Salivary Gland Dysfunction and Xerostomia in Sjögren's Syndrome

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KEYWORDS

• Sjögren's syndrome • Salivary gland dysfunction • Hyposalivation • Sialometry • Xerostomia • Subjective assessment

KEY POINTS

- Unstimulated whole saliva sialometry is a major criterion for evaluation of salivary gland dysfunction in Sjögren's syndrome according to the American-European Consensus Group classification criteria.
- Stimulated whole saliva sialometry and gland specific sialometry are of importance for diagnosing patients with SS. Unstimulated and stimulated sialometry are essential in identifying patients who may benefit from intervention therapy.
- Xerostomia should be assessed regularly by validated tools to evaluate impact on oral health-related quality of life and monitor alleviation/treatment efficacy or disease progression.

INTRODUCTION

It is generally accepted that the secretions of the salivary glands are of paramount importance for the maintenance of oral health. A reduced salivary flow induces symptoms that include the subjective feeling of dry mouth (xerostomia), difficulty with the swallowing of food, and an increased susceptibility to dental caries and opportunistic infections. These symptoms reflect the impact of reduced salivary flow on the maintenance of the health of the oral tissues, because salivary dysfunction negatively affects several main functions of saliva, such as (1) protecting the mineralized tissues against wear and demineralization, (2) wetting the oral mucosa, thereby forestalling oral desiccation and infection, and (3) promoting speech and the digestion of food. In this article, salivary gland dysfunction and xerostomia in Sjögren's syndrome (SS) is discussed, with a focus on the pathophysiology of salivary dysfunction in SS, the clinical presentation of dry mouth in SS, how to assess salivary gland hypofunction and xerostomia in SS, and the impact of salivary gland dysfunction on quality of life in patients with SS.

SALIVARY GLAND PHYSIOLOGY

What is Saliva?

The mixed fluid in the mouth is called whole saliva or oral fluid. Whole saliva is for the greater part composed of secretions from 3 pairs of major salivary glands (parotid, submandibular [SM], and sublingual [SL]) and from numerous minor glands (labial, buccal, lingual, palatal, retromolar). Each type of gland secretes a fluid with a characteristic protein composition.[1] In addition, whole saliva contains gingival crevicular fluid, microorganisms, food debris, and shed mucosal cells. Saliva is a hypotonic fluid relative to plasma, and it is composed of more than 99% water and less than 1% of dry matter, such as proteins and salts. The normal

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Oral Maxillofacial Surg Clin N Am 26 (2014) 35–53
http://dx.doi.org/10.1016/j.coms.2013.09.003

daily production of whole saliva ranges between 0.5 and 1.5 L.

At night and in resting state during daytime, the SM and SL glands are the main contributors to whole saliva (Table 1). Together with the numerous minor salivary glands, they secrete most of the salivary mucins.[2] The large salivary mucins are responsible for the viscoelastic properties of mucous saliva. These large glycoproteins are the backbone of the lubricating layers that cover all oral surfaces, acting as diffusion barriers impeding the entry of noxious agents, including acids, microorganisms, and viruses. This mucous layer helps in reducing the friction between antagonistic tooth surfaces. The low-molecular-weight mucins have broad-spectrum bacteria-binding properties and play an important role in the oral clearance of bacteria, yeasts, and viruses. Without mucins, the oral mucosa and the dental surfaces become highly vulnerable to infection, inflammation, and mechanical wear.[3]

Saliva Secretion: The Two-Step Model

Basically, saliva is formed in 2 steps. The secretory end pieces (acini) produce primary saliva, which is isotonic, having an ionic composition similar to that of plasma (Fig. 1). The primary fluid is then modified in the ductal system by selective reabsorption of sodium and chloride, and by a certain secretion of potassium and bicarbonate, although the duct is impermeable to water. Thus the secretion rate and thereby the volume of final saliva are determined directly by the formation rate of primary saliva by the acinar cells.

The ionic composition of saliva is strongly dependent on the secretion rate. When the salivary secretion rate is low (eg, at rest), the mouth fluid is rich in potassium and chloride and low in sodium and bicarbonate. On stimulation of the flow rate, sodium, chloride, and bicarbonate concentrations increase, and potassium decreases (Fig. 2). This situation can be explained by the ion exchange mechanism during saliva transport in the ductal system, in particular during its transport in the striated ducts. Similar to the fluid secreted by most exocrine organs (eg, sweat and lacrimal glands), saliva formation involves 2 stages. The primary fluid secreted by salivary acinar cells resembles plasma in ionic composition, which is rich in sodium, chloride, and bicarbonate (see Fig. 1). As this primary secretion passes through the ductal system, sodium, chloride, and bicarbonate are reabsorbed, whereas potassium is excreted, resulting in a fluid hypotonic to plasma, although rich in potassium. When saliva secretion rate is increased, as a result of the combination of a maximum reabsorption capacity in the duct epithelium and the shorter passage time in the duct, the stimulated saliva secretion is less hypotonic than the resting saliva. This situation results in apparently increased sodium, chloride, and bicarbonate concentrations and decreased potassium concentration.

Stimulation of salivary secretions thus influences both the quantity of saliva and its ionic and protein composition. In addition, large differences exist between individuals, both in the volume and the protein composition of saliva. Altogether this situation makes it difficult, in particular for whole saliva, to define normal reference values for salivary parameters with which to compare patient data.

Salivary Secretion and Composition in SS

When discussing whole saliva, one should be aware that saliva enters the mouth at several locations, but the different glandular secretions are not well mixed. For example, the contribution of parotid saliva to (un)stimulated whole saliva varies from site to site, ranging from being the major contributor to whole saliva collected buccally from the maxillary molars to being almost noncontributing to whole saliva collected in the incisor region. This site-specific variation in composition of whole saliva seems to account for the site specificity of smooth surface caries and supragingival

Table 1
Relative (%) contribution of different gland types to whole saliva under various conditions

Salivary Gland	Sleep	Unstimulated Whole Saliva	Stimulated (Mechanical) Whole Saliva	Stimulated (Acid) Whole Saliva
Parotid	0	21	58	45
SM	72	70	33	45
SL	14	2	2	2
Minor glands	14	7	7	8

Data from Refs.[39–41]