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ORIGINAL ARTICLE

Nasal carriage rate of *Staphylococcus aureus* among patients with systemic lupus erythematosus and its correlation with disease relapse

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KEYWORDS

Staphylococcus aureus;
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Abstract *Introduction:* Systemic lupus erythematosus (SLE) is an autoimmune disease with unknown origin. The disease causes a broad spectrum of signs and symptoms in a majority of body organs. Due to several factors like damage to mucosal surfaces and defect in complement systems, these patients are at a great risk of infections with opportunistic pathogens.

Aim of the work: To evaluate the nasal carriage of *Staphylococcus aureus*, rate of Methicillin-resistant *S. aureus* (MRSA) and its correlation with relapse in lupus patients.

Patients and methods: In an analytical-descriptive study, 80 patients (65 female and 15 male) with SLE attending the rheumatology clinics of Tabriz University of medical sciences were selected. Nasal mucosa specimens of the patients were taken and incubated in appropriate culture environment. All of the patients were followed for 1 year and the relapse of the disease was evaluated.

Results: The mean age of the patients was 25.35 ± 5.87 years. The mean disease duration was 3.66 ± 2.27 years and the mean SLE disease activity index (SLEDAI) was 6.40 ± 2.84. Thirty-nine out of 80 patients (48.75%) were positive for *S. aureus* in the nasal mucosa. Although no significant difference in SLEDAI was observed between the patients with nasal carriage of *S. aureus* and those without, the two groups were significantly different in the relapse and complement levels.

Conclusion: These results indicate that relapse of SLE in patients having *S. aureus* in their nasal mucosa is higher than in patients without.

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1. Introduction

Systemic lupus erythematosus (SLE) is an autoimmune disease with a prevalence of 20–150 in 100,000 which mainly affects young women in the range of 20–30 years [1,2]. Although the exact etiology of the disease is not clearly understood, it is thought to result from interplay of certain genetic factors, environmental factors and the infections such as Epstein–Barr virus (EBV) infection that is one of the suspected factors [3].

It has been shown that SLE patients are at high risk of different infections due to damage to mucosal surfaces, defect in the immune system with lymphocyte dysfunction, complement deficiency and spleen dysfunction as well as treatment with immunosuppressive agents. These factors can also contribute to disease relapse and hospitalizations of patients. The major cause of death in the first few years of illness is active disease (e.g., cerebritis, nephritis, or cardiovascular disease) and/or infection due to immunosuppression [4].

In some forms of vasculitis like Wegener's granulomatosis, the relationship between colonization of *Staphylococcus aureus* in the nasal cavity and disease relapse has been studied [5,6]. Some other studies have indicated the colonization of these bacteria in different parts of the body in patients with lupus. Nasal cavity colonization of these bacteria may lead to pneumonia by the same organisms. To the best of our knowledge, no study has been performed about the correlation between disease relapse and the colonization of these bacteria in patients with SLE. Previous studies have investigated the organism in oral microflora [7,8] and intestine [9].

The aim of the present study is to evaluate *S. aureus* colonization in SLE patients and their Methicillin-resistance and to study its correlation with disease relapse.

2. Patients and methods

This analytical-descriptive study was performed in the internal medicine department of Tabriz University of medical sciences, Tabriz, Iran. We enrolled 80 patients with SLE referring to Sina and Emam Reza hospitals and Sheikholraies clinic of Tabriz in the years 2012–2013. SLE was diagnosed according to the Systemic Lupus International Collaborating Clinics (SLICC) Classification Criteria [10].

The exclusion criteria were the anti-Staphylococcus therapy in the past 1 month, and the immune deficiency related conditions like diabetes, renal failure, IV drug abusing, cancers, organ transplantation and human immunodeficiency (HIV) infection. The ethics committee at the Tabriz University of Medical Sciences reviewed and approved the present study, in compliance with the Declaration of Helsinki. Informed consent was obtained from all participants.

At the beginning of the study all of the patients were completely examined and a blood sample was taken for assessment of the blood cell count, serum creatinine, anti-nuclear antibody (ANA), anti-ds DNA and complement levels as well as a urine sample for analysis.

The nasal sample was also obtained from the patients by a microbiologist and was cultured for 48 h in Mannitol salt agar environment after 16–20 h of incubation. Yellow colored colonies were evaluated initially with Disc Diffusion Oxacillin 1 μm, if the samples were resistant; they were tested with E-test for approving the MRSA. At the time of flares nasal culture was obtained again. The activity of SLE was evaluated using the SELENA SLE disease activity index (SLEDAI). Patients were followed up for 1 year and the flare was diagnosed as follows [11]:

Mild/moderate flare: a change in SLEDAI >3 points, or: new/worse skin, stomatitis, serositis, arthritis, fever, or increased prednisone <0.5 mg/kg/d, or added non-steroidal anti-inflammatory drugs (NSAIDs)/hydroxychloroquine, or >1.0 increase in a physician's global assessment (0–3 scale).

Severe flare: change in SLEDAI >12, or new/worse CNS-SLE, vasculitis, nephritis, myositis, platelet count $<60{,}000$, hemolytic anemia (Hb <7 mg/dl), requiring doubling or >0.5 mg/kg/d prednisone or hospitalization for SLE or new immunosuppressive, and/or increased physician's global assessment to >2.5.

All the information from the patients was recorded confidential and the patients could leave the study at the time of their decision.

Statistical evaluation was carried out with the SPSS 16.0 software (SPSS, Inc., Chicago, IL). Data obtained from the study groups were compared by Student's *t*-test and Mann–Whitney *U* test. A *p*-value <0.05 was regarded as statistically significant. All the results are expressed as mean ± standard deviation (SD).

3. Results

We studied 80 patients with SLE. Sixty-five patients (81.3%) were females and 15 (18.7%) were males. Demographic and clinical characteristics of patients are shown in Table 1.

Thirty-nine of the patients (48.72%) were carriers for *S. aureus* upon the nasal mucosa culture in Mannitol salt agar environment. From the 39 positive culture tests, 3 were resistant in Disc Diffusion Oxacillin test for which the E-test was done and all of them were sensitive.

Flare was seen at one year follow-up in 11 patients (13.75%). All of the flares were mild/moderate except for one severe flare in the *S. aureus* carriage group.

Both carriers and non-carriers of S. *aureus* did not differ significantly from each other regarding the SLEDAI, age and sex (Table 2). Hypocomplementemia was significantly more frequent in carriers ($p = 0.012$).

There was no significant association between the presence of renal involvement in carriers and non-carriers of S. *aureus* ($p = 0.012$) and recurrence had a significantly higher rate

Table 1 Systemic lupus erythematosus patients' demographic and clinical characteristics.

Number of patients (Female: Male)	80 (65:15)
	mean ± SD
Age (years)	25.35 ± 5.78
Disease duration (years)	3.66 ± 2.27
SLEDAI	6.4 ± 2.84
Treatment regimens N (%)	
HCQ + P	53 (66.25)
HCQ + P + CYC	23 (28.75)
HCQ + P + Cyclosporine	4 (5)

HCQ, hydroxychloroquin; P, prednisolone; CYC, cyclophosphamide.