

Alterations in Salivary IgA Levels in Infectious and Inflammatory Disorders of Upper Respiratory Tract

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Abstract:

Background: The airway surfaces are one of the most common ways of entry of infectious agents. The impact of upper respiratory tract diseases on salivary IgA production has not been fully understood. Therefore, in this study, we investigated the salivary IgA levels in patients suffered from upper respiratory tract diseases to indicate the effect of these diseases on salivary IgA production.

Materials and Methods: In this study, salivary IgA level of 156 patients with inflammatory diseases of the upper respiratory tract including chronic rhinosinusitis, ear and pharynx diseases have been evaluated by direct immunoenzymatic determination.

Results: In pharynx disorders 11.8 % of patients were IgA deficient , 76.2 % were normal and 11.8 % had elevated level of IgA .In patients with chronic rhinosinusitis IgA deficiency was observed in 9.2 % , 75.9 % were normal and there was an elevation in 14.8 % of patients .In ear disorders 11.6% were IgA deficient ,76.7 % normal and 11.6 % had elevated IgA level.

Conclusion: This study provided evidence for the first time that changes in salivary IgA level are almost the same in different sites of infectious and inflammatory diseases of upper respiratory tract. Our investigation revealed that local up regulation of salivary IgA is not particular interest in majority of patients with upper respiratory tract infections.

Keywords: Salivary IgA; Upper respiratory tract diseases; Mucosal defense

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Introduction

Surfaces are the most common way of entry of infectious agents, allergens and carcinogens. These include the airways, the conjunctiva covering the eyes as well as gastrointestinal, urinary and genital tracts. Mucosal infections are the main cause of death for children below the age of 5 years old and kill 10 million children annually; unfortunately, there is no remedy for at least 6 million of this cases (1). Therefore, finding the defect of mucosal defense is the solution of these problems.

The mucosal immune system has improved the adaptive anti-inflammatory defense to set homeostasis by immune exclusion mediated by secretory IgA (SIgA) antibodies (Abs) to the clearance of pathogenic

organisms from the mucosal surfaces by way of neutralizing toxins and viral particles, inhibiting adherence of pathogens, colonization and penetration of mucosal surfaces by pathogenic microorganisms and immunosuppressive ways to limit overreaction against inoffensive luminal antigens. The secretory immunoglobulins are the most essential section of the antibody-dependent defense of the body (1-2).

Secretions of the mucosal layers are most commonly used for testing for the existence of SIgA Abs in order to examine local humoral immune responses. But the protective role of SIgA in upper respiratory tract infections is yet esoteric. Hence, the aim of this study is to evaluate the salivary IgA level as a

secretary immunoglobulin in patients suffer from infectious and inflammatory disorders of upper respiratory tract including ear, pharynx and chronic rhinosinusitis (CRS) to find a noninvasive method to indicate the local humoral reaction mediated by SIgA in such patients.

Methods and material

Patients and samples

The study population included 156 patients with infectious and inflammatory disorders of ear, pharynx and CRS. Patients were recruited from the Ear, Nose, Throat, Head and Neck Surgery section of the university hospital (Mazandaran University of Medical Science, Sari, Iran).

In the opinion of investigators, participants with conditions that could affect salivary IgA level, such as malignancy, renal dysfunction, vascular disease, diabetes mellitus and malnutrition or any other conditions that could make the participants unsuitable for the study, were excluded.

All subjects gave their consent to participate in the study. This study was conducted in accordance with the declaration of Helsinki and good clinical practice according to International Conference on Harmonization guidelines.

Immunoglobulin assay

We collected fasting oral cavity secretions (2 ml) of the patients and salivary IgA was determined by Neophlometric system. All assays were performed duplicate at the time of samples collection. According to literature data and on the results reported by the Dia. Metra kit, the normal range is 40-170 $\mu\text{g/ml}$.

Statistical analysis

Quantitative data were presented as mean \pm SD (standard deviation). For statistical analysis, SPSS software (Version 15, Chicago, IL, USA) was used.

Results

The demographic data of the patients are summarized in Table 1. Patients divided to three groups (patients with infectious and inflammatory disorders of pharynx (a), ear (b) and CRS (c)). Each group had three subgroups including patients with low, normal and elevated level of salivary IgA. In group a, Mean \pm SD of patients with low level of IgA was 19.57 ± 10.14 , for normal participants became 84.92 ± 31.85 and with elevated level 300.4 ± 106.16 . In group b, Mean \pm SD of patients with low level of IgA became 22.62 ± 11.85 for normal participants 84.14 ± 27.69 and in patients with elevated level of IgA was 313.6 ± 117.36 . In group c, Mean \pm SD of patients with low level of IgA was 27.92 ± 14.28 , for

normal participants 86.03 ± 41.91 and in patients with elevated level 304 ± 152.16 .

Table 1. Demographic data of study population.

	Male (number %)	Female (number %)	Age (mean \pm SD)
Ear Disorders	16(37.2%)	27(62.7%)	38 \pm 23.31
Pharynx Disorders	28(47.4%)	31(52.5%)	37.90 \pm 25.21
Chronic Rhinosinusitis	23(42.5%)	31(57.4%)	38.61 \pm 22.62

Elevated level of IgA was observed in 7 participants (11.8%) in group a, 5 patients (11.6%) in group b, and 8 subjects (14.8%) suffered from CRS (c). low level of IgA was identified in 7 subjects (11.8%) with pharynx disorders (arm a), 5 patients (11.6%) with ear disorders (group b), and 5 patients (9.2%) with CRS (group c) (table2).

Table 2. Distribution of salivary IgA level in patients suffered from upper respiratory tract infections.

	N	elevated level of IgA	normal level of IgA	low level of IgA
Ear Disorders	43	5(11.6%)	33(76.7%)	5(11.6%)
Pharynx Disorders	59	7(11.8%)	45(76.2%)	7(11.8%)
Chronic Rhinosinusitis	54	8(14.8%)	41(75.9%)	5(9.2%)

Discussion

Although it has been demonstrated that B-cell aggregation and immunoglobulin production are vital processes in the airway diseases but the mechanism of local humoral defense in upper respiratory tract mediated by salivary IgA has not been well defined. So, in this study, we evaluated salivary IgA level in infectious and inflammatory disorders of upper respiratory tract to elucidate local humoral reaction in inflamed mucosa.

Probably SIgA may work as antiseptic shell at the mucosal membrane by preventing bacterial adherence and influx of microorganisms. In situations associate with disruption of the mucosal barrier with manufacture of inflammatory mediators, SIgA provokes dendritic cells expressing Fc α RI which play a vital role either as a second line of defense against bacterial infection or by arming the immune system to confront with exogenous antigens (3). Fc α RI cannot be detected by immunohistochemistry on epithelial Langerhans cells (LC), indicating that LC might neglect IgA immune complexes within the epithelium in the lack of a destruction of the epithelial barrier (4).

Mucosal inductive sites consist of the Peyer's patches or gut-associated lymphoid tissues as well as the Waldeyer's ring of tonsils and adenoids as

nasopharyngeal associated lymphoid tissues, which collectively comprise a mucosa-associated or MALT network for continuous supply of memory B and T cells to mucosal effectors sites (5, 7). Studies claimed that Peyer's patches play an important role in the induction of SIgA and oral tolerance (8-9).

One of the most common congenital immunodeficiency is IgA deficiency (10-11). IgA deficiency is thought to be a non-important condition needing only common pediatric care. Although one-third of IgA-deficient patients are symptomatic but most of them have no clinical signs (12). The presence of CRS in predominantly humoral immunodeficiencies, has been reported in few studies (13-14).

Herein, in the current study, we tried to find that salivary IgA elevation has considerable implication for the local activation of Abs in the upper airway infections or not. In various groups of our research population about 76.7% in infectious and inflammatory disorders of ear, 76.2% in pharynx, and 75.9% in CRS had normal level of salivary IgA which showed in most of our study population salivary IgA didn't indicate reportable change (table2). Our study claimed that in different parts of upper respiratory tract the local mucosal defense is almost the same.

There are few published researches which exactly examined the salivary IgA production in infectious and inflammatory disorders of upper respiratory tract but in this relation, Finocchi *et al.* examined humoral immune defects in 67 non-atopic patients with recurrent infections and they revealed 55% of the research populations were deficient (15). In consistent with our work, IgA deficiency as one of humoral immune defects was reported in 11.8 % patients with inflammatory disorders of pharynx, 9.2 % in CRS and 11.6 % in inflammatory disease of ear. May a *et al.* evaluated serum immunoglobulins of 254 patients with refractory CRS. Their team reported that 22 patients had common variable immunodeficiency (16). Likewise in our research, IgA deficiency was observed in 5 patients among 54 patients suffered from CRS.

Conclusion

In conclusion, our research revealed that local overproduction of salivary IgA is particular interest in 12.7 % of patients with upper respiratory tract infections. Low IgA levels can be detected in a considerable proportion of patients with upper respiratory tract disorders.

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