

Sialochemistry of patients with autoimmune rheumatic disease with and without histological manifestations of Sjögren's syndrome

E B TSIANOS,¹ A G TZIOUFAS,¹ A K MAVRIDIS,² A K SARRAS,¹ C S PAPANIMITRIOU,³ O TSOLAS,⁴ AND H M MOUTSOPOULOS¹

From the Departments of ¹Medicine, ²Microbiology, ³Pathology, and ⁴Biological Chemistry, Medical School, University of Ioannina, Ioannina, Greece

SUMMARY Fifty-one patients with autoimmune rheumatic diseases underwent biopsy of the labial minor salivary glands. These patients were divided according to histopathology of lip biopsies into three groups (negative lip biopsy, 1+ and 2+). From all the patients stimulated parotid salivary flow was measured. In the saliva sodium, potassium, magnesium, α -amylase, and immunoglobulin levels (IgA, IgG, IgM) were measured. It is shown that patients with advanced chronic inflammatory disease of the minor salivary glands have decreased stimulated salivary flow. However, no statistically significant differences were observed in the biochemical markers tested between the histopathological groups examined.

Key words: minor salivary glands, exocrine glands, lip biopsy, α -amylase.

The major oral manifestations in patients with primary or secondary Sjögren's syndrome are mucosal dryness, atrophy, and accelerated dental decay.¹ In an attempt to explain these oral manifestations studies of the salivary composition from these patients have been performed. The results for sodium, potassium, and immunoglobulin salivary content are conflicting.²⁻⁵

In the present study we approached the same questions by examining biochemical markers in stimulated parotid saliva from autoimmune rheumatic disease patients with or without histological findings in the minor salivary glands compatible with Sjögren's syndrome.

Materials and methods

We studied 51 patients with autoimmune rheumatic diseases. Sixteen patients (12 females and four males) had classical rheumatoid arthritis,⁶ 11 patients (10 female and one male) had systemic lupus erythematosus,⁷ sixteen female patients had

primary Sjögren's syndrome,¹ four female patients had mixed connective tissue disease,⁸ and four female patients had Raynaud's phenomenon.

All patients underwent minor salivary gland biopsies regardless of subjective or objective manifestations of xerostomia. The density of the inflammatory infiltrations was examined and graded according to Tarpley's criteria.⁹ From all these patients parotid salivary flow was measured with Carlson-Crittenden cups. Saliva was collected after lemon juice stimulation. The collected parotid salivas were centrifuged at 1500 rpm for 10 min. The supernatants were kept frozen at -20°C until tested.

Sodium and potassium levels were assayed by flame photometry (Corning photometer 435). Magnesium was determined by the Magnesium Rapid Stat Kit (Lancer, Ireland). α -Amylase activity was measured by the 'Phadebas' method (Pharmacia AB, Uppsala, Sweden).¹⁰ Immunoglobulin levels in saliva were measured by the single radial immunodiffusion technique.

The concentrations of salivary electrolytes (sodium, potassium, magnesium), α -amylase, and immunoglobulins (IgA, IgG, IgM) of the patients studied were expressed according to the five-minute flow rate.

Accepted for publication 10 January 1985.

Correspondence to Dr E B Tsianos, Department of Medicine, Medical School, University of Ioannina, 453 32 Ioannina, Greece.

The statistical differences between the groups were evaluated by Student's *t* test.

Results

Twenty-two of the 51 patients studied had normal minor salivary glands on labial biopsy. These constituted group 0. Nine patients had labial biopsies graded as $\geq 1+$ group. The means of the flow rate, α -amylase, sodium, potassium, magnesium, and immunoglobulin (IgA, IgG, IgM) levels in the five-minute flow rate of the saliva in the three groups of patients tested are shown in Table 1. The only statistical correlations found were the decreased parotid flow rate in patients with labial biopsies $\geq 2+$ versus patients with negative biopsies and between the mean secretion rates of α -amylase in patients with $1+$ versus $\geq 2+$ labial biopsies. In addition it was seen that group $1+$ compared with group $\geq 2+$ had higher mean values in the secretion rates of sodium, potassium, magnesium, and IgA immunoglobulin. The salivary IgG and IgM immunoglobulins were not measurable by the method used.

Discussion

This study shows that there is a significant decrease of the salivary flow rate in patients with advanced inflammatory salivary glands disease; a finding which further substantiates previously reported observations.¹¹ In the early inflammatory disease ($1+$), however, the mean salivary flow rate did not differ from that of patients with normal minor salivary glands. This observation indicates that the salivary flow rate cannot be used as an early and sensitive indicator for the diagnosis of Sjögren's syndrome.

The other interesting observation in this study was that in the early inflammatory salivary glands disease ($1+$) increased levels of the electrolytes and proteins tested were found compared with groups 0 and $\geq 2+$. This finding perhaps suggests that in the initial inflammatory stage the secretory epithelium is

stimulated by the cellular inflammation or by lymphokines to produce more substances. Alternatively the increased levels in patients with mild inflammation can be attributed to the fact that the metaplastic epithelial cells that replace the normal ductal cells in these patients are not capable of reabsorbing these substances effectively. In the late inflammatory stage, however, the decrease of the salivary constituents can be attributed to the significant decrease of the secretory epithelium or to the replacement of these cells by non-functional collagen tissue.

Finally, we observed that the salivary IgA immunoglobulin did not correlate with the degree of inflammation of the minor salivary glands. From experiments *in vitro* and *in vivo* it is known that serum hypergammaglobulinaemia in patients with Sjögren's syndrome is attributed mostly to the excessive production of immunoglobulins due to the B cells infiltration of the salivary or other exocrine glands.^{12, 13} Why the IgA immunoglobulin levels did not differ in patients with autoimmune rheumatic disease without inflammation of the minor salivary glands compared with mild or severe inflammatory changes is a very interesting question. We speculate that the immunoglobulins produced by the infiltrating cells are directed towards the circulation rather than the salivary excretions. This hypothesis is supported by our observation that explicit leakage of immunoglobulins IgG and IgM was not observed in the patients tested.

In conclusion sialochemistry of the stimulated parotid saliva cannot be used as a non-invasive adjunct for the diagnosis of chronic inflammatory disease of the salivary glands.

We wish to thank Ms E E Papanikolaou for excellent secretarial assistance.

References

- 1 Moutsopoulos H M, Chused T M, Mann D L, *et al*. Sjögren's syndrome (sicca syndrome): current issues. *Ann Intern Med* 1980; **92**: 212-26.

Table 1 Biochemical values* between the histopathological groups in patients with autoimmune rheumatic diseases

| Patient group† | Patients (n) | Flow rate (ml/5 min) | α -Amylase (U/5 min) | Na ⁺ (mEq $\times 10^{-3}$ /5 min) | K ⁺ (mEq $\times 10^{-3}$ /5 min) | Mg ⁺ (mEq $\times 10^{-3}$ /5 min) | IgA (mg $\times 10^{-2}$ /5 min) |
|----------------|--------------|----------------------|-----------------------------|---|--|---|----------------------------------|
| 0 | 22 | 1.34 \pm 0.78‡ | 393.1 \pm 362.6 | 21.19 \pm 35.54 | 20.81 \pm 14.46 | 0.056 \pm 0.089 | 2.13 \pm 1.46 |
| 1+ | 9 | 1.28 \pm 1.03 | 635.8 \pm 515.4§ | 31.86 \pm 42.12 | 27.34 \pm 25.49 | 0.113 \pm 0.268 | 6.87 \pm 9.42 |
| $\geq 2+$ | 20 | 0.77 \pm 0.92 | 247.4 \pm 591.7 | 9.9 \pm 17.31 | 13.46 \pm 17.41 | 0.063 \pm 0.258 | 1.69 \pm 2.1 |

*Values are mean \pm SD.

†According to lip biopsy.

‡p<0.05, group 0 versus $\geq 2+$. §p<0.05, group 1+ versus $\geq 2+$.

- 2 Mandel I D, Baurmash H. Sialochemistry in Sjögren's syndrome. *Oral Surg* 1976; **41**: 182-7.
- 3 Ben-Aryeh H, Nahir M, Scharf Y, Gutman D, Laufer D, Szargel R. Sialochemistry of patients with rheumatoid arthritis. *Oral Surg* 1978; **45**: 63-70.
- 4 Fischer C J, Wyshak G W, Weisberger D. Sjögren's syndrome. Electrophoretic and immunological observations on serum and salivary proteins of man. *Arch Oral Biol* 1968; **13**: 257-70.
- 5 Herzberg S M, White C, Wolf R O. Characterization of salivary proteins in patients with Sjögren's syndrome. *Oral Surg* 1973; **36**: 814-7.
- 6 Ropes M W, Bennett G A, Cobb S. 1958 revision of diagnostic criteria for rheumatoid arthritis. *Bull Rheum Dis* 1958; **9**: 175-6.
- 7 Cohen A S, Reynolds W E, Franklin E C, *et al*. Preliminary criteria for the classification of systemic lupus erythematosus. *Bull Rheum Dis* 1971; **21**: 643-8.
- 8 Sharp G C, Irwin W S, Tan E M, *et al*. Mixed connective tissue disease, an apparently distinct rheumatoid disease syndrome associated with a specific antibody to an extractable nuclear antigen (ENA). *Am J Med* 1972; **52**: 148-54.
- 9 Tarpley T M, Anderson L G, White C L. Minor salivary gland involvement in Sjögren's syndrome. *Oral Surg* 1974; **37**: 64-74.
- 10 Ceska M, Brown B, Birath K. Ranges of α -amylase activities in human serum and urine and correlations with some other α -amylase methods. *Clin Chim Acta* 1969; **26**: 445-53.
- 11 Rice D H. Advances in diagnosis and management of salivary gland diseases. *West J Med* 1984; **140**: 238-49.
- 12 Talal N, Asofsky R, Lightbody P. Immunoglobulin synthesis by salivary gland lymphoid cells in Sjögren's syndrome. *J Clin Invest* 1970; **49**: 49-56.
- 13 Lane H C, Callihan T R, Jaffe E S, Fauci A S, Moutsopoulos H M. Presence of intracytoplasmic IgG in the lymphocytic infiltrates of the minor salivary glands of patients with primary Sjögren's syndrome. *Clin Exp Rheumatol* 1983; **1**: 237-40.