CARBON DIOXIDE EXTRACT OF SIBERIAN FIR IN COMPLEX TREATMENT OF CHRONIC INFLAMMATORY DISEASES OF THE UPPER RESPIRATORY WAYS

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Chronic inflammatory diseases of the upper respiratory tract, such as tonsillitis, pharyngitis, laryngitis, rhinitis, rhinosinusitis, remain one of the most common diseases, especially in children. The problem of rehabilitation of children is relevant not only in connection with the high incidence of this pathology, frequent relapses of the inflammatory process in the nasopharynx, but also in view of the possible serious complications of these diseases, their negative impact on the growth and development of the child.

The cause of infectious diseases of the respiratory tract are opportunistic microorganisms that are colonized in the nasopharynx. Respiratory infections are recurrent in spite of the number of antibiotics available. The widespread use of antibiotic therapy does not solve the whole problem, and the appointment of antibiotics is not always justified. In addition, antibiotics, inhibiting the microbial pathogen, also have negative side effects in the form of dysbiosis and sensitization [2]. The impact of most antibiotics on the immune system can contribute to a decrease in the specific immune response, and the development of antimicrobial resistance develops into a global problem [11].

The mucous membrane of the upper respiratory tract is the first barrier to the penetration of foreign agents of various nature. Violation of the system of local specific and non-specific immunological protection of the mucous membranes of the upper respiratory tract plays an important role in the development of chronic inflammation in various parts of the respiratory tract [1]. It is necessary to look for ways to increase the effectiveness of etiotropic therapy and at the same time to reduce the side effects that appear during its use. Perhaps one of the solutions to this problem is to increase the functional activity of the immune system and restore its impaired functions. The peculiarity of the use of immunotropic drugs in ENT pathology is the expediency of their local use, which is due to the existence in the norm of an active system of local immunity of the mucous membranes.

Currently, there are studies on the local immunity of the mucous membranes of the upper respiratory tract and the possible immunocorrection of chronic diseases using natural and preformed physical factors [8]. In the complex treatment of diseases of ENT organs, the inhalation method of administering drugs is widely used. When inhaled, these drugs have an effect, primarily on the mucous membrane of the respiratory tract throughout their length, on microorganisms localized here, as well as on mucociliary clearance. Of the preformed physical factors, it is of interest to treat patients with chronic tonsillitis, vasomotor rhinitis, and rhinosinusitis using ultrasound. Studies have shown that ultrasonic exposure of low intensity has a stimulating effect on the biological properties of palatine tonsils, improving the drainage function of the lacunar epithelium. A number of authors have established the stimulating effect of ultrasound on factors of nonspecific immunity [9 [3]].

In clinical practice, in the treatment of patients with chronic tonsillitis, phonophoresis with various drugs (hydrocortisone, peloidin, humisol, splenin, aloe extract, propolis, etc.) is currently the most widely used. In addition, for the complex treatment of inflammatory diseases of the upper respiratory tract, inhalations through the nose or mouth with various medicinal herbs are successfully used [10]. Siberian fir extract is a well-known medicine. It has a pronounced anti-inflammatory, regenerative, bactericidal, antioxidant effect, increases the protective functions of the body. The presence of vitamin complexes, macro- and microelements, chlorophyll and its derivatives contributes to the stimulation of the hematopoietic and immune system [3]. The aim of the study was to study the combined use of Siberian fir extract and ultrasound therapy in children with chronic inflammatory diseases of the upper respiratory tract.

RESEARCH METHODS

Under observation were 65 children aged 7 to 14 years suffering from chronic inflammatory pathology of ENT organs: 21 patients with chronic rhinosinusitis and 44 with chronic tonsillitis in remission and fading exacerbation, who were undergoing spa treatment in the Tomsk Children's Department research institute of balneology and physiotherapy.

The division into treatment groups was carried out according to the designation of local therapeutic measures. So, in the 1st group, patients received inhalations of 1% (diluted with distilled water) of the carbon dioxide aqueous extract of Siberian fir from the Vulcan apparatus through a mask, for 5 minutes, daily, 10-12 procedures. In the 2nd group, patients were prescribed complex treatment using inhalations of a carbon dioxide aqueous extract of Siberian fir and ultrafonophoresis of carbon dioxide oil extract of Siberian fir from the UZT-1.01F apparatus. In chronic tonsillitis, the effect was carried out through the soft tissues of the neck in the submandibular region at the angle of the lower jaw, in the position of the patient sitting. Fir extract was applied to the surface of the emitter with an area of 1–2 cm2 and applied to the skin of the irradiated area. The exposure technique is stable, intensity 0.05 W / cm2, pulse mode, 5 minutes for each amygdala, for a course of 8 to 10 procedures. In chronic rhinosinusitis, the action was carried out on the slopes of the nose and the projection of the sinuses, the method of exposure was labile, the intensity was 0.2 W / cm2, 5 minutes on each side, daily, 8-10 procedures. In the 3rd control group, children received inhalation of saline according to the same method.

The following indicators served as criteria for evaluating the effectiveness of treatment: positive dynamics of clinical symptoms (general condition, patient's well-being, runny nose, sore throat, severity of congestive inflammatory phenomena in the upper respiratory tract), an increase in the duration of remission of the disease, a decrease in the frequency of exacerbations, and an improvement in immunological data (in particular local factors of protection of the mucous membrane of the upper respiratory tract).

The determination of antimicrobial properties was carried out by a combined and unified method for determining the sensitivity of microorganisms to antibiotics by agar diffusion using paper discs [7]. The results were evaluated by the diameter of the sterile zone around the substrate on Petri dishes with seeded cultures of opportunistic microorganisms and expressed in accordance with the action of penicillin doses in units [6]. Museum strains of Escherichia coli, Staphylococcus albus, Staphylococcus areus, Proteus vulgaris were used as experimental test cultures.

Carbon dioxide water and oil extract of Siberian fir were obtained from the plant according to the original patented technology without exposure to high temperatures and the use of toxic organic solvents, which contributes to a more complete extraction of biologically active substances, increase the stability of the final product and extend its shelf life.

The chemical composition of fir is extremely diverse. The needles and young branches of the Siberian fir contain essential oil, the main components of which are borni-acetate and free borneol. In addition, camphene, α- and β-pinene, santen, bisabolene and fellandren are present in the essential oil. The needles also contain flavonoids, ascorbic acid, chlorophyll, carotenoids, vitamin E, sterols, phytoncides, macro- and microelements [10].

The unique technology of carbon dioxide extraction allows you to extract natural cellulose juice of fir needles, containing a whole range of biologically active substances, in terms of dry matter - 3.2%. Including flavonoids - 1250 mg / kg, carotene - 1.7 mg / kg, ascorbic acid - 200 mg / kg, vitamin B1 - 0.01 mg / kg, maltol - 9000 mg / kg.

The Siberian fir oil extract obtained by carbon dioxide extraction is significantly richer in composition than ordinary fir oil obtained by water-steam distillation. Unlike fir oil, the extract, in addition to volatile terpenoids of essential oils, contains heavier molecules: almost all fat-soluble vitamins, sterols, flavonoids, phospholipids, a complex of organic acids, chlorophylls, phytoncides, macro- and microelements. Borneol extract contains 3.4%, bornyl acetate - 21.6%.

RESEARCH RESULTS

According to the results of treatment in the groups of examined patients who received various rehabilitation techniques, the dynamics of clinical and laboratory parameters was evaluated. An analysis of the clinical signs of chronic rhinosinusitis showed that before treatment, sick children with varying degrees of severity had stagnant inflammatory changes in the mucous membrane of the nasal concha, separated in the nasal passages, specific complaints. After treatment, in all observation groups, there was a positive dynamics in clinical and paraclinical indicators, but the most pronounced therapeutic ef-

fect was in patients of the 1st and 2nd treatment groups who received inhalation of an aqueous extract of fir and inhalation as a component of complex treatment in combination with utrafonophoresis of fir oil extract, respectively. In the immunological status in patients of these groups, there was a positive dynamics of the T-cell immunity indices (Table 1).

An analysis of the data obtained in children with chronic tonsillitis showed that before treatment, stagnant inflammation from the tonsils, palatine arches, and the posterior pharyngeal wall was expressed. Tonsill lacunae in some cases contained caseous masses. Regional lymphadenitis was noted in almost all examined. Upon admission, patients noted a violation of the immunological protection of the mucous membrane of the upper respiratory tract (a decrease in the concentration of immunoglobulin A, lysozyme activity). Under the influence of complex treatment, improvements in clinical and laboratory indicators were observed. In the objective status, there was a decrease in congestive inflammatory processes in the pharynx, cleansing of the tonsils from pathological contents, and an improvement in the general well-being of children. From the indices of local immunity of the mucous membrane of the upper respiratory tract, an increase in the concentration of immunoglobulin A in tonsillar secretion was observed in patients of the 2nd treatment group, there was a tendency to normalization of lysozyme activity in tonsillar secretion in patients of the 1st and 2nd groups (Table. 2).

For the treatment of acute and chronic rhinitis, pharyngitis, laryngotracheitis, bronchitis, pneumonia, the doctor may recommend patients to use fir extracts at home in the form of heat, steam, oil inhalation [11]. When biologically active substances of fir extract are absorbed, they exert not only local, but also reflex action through the olfactory nerve receptors, interoreceptors of the bronchial mucosa and bronchioles. An important role in the mechanism of therapeutic action of inhalation therapy belongs to the improvement of patency of the bronchial tree, both due to the action of the used phytopreparation and due to the action of a moistened and warmed inhaled mixture [4]. The antimicrobial properties of fir extract play an important role in the treatment and prevention of inflammatory diseases of the upper respiratory tract.

At the Scientific Research Institute of Balneology and Physiotherapy, Tomsk, the antimicrobial properties of the aqueous and oil fractions of the carbon dioxide extract of Siberian fir were revealed in relation to 6 strains of conditionally pathogenic microorganisms. It has been shown that Siberian fir extract inhibits their growth and development by 70-150 times. The greatest effect is expressed by the effect on gram-positive staphylococcal microorganisms.

The clinical use of essential oils for respiratory infections is as effective as the use of a number of antibiotics. Essential oils increase secretion, and in high concentrations cause hyperemia of the mucous membranes, have an antispasmodic and local anesthetic effect, and improve mucus secretion. Their bactericidal and bacteriostatic effect is more prolonged due to the fact that they are slowly excreted through the lungs [5]. As already mentioned, the prophylactic and therapeutic effectiveness of the oil fraction of the extract of fir is much higher than the activity of ordinary fir oil. In addition, antioxidant, i.e. membrane-stabilizing activity, which underlies many of its beneficial effects and, first of all, prevents cell death as a result of radical oxidation, intensifying against a background of various diseases, including inflammatory ones.

Thus, through the use of a new physiotherapeutic complex based on the local combined effects of the aqueous and oil fractions of fir extracts and ultrasound therapy, it is possible to increase the effectiveness of the treatment and rehabilitation of children with chronic inflammatory diseases of the upper respiratory tract. This method of treatment is effective, affordable for outpatient treatment, does not require large economic costs, increases the period of remission of the disease up to 6 - 8 months, has an immunocorrective effect. For the purpose of prophylaxis, it is possible to recommend inhalation of an fir extract tract to persons prone to acute respiratory diseases and exacerbations of chronic tonsillitis, to create greater resistance of the mucous membrane of the upper respiratory tract to colds and infectious factors. Preventive courses of inhalation therapy should be carried out at least 2 times a year (in spring and autumn) [11].