

STATE OF MICROBIAL LANDSCAPE OF UPPER RESPIRATORY TRACT IN CHILDREN WITH ACUTE STENOSING LARYNGOTRACHEITIS



Gulnoza Samieva

Samarkand State Medical Institute, Samarkand, Uzbekistan

ABSTRACT

The increase in the number of acute respiratory infections in children, accompanied by airway obstruction, often leads to the development of stenotic laryngotracheitis. The primary factors are respiratory viruses, and bacterial flora often joining together, changing the type of the disease which is determined by its outcome. Exposure to infectious agents in the body contribute to the development of chronic infectious diseases of the respiratory tract in children, resulting in damages to the ciliary epithelium and weakening of its connection with the basal cells and the basement membrane. This, in turn, facilitates the penetration of allergens and other inflammation stimulants into submucosal tissue.

We have studied the state of the microbial landscape of the mucous membranes in the upper respiratory tract in 275 patients with stenosing laryngotracheitis; they are children aged 6 months to 5 years. All patients were divided into 2 groups: group 1 included 122 children with primary stenosing laryngotracheitis (PSLT); group 2 were 153 patients with recurrent stenosing laryngotracheitis (RSLT). We noted that the most common mucosal lesion of germs in all age groups falls on *Staphylococcus aureus*. It has been established that the nasopharynx microbial defeat is found twice as often at RSLT than at PSLT. In older children with RSLT, oropharynx was frequently a complex association of pathogens.

UDC CODE & KEYWORDS

■ UDC: 616.22-002-616.231-002-08.053.4 ■ Respiratory tract ■ Acute stenosing laryngotracheitis

INTRODUCTION

Acute respiratory infections are the leading pathology in children. Their proportion together with influenza is at least 70% of the entire incidence in children. In recent years, there has been a growth in the number of acute respiratory virus infections, accompanied by respiratory obstruction, among which a large proportion amounts to constrictive laryngotracheitis (Alenina et al., 2002; Afanasyev, 2006; Fifoot & Ting, 2007; Sukhovetskaya, Timchenko, Kolobov, & Pavlova, 2001).

In literature, the prevailing view is that the reason for the development ASLC is the viral infection (Alenina et al., 2002; Balkarova, Chuchalin, & Grachev, 2008; Kononen, Jousimies-Somes, Bryk, Kilp, & Kilian, 2007; Sukhovetskaya et al., 2001). It is proven that this disease can develop on the background of a respiratory disease of any etiology, but the real practical value is in all four types of viruses: influenza, adenovirus infection, parainfluenza, and respiratory-syncytial infection. The primary etiologic factor is always the respiratory viruses and bacterial flora, often joined by altering the course of disease, and this determines the outcome. Respiratory viruses as a cause of acute laryngotracheitis can be distributed as follows: influenza viruses - 56.8%, parainfluenza viruses - 20.1%, adenoviruses - 16.7%, and mixed virus infection - 6.4%

The purpose of this study was to study changes in the respiratory tract microbiocenosis of children in both primary and in recurrent laryngotracheitis..

Material and methods

A study was conducted among 275 children aged 6 months to 5 years with the generated recurrent stenosing laryngotracheitis. The microbial landscape of the mucous membranes in the upper respiratory tract (URT) was studied by conventional methods of bacteriological examination, including nasal discharge crops and oropharynx in a nutrient medium with subsequent identification. All examined children were divided into 2 groups according to the forms of acute stenosing laryngotracheitis, according to the classification of Mitin (1986): Group 1 - 122 (44.4%) of pediatric patients with primary stenosing laryngotracheitis.

Group 2 - 153 (55.6%) with recurrent stenosing laryngotracheitis.

ASLC often develops in infants (from 6 months. Up to 3 years).

- In Group 1, the majority of children (60.7%) became ill at the age of 1 to 3 years and at the age of 1 year became ill (16.4%) of children, and in the period of 3 years and older (23.0%).
- In Group 2, the picture is somewhat different: the incidence between the ages of 3 years and older is almost 3 times higher than in Group 1.

Results and discussion

We compared the character of the respiratory tract dysbiotic changes during the acute stage of the disease, depending on the age of our patients, and noted frequent affection of mucous membranes by *Staphylococcus aureus* in all ages. In the acute phase, PSLC in children from 6 months up to 3 years, identifying the most expressed disturbances of microbiocenosis of mucosal respiratory tract in the nasopharynx as well as in the oropharynx (normal microflora is present

in structure 9.5% and 9% of the patients, respectively). At RSLC in the acute period, such regularities were not identified. During remission at the normal PSLC, the microbiological composition of the respiratory tract was restored only in half of those surveyed from 6 months up to 3 years; at an older age, the normal structure of flora in the nasopharynx was at 33% of children of 3-6 years, and 22% at age 6 and older. The normal microbial landscape of the oropharynx in children up to 3 years during remission at PSLC determined in 50% of cases, in the other two groups - at only 25%. Under RSLC during remission the restoration of normal flora from 0 to 3 years was observed only at 16%, over 3 years - 50% of cases the normal microflora was maintained.

In the acute period, significant changes were marked in the respiratory tract microbiocenosis both primary and relapsing SLC. Disbiotic processes were characterized by settling the mucous membranes by VAR pathogenic and conditionally pathogenic Gram-positive and Gram-negative flora, the reduction of isolation saprophytic and normal microflora. Undoubted leadership in this process in the acute period of the disease was *Staphylococcus aureus*. It occurred as a monoculture and in the form of associations - in combination with other pathogenic agents. The affection by *Staphylococcus aureus* of the respiratory tract in the acute period was high both under PSLC, and RSLC. Under PSLC in the acute period *Staphylococcus aureus* was isolated from the nasopharynx in 28% of children surveyed, and 25% of the oropharynx. Under RSLC this microbe was detected in 39% of cases in the nasopharynx and 23% of children in the oropharynx. In association, *S. aureus* often was shown in patients with from the oropharynx RSLC - in 22% of cases.

In the acute phase of the disease, α -hemolytic streptococcus was determined more often in the oropharynx of patients with PSLC (17%), while under RSLC it was determined extremely rare (2% of cases). Both with PSLC and RSLC in acute period in the mucous URT was detected *E. coli* (6 and 8%, respectively). At PSLC in the oropharynx was identified Fungi *Candida* in 25% of cases, at RSLC - 18% from the nasopharynx also isolated the mycelium of the fungus, both in PSLC and RSLC. Complex associations of microorganisms were observed only in patients' nasopharynx with PSLC, at RSLC they were found in the nasopharynx (15%) as well as in the oropharynx (23% of the patients). Gram-positive pathogens in the acute phase of SLC were found mainly in the form of associations, especially with *S. aureus*, and did not have such a high representation in the VAR as *S. aureus*.

Under RSLC in the acute period of the disease, complex associations of pathogens were more common in older children in the oropharynx (43%). The presence of such changes of microbiocenosis characterizes the severity of diabolic processes and the duration of their existence. Under PSLC in acute period, aforementioned regularities were not identified, although such pathogens as *Candida*, *E. coli*, *Klebsiella*, often allocated in older children. Affection of mucous membranes of the respiratory tract by *S. aureus* in remission was very high, both in the primary and in recurrent SLC. But, at RSLC, the process of settlement in the mucous by this pathogen was expressed increasingly. Under PSLC the level of *S. aureus* isolation from the nasopharynx at 32%, with RSLC it reached almost 50%. β -hemolytic streptococcus was found at RSLC only as associations, and only in the oropharynx - up to 17% of cases; PSLC α -hemolytic streptococcus was found in the nasopharynx as a monoculture - up to 7%, in the oropharynx as associations - up to 20% of the patients. *Pneumococcus* at PSLC was detected in respiratory tract during remission in 13%, with RSLC - only in the oropharynx in 12% of patients. Complex association of pathogens during remission was found in the nasopharynx at RSLC almost two times more often than at PSLC. In the oropharynx, complex combinations of pathogens at PSLC during remission was identified quite often - in 33%, with RSLC - 26%. Both in acute period and during remission, phenomena of dysbiotic deepening processes were detected in the nasopharynx at RSLC.

At PSLC, from the nasopharynx during remission, Fungi *Candida* was not isolated, and at RSLC was determined in 3% of patients. In the oropharynx, the detection rate of these pathogens in primary and relapsing SLC was about the same - 20%. *Klebsiella* in the respiratory tract during remission at PSLC was not detected; at RSLC, it was detected in 3% of cases. Identification of *E. coli* from the nasopharynx in primary and relapsing SLC was approximately at the same level and respectively 7 and 6%. Oropharyngeal colonization of this pathogen at RSLC increased almost two times in comparison with PSLC - 12 and 7%, respectively. Normal flora was represented during remission, as well as in the acute phase, both in the primary and in recurrent SLC predominantly by α -hemolytic streptococcus.

During remission, the isolation of *Staphylococcus aureus* from the mucous of the respiratory tract at PSLC was observed more often in children aged 3 to 6 years. As a monoculture, *S. aureus* was isolated in 100% of these children with nasopharyngeal mucosa, and 50% - from the oropharynx. Children in this age group also noted the great frequency of isolation of fungi *Candida* (75%), *pneumococcus* (50%), complex microbial associations (75%), and the most aggressive pathogens - *S. haemolyticus* (25%) and *E. coli* (25%). In infants, the composition of the microflora of URT in remission was mainly represented by *S. aureus* and *pneumococcus* (14%). At older ages, the leadership remained by *S. aureus* (50%), *pneumococcus* (25%), and complex microbial associations (50%).

Under RSLC, isolation of *Staphylococcus aureus* from the mucous URT was observed in children of all ages, reaching 83% in older children (in the nasopharynx and the oropharynx). Complex combinations of pathogens and microorganisms, such as *E. coli*, *S. haemolyticus* and *Candida* species, were determined during remission predominantly in older children. In children older than 3 years, the main representatives of the microflora were *S. aureus*, *Streptococcus pneumoniae*, and hemolytic *Staphylococcus* (42%, 17%, and 17%, respectively). In this age group, we noted a lack of isolation of gram negative bacteria - *Klebsiella*, *E. coli*, as well as α -hemolytic streptococcus. Despite the frequent administration of antibacterial drugs in children of this age, *Candida* species and complex associations from the oropharyngeal were determined only in 8% of patients.

Under recurrence of CFP at an early age and during remission there was a high degree of contamination of mucous URT by *S. aureus* (20%), α -hemolytic streptococcus (20%), and complex associations (30%). Established the considerable reduction of isolation of *S. aureus* from the mucous URT compared with the acute period (from 83 to 20%), while the proportion of α -hemolytic streptococcus in this age group (remission) increased from 0 to 20%, also marked by the growth of seed of *E. coli* (0 to 10%) and complex associations (0 to 30%).

Conclusion

In the acute phase as well as during primary stenosing laryngotracheitis and recurrent child stenosing laryngotracheitis had been the highest population of the respiratory tract in particular *Staphylococcus aureus* in the oropharynx and nasopharynx.

The defeat of the nasopharynx complex associations of pathogens, especially at recurrent child stenosing laryngotracheitis were more common in older children that characterized much severity of dysbiotic processes and the duration of their existence at recurrent child stenosing laryngotracheitis.

Thus, disbiotic violations, maintaining the chronic inflammation in the mucous membranes of the upper respiratory tract, provided weighting of the degree of stenosis of the larynx, the increase in the duration of cough, changes in the lungs and were a risk factor for recurrence of stenosis laryngotracheitis.

REFERENCES

1. Alenina, T. M., Karavaev, V. E., Orlov, S. N., Berdunova, E. G., Kalistratova, E. P., & Gordeev, N. N. (2002). Modern features of the course of stenosing laryngotracheitis with ARVI in children. *Bulletin of Ivanovo Medical Academy*, 7(1-2), 27-29.
2. Afanasyev, O. I. (2006). Clinical and laboratory characteristics and treatment of ARVI with stenosing laryngotracheitis in children. *Children's Infection*, 1, 32-33.
3. Balkarova, E. O., Chuchalin, A. G., & Grachev, N. M. (2008). Viral and bacterial dysbiosis, clinical and morphological changes in the respiratory and gastrointestinal tract in atopic syndrome. *Pulmonology*, 2, 47-53.
4. Fifoot, A. A., & Ting, J. Y. (2007). Comparison between single-dose oral prednisolone and oral dexamethasone in the treatment of croup: a randomized, double-blinded clinical trial. *Emergency Medicine Australasia*, 19(1), 51-58.
5. Kononen, E., Jousimies-Somes, H., Bryk, A., Kilp, T., & Kilian, M. (2007). Establishment of streptococci in the upper respiratory tract: longitudinal changes in the mouth and nasopharynx up to 2 years of age. *Journal of Medical Microbiology*, 51(9), 723-730.
6. Mitin, Yu. V. (1986). *Acute laryngotracheitis in children-M: Medicine, Monography*.
7. Sukhovetskaya, V. F., Timchenko, V. N., Kolobov, L. V., & Pavlova, E. B. (2001) *Diagnosis, differential diagnosis and treatment of influenza and other acute respiratory viral infections in children in modern conditions: Method, recommendations*.