SAŽETAK

Cilj: Osnovni cilj istraživanja je bio da se ispita familijama učešća u rekur rentnim furunkuloidnim boleznima, ali i faktori rizika za navodni infekciji, učešća nosnog kliconoštva S. aureus-a i osetljivost izolovanog soja na antibiotike.

Metod: U istraživanju je, u periodu od 1998-2000 god. uključeno 29 pacijenata sa kroničnom furunkuloidnom boleznim (uzrasta od 2 do 21 god.) Od svakog pacijenta su uzeti purulentni sadržaj furunkula, bris gla i nosa, a u nekim slučajevima poročilne furunkuloidne bolesni brisevi gla i nosa su uzima ni od svih članova porodice. S. aureus je identifikovan standardnim metodama, a osetljivost na antibiotike određivana je disk difuzionom met od prema NCCLS.

Rezultati i zaključak: U 627 (41%) slučajeva poročilne furunkuloidne bolen se nalazilo S. aureus-a, u nosu i glavozna u 6 pacijenata (21%). Već na izolovanih soja S. aureus-a su bili rezistentni na penicilin (94.1%). Majski broj soja je bio rezistentan na doxycyclin (27.1%), klinikalamin (4.7%), etromycin (7.1%), trimetoprim/sulfametoksazol (5.9%) i ciprofloksacin (1.2%).

Ključne reči: Staphylococcus aureus kliconoštvo, adolescenti.

ABSTRACT

Objectives: To analyse family occurrence and recurrence of furuncles in children and adolescents, the risk factors of infections and Staphylococcus aureus (S.A.) nasal carriage and antibiotic susceptibility results.

Methods: We observed 29 patients aged 2-21 between 1998 and 2000 with chronic furunculosis. From each patient purulent discharge from furuncle, nasal and throat swabs were taken. In some cases of family furunculosis we took nasal and throat swabs from all family members. S.A. was identified by standard methods and disk-diffusion susceptibility testing was done according to NCCLS.

Results: Twelve cases family furunculosis have been noticed (41%). Nasal and throat carriage of S.A. was observed in 48% of patients. Furuncles were located most frequently on the neck and thighs (41%). Systemic symptoms were observed in only 6 patients (21%). Most of the S.A. strains were resistant to penicillin (94.1%), doxycyclin (27.1%), clindamycin (4.7%), etromycin (7.1%), trimetoprim/sulfametoksazol (5.9%) and ciprofloksacin (1.2%).

Conclusions: Furunculosis tends to become recurrent and occurs in families. Family occurrence is often connected with S.A. nasal carriage. Not every carrier suffered from furunculosis. All carriers should be treated with local drugs because they may be a source of infection for other family members. Elimination of S.A. nasal carriage would decrease the number of recurrences of disease in family. Most S.A. are resistant to penicillin and doxycyclin which should be bare in borne mind when we want to prescribe antibiotics.

Key words: Staphylococcus aureus, adolescents.
Conkey, Sabouraud (BioMerieux, Grasso). Pathogenes were identified by test Pastorex Staph Plus (BioRad). After incubation at 35°C for 24 and 48 hours, Staphylococcus aureus was identified by colony morphology and positive catalase and coagulase tests. Antimicrobial susceptibility was tested using the agar diffusion technique according to the National Committee for Clinical Laboratory Standards (NCCLS) guidelines, with Mueller-Hinton agar and the following panel of antibiotics: penicillin, oxacillin, erythromycin, clindamycin, doxycyclin, vancomycin, ciprofloxacin, trimethoprim/sulfamethoxazole, mupirocin.

RESULTS
Twelve cases (41%) of family furunculosis have been noticed. In each of 3 families, two members had furuncles, in 2 families, three members presented furuncles. Nasal and throat carriage of Staphylococcus aureus was observed in 48% of patients. Furuncles were located most frequently on the nates and thighs (41%). Local symptoms were observed in 29 (100%) patients, systemic (fever, discomfort, chills, lymphadenopathy) in only 6 (21%) patients. Most of the Staphylococcus aureus strains were resistant to penicillin (94.1%), doxycyclin (27.1%), rarely to erythromycin (7.1%), clindamycin (4.7%), ciprofloxacin (1.2%) and trimethoprim/sulfamethoxazole (5.9%) (figure 4.).

The group of patients aged 2-21 who attended the Department of Clinical Bacteriology between 1998 and 2000 was studied. All of them (29 patients) had recurrent staphylococcal furunculosis (table 1., figure 1.).

Table 1. Furunculosis in male and female.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Number of people</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>18</td>
<td>65</td>
</tr>
<tr>
<td>Female</td>
<td>13</td>
<td>35</td>
</tr>
</tbody>
</table>

Most of the patients were adolescents between 13 and 21 years old. The patients were diagnosed to have no underlying disease and had active furuncles at the time of the study. They suffered from furunculosis from 3 months to 10 years (tables 2. and 3., figures 2. and 3.).

Table 2. Occurrence of furunculosis in three age groups.

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of people</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5 yrs.</td>
<td>1</td>
<td>3.5</td>
</tr>
<tr>
<td>5-12 yrs.</td>
<td>8</td>
<td>27.5</td>
</tr>
<tr>
<td>13-21 yrs.</td>
<td>20</td>
<td>69</td>
</tr>
</tbody>
</table>

Table 3. Duration of disease.

<table>
<thead>
<tr>
<th>Duration of disease</th>
<th>Number of people</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 months – 1 year</td>
<td>13</td>
<td>45</td>
</tr>
<tr>
<td>2 – 3 years</td>
<td>11</td>
<td>38</td>
</tr>
<tr>
<td>4 years</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>10 years</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

Most of the patients were adolescents between 13 and 21 years old. The patients were diagnosed to have no underlying disease and had active furuncles at the time of the study. They suffered from furunculosis from 3 months to 10 years (tables 2. and 3., figures 2. and 3.).

![Figure 1. Furunculosis in male and female.](image1)

![Figure 2. Occurrence of furunculosis in three age groups.](image2)

![Figure 3. Duration of disease.](image3)
DISCUSSION

Staphylococcal furunculosis is particularly likely to recur if the skin or nasal carriage of the infecting strain of Staphylococcus aureus persists within the family; then carrier sites in both the patient and his household members must be identified if the pathogen is to be eradicated. The usual reservoir is the nose, where organisms replicate and thence spread over the body surfaces (3).

While the nasal carriage of Staphylococcus aureus is common and affects > 30% of people, relatively few subjects develop furunculosis (2). Furthermore the carriage stage may not be demonstrated in all affected individuals. Similarly not all family members who are Staphylococcus aureus carriers suffer from furunculosis.

In this study, none of the patients had an underlying immune defect or diabetes mellitus. Ahlestimated 48% of them were carriers of Staphylococcus aureus.

Nasal carriage plays a key role in the epidemiology and pathogenesis of endogenous Staphylococcus aureus infections, both nosocomial and community-acquired (4).

Studies have shown that nasal carriage of Staphylococcus aureus increases not only furunculosis incidence but also wound infections.

Kluuyvans et al. (5) performed a case control study in patients undergoing sternotomy. For nasal carriers with postoperative Staphylococcus aureus, the phage types of the Staphylococcus aureus isolated from the nose and wound were identical in 92% of cases. The surgical wound infection also correlated with the density of Staphylococcus aureus in the nasal culture. It appears to be necessary to eradicate nasal staphylococci with local antibiotics to decrease complications caused by these bacteria.

Local application of antibacterials suppresses the nasal carriage of Staphylococcus aureus. It can reduce the frequency of recurrent furunculosis (3). Intranasal mupirocin, chlorhexidin and chloramphenicol ointments have been evaluated for the use in eliminating nasal carriage (5, 6, 7).

Esperns and Hedstrom (8) investigated the level of specific antibodies in patients with recurrent furunculosis. They studied serum antibody response against Staphylococcus aureus antigens by immunoelectrophoresis. The antibody level obtained in the serum from patients with chronic furunculosis was higher than in normal controls (8, 9).

Cates (10) studied neutrophil chemotactic response to the staphylococcal factors in patients with chronic staphylococcal furunculosis. In this investigation patients with active furuncles were found to have the increased neutrophil chemotactic activity toward bacteria-derived chemotaxis but normal chemotactic activity toward zymosan-activated serum. Patients with a past history of staphylococcal furunculosis but no recent infection had normal neutrophil chemotaxis to all attractants.

It is true that neutrophils play important functions (chemotaxis, phagocytosis, superoxide generation) in host defence against the microbial pathogens (11, 12). It is also true however that their functional defect may lead to recurrent infections (13).

Some authors do not recommend systemic antibiotics in recurrent furunculosis. Zimakoff (7) has described his experience while treating family furunculosis without antibiotics but with a combination of chlorhexidine bathing and nasal 1% chlorhexidine gel. He also recommended some improvement in hygienic conditions the families lived in. The infecting Staphylococcus aureus strains were eradicated from the surroundings and the skin in all (6) families, but several of the family members still retained the strain in the nose. All the family members were cured however, and showed no infections during the follow up period of 2 years.

Most authors recommend a combination of systemic and local therapy in furunculosis. Szarmach et al. (14) proved that a combination of cefotaxime and autovaccination appeared to be beneficial in the treatment of patients with recurrent furunculosis.

Hoss (1) recommends the use of rifampin with cloxacillin for 14 days. If rifampin is used alone to treat infection, bacterial resistance can develop rapidly. When used in combination with other antibiotics however, rifampin resistance is uncommon (15). Rifampin is also effective in eliminating Staphylococcus aureus from persistent nasal carriers. Hoss finds combination of rifampin with other conventional antistaphylococcal antibiotics beneficial in the treatment of recurrent furunculosis.

Klepner (16) describes using low-doses oral clindamycin therapy as a prevention of recurrent staphylococcal skin infections. His patients have taken 150mg of clindamycin for three months. The antibiotic was well tolerated, with no untoward side effects. 82% of the patients had no recurrent abscess during three months after treatment.

Some authors (11, 13) suggest to treat recurrent furunculosis with vitamin C (0.5-1.0 g/day). It improves not only neutrophil functions but also clinical course of illness.

The nature of defect in the neutrophil functions in patients with recurrent furunculosis is unknown (11).

The effect of vitamin C on phagocytosis and chemotaxis appears to be due to the modulation of tubulin tyrosination by an antioxidant effect (13).
Vitamin C may be a significant agent for counteracting escaped, oxidants and for protecting neutrophil autooxidation and dysfunction (11).

Chronic recurrent cases of furunculosis often present severe therapeutic problems, as further lesions may develop after the end of each course of antibiotics and the prevention of recurrences in such cases is difficult and disappointing (17).

According to Asher (18) pentoxifylline (PTX) may provide a new and effective way of treatment of chronic furunculosis. PTX has no direct antibacterial activity but it enhances neutrophil killing of Staphylococcus aureus. Asher described successful therapy with PTX in a patient suffering from non-insulin-dependent diabetes mellitus and glucose 6-phosphate-dehydrogenase deficiency anemia with chronic furunculosis (complete remission of furuncles).

Some scientists are looking for relation between the serum iron concentration and furunculosis (19). Iron deficiency increases susceptibility to infections so it can be also associated with furunculosis. Wejmer (20) has proved that iron supplementation led to the resolution of furuncles in his investigations.

The main reason for treating family furunculosis is to prevent recurrences of infection. It is essential that where several members of a family carry the same phage type and are potential sources that the whole family receives the treatment. If, on the other hand, there is no family carriage, then only the infected member needs treatment (21, 22).

CONCLUSIONS
1. Recurrent furunculosis often appears in families.
2. Most of nasal carriers of Staphylococcus aureus have no furuncles but they can be a source of infection.
3. Carriers of infecting strains among family members should be treated in a similar manner.
4. Most of Staphylococcus aureus infections are resistant to penicillin and doxycyclin.

REFERENCES