 = globular sialectasis, 1–2 mm in diameter (Fig. 3A); Stage 3 = cavitory sialectasis, more than 2 mm in diameter (Fig. 4A); Stage 4 = destructive pattern (Fig. 5A).

2.4. Analysis of CT manifestations

Two maxillofacial radiologists with 15 years' (Yanping Zhao) and 10 years' (Denggao Liu) of experience in salivary gland diseases interpreted all CT images independently on a GE CT computer workstation. The radiologists were blinded to the results of any other clinical symptoms or tests. The following qualitative criteria were evaluated: presence or absence of heterogeneity of the parotid gland, abnormal diffuse fat tissue deposition area, diffuse punctate calcifications, nodular mass, cystic lesions, swelling or atrophy of the parotid gland.

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