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Justification of Lymphotropic Injection of An Immunomodulator in Odontogenic Osteomyelitis

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Abstract: The lymphotropic injection of the drug named “Gamma-plant", which is an extract of potato sprouts (Solanituberosigerminum extract) and has a high therapeutic effect, was proved by pathomorphological studies in the experiment on guinea pigs (n = 18).

Key words: Odontogenic osteomyelitis, Gamma-plant, sequestration, segmented white blood cells, histiocytes, fibroblasts, tissue of lymph node.

1. Introduction

Regional lymph nodes and vessels are filled with necrobiotic masses in severe odontogenic osteomyelitis [1, 2]. Microlimphatic drainage of tissues and lymph passage through the lymph nodes are blocked. All this paralyzes the barrier and immune functions of the lymphatic system, making it a source of septicemia and toxemia itself [3]. These changes contributed to the justification of lymphotropic therapy – a method that allows creating high concentrations of drugs in the focus of inflammation in odontogenic destructive osteomyelitis.

2. Materials and Methods

18 guinea pigs (250-300 g) were the experimental models in the experiments, they were injected subperiosteally with 0.25 ml of microbial suspension of a daily culture of Staphylococcus aureus containing 106 CFU/ml. “Gamma-plant”- extract of potato sprouts (Solanituberosigerminum extract) - was used as an immunomodulator. The animals were divided into 3 groups: in 1st group (n = 6) that was control “Gamma-plant” was not injected; in 2nd group (n = 6) “Gamma-plant” was injected lymphotropically 2 days before the start of the experiment; in 3rd group (n = 6) “Gamma-plant” was injected as a treatment course lymphotropically, starting from the 5th day of the experiment. The material was collected on 7th, 14th and 28th days. The material was fixed in 10% neutral formalin. Tissue sections thickness of which was equal to 6 microns were stained with hematoxylin-eosin.

3. Results

It was found that guinea pigs of all groups got a rapidly developed inflammatory process in the form of diffuse leukocyte infiltration after the introduction of the culture on the 5th day. Abscesses spontaneously opened in 2-3 weeks with the formation of fistulas in 83% of animals of the control group. On the 10th -12th day of the experiment, leukocyte infiltrates in

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the lower jaw area were resolved in 16.6% of guinea pigs of 2nd group, the formed abscesses in 33.3% of animals opened spontaneously, forming fistulas. By this time of the experiment, fistulas were formed in the submandibular region in 16.7 % of guinea pigs of the control group. Local changes in guinea pigs of all groups were the same on the 28th day of observation.

It was found that the prophylactic course of Gamma-plant (group 2) contributed to a decrease in the destruction of bone tissue to 6.52 ±1.33 mm^2.

The introduction of Gamma-plant to guinea pigs with the developed infectious and inflammatory process for 5 days of the disease promotes the complete resorption of the infiltrate in a part of their part (in 50% of cases). During the formation of abscesses in 3, spontaneous opening of them occurred earlier than in animals of the control group. Among the animals that received Gamma-plant lymphotropically, in which fistulas were formed, in 83.3% of observations, clinical recovery occurred by 28 days. There was a high (up to 84%) survival rate of guinea pigs of the 3rd group with lymphotropic introduction of Gamma-plant. The average rate of destruction of bone tissue was 5.10 ± 1.31 mm^2 and was significantly lower than in animals of the control group.

On the 7th day of the experiment, the guinea pigs of group 3 developed a pronounced purulent inflammation, plethora of blood vessels, and there were foci of hemorrhage. On the 14th day of observation in animals of this group, a formed fibrous capsule was formed around the purulent focus in the soft tissues; bone tissue retains a lamellar structure only in certain areas. The formation of sequesters was noted. The connective tissue surrounding them is moderately infiltrated with segmented leukocytes, histiocytes, and fibroblasts. An active inflammatory response persisted only around the sequesters (Figure 1).

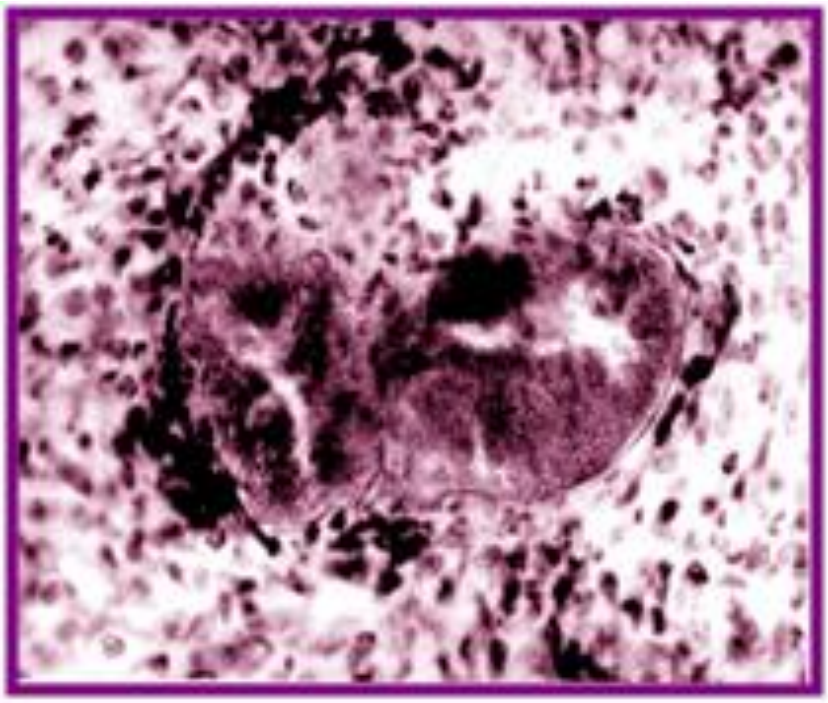

Fig. 1 Resorption of sequestration in osteomyelitis of the lower jaw in guinea pig, received lymphotropically gamma-plant, 14 days. Staining with hematoxylin and eosin. Uv. x 280.

On the 28th day of the experiment, in animals of the 3rd experimental group, microscopically, in the peri-maxillary soft tissues, the focus of purulent inflammation was completely resolved and replaced with mature fibrous connective tissue, regeneration of muscle fibers was noted (Figure 2).

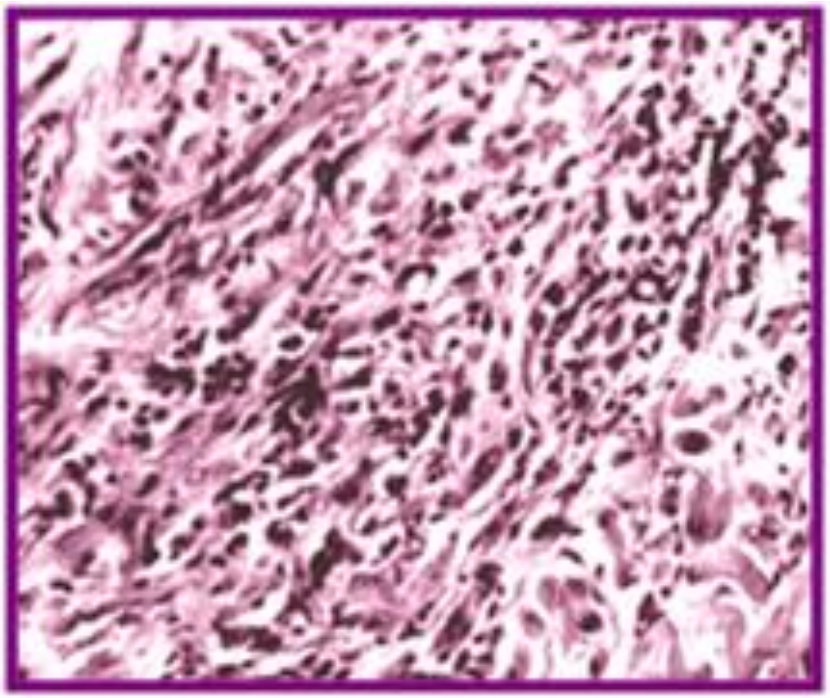

Fig. 2 The proliferation of mature connective tissue at the site of the former inflammatory focus in a guinea pig that received lymphotropic gamma-plant, 28 days. Staining with hematoxylin and eosin. Uv. x 200.

4. Discussion

Thus, the revealed histological changes affect the ability of lymphatic capillaries and blood vessels to remove from tissues the products of impaired metabolism, which are especially toxic in purulent inflammation.

Disorders of the lymphatic microvasculature of the peripheral lymphatic system were found. At the same time, a large number of closed lymphatic cavities of various configurations remained, which was characterized by lymphostasis, the development of stromal edema, and dilated interstitial gaps were revealed against the background of lymphocytic infiltrate. Histological examination of regional lymph nodes showed that on the 12th day after surgery, morphological signs of impaired drainage function remained in their structure. So, in particular, there was an expansion of the sinuses, indicating a stagnation of lymph. The edema and deformation of littoral cells, performing the filtration-phagocytic function, remained.

5. Conclusions

Thus, the revealed pathomorphological changes in the tissue of the lymph nodes indicate disorders in the lymphatic apparatus of the maxillofacial region with the development of an odontogenic purulent inflammatory process. This fact is confirmed by histological changes, which are characterized by a decrease in the drainage, transport, barrier-filtration functions of the lymphatic system. Inhibition of regenerative processes in a purulent wound is noted in the form of a violation of the structure of the structure of lymphoid follicles, inactive centers of reproduction, the presence of desquamated epithelial cells in the sinusoids, which leads to clogging and impaired drainage function of the lymphatic ducts. Based on the results of the morphological study, it follows that the normalization of indicators of the full functioning of the lymphatic system is an essential condition for the optimization of regenerative processes in a purulent wound of the maxillofacial region. And in this aspect, the use of the drug Gamma-plant is of great scientific and practical interest.

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