

## APPLICATION OF HELIUM-NEON LASER IN PEDIATRIC DENTISTRY

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**Abstract:** This article examined the structure of a helium-neon laser and considered specific methods of its use in pediatric dentistry.

**Keywords:** helium-neon laser, application, method, pediatric dentistry.

## INTRODUCTION

The word laser is an abbreviation of the words "Light Amplification by the Stimulated Emission". The action of the laser was described by Einstein in 1917, but the first working laser was created only in 1960 by Theodore Maiman, and had nothing to do with medicine. He used an artificial ruby crystal as the working medium. In 1964, a laser with carbon dioxide (CO<sub>2</sub>) as a working medium was manufactured. In the same year, the argon laser was invented, which turned out to be valuable for dentistry. In 1968, the CO<sub>2</sub> laser was first used to perform surgery on soft tissues [1].

## MATERIALS AND METHODS

During the study, articles were analyzed and materials from scientific and medical journals were studied.

## RESULTS AND DISCUSSION

The beginning of the medical application of lasers is considered to be 1961, when A. Javan created a helium-neon emitter [1]. In a helium-neon laser, the working substance is a neon atom. Excitation of neon atoms is carried out by an electric discharge. Since neon atoms are difficult to excite in pure form, an additional gas is introduced - helium. A mixture of helium and neon, and only in a ratio of 5:1, and only at a low pressure of 300 Pa creates an active medium in which energy is transferred from a non-working but easily excitable gas to a gas that accumulates energy and easily emits in the form of a laser beam. The glass shell of the laser has a mirror that collects the glow into a beam of light and directs it along the emitting tube to the output element. Local heating of tissues by a laser beam causes the release of Ca ions from the intracellular depot, an increase in the concentration of Ca in the cell cytosol and, as a consequence, the activation of Ca - dependent processes.

As a result:

1. DNA and RNA synthesis is enhanced.
2. The redox potential of mitochondria increases.

3. NO is released.

4. Active oxygen species are released [1].

All this contributes to an increase in energy and plastic processes in the cell.

The considered biological mechanism of the effect of a helium-neon laser on cells and tissues of the body will determine the following therapeutic and stimulating effects:

1. Anti-inflammatory effect is due to increased local blood circulation, increased fibrinolysis and tissue perfusion.

2. Trophogenic stimulating effect associated with increased oxygen mechanism, increased ATP.

3. Bactericidal and bacteriostatic action associated with increased leukocyte chemotaxis, activation of acid phosphatase and myeloperoxidase, which enhance phagocytosis.

4. Regenerative due to activation of fibroblasts, profibroblasts, epithelial cells.

5. Anti-edematous action.

6. Effect on hematopoiesis.

7. Anesthetic effect associated with a decrease in the sensitivity of nerve endings due to the elimination of tissue edema, also due to an increase in the production of endorines and encafeines in the structures of the peripheral nervous system [1].

The following general methods of using a helium-neon laser are distinguished: distant, contact, stable and labile. With the distant method, the laser beam passes in the open space between the emitter and the object, and with the contact method - with a tight fit of the emitter to the irradiated surface. The first method is more often used with external irradiation of extensive pathological foci, and the contact method is used for transoral irradiation. With the stable method, the field of action does not change during irradiation. The labile method is used in cases where the size of the pathological lesion significantly exceeds the size of the irradiation field.

Specific methods of using a helium-neon laser.

Currently, the helium-neon laser is successfully used for the prevention and treatment of initial forms of caries. Its light:

- activates the enzymatic system of the dental pulp;
- compacts the crystal lattice of the enamel;
- increases the effectiveness of anti-caries agents;

- actively affects the permeability of the enamel, reducing the solubility of its surface layer;
- increases the density of the surface layer of the enamel [2].

Currently, the helium-neon laser is successfully used for the prevention and treatment of initial forms of caries.

When preventing caries, laser irradiation can be used both independently and in combination with the use of Remodent, fluoride varnish, calcium preparations, while the effectiveness of these means of preventing caries significantly increases by 60, 40 and 30%. The laser beam is directed between the equator and the neck of the tooth for 2-3 seconds sequentially from the vestibular and oral sides. The course of treatment is 1-3 procedures daily [3].

In the treatment of medium and deep caries, a helium-neon laser allows you to stop the initial signs of inflammation in the dental pulp, stimulate the formation of secondary dentin. Before filling the prepared carious cavity, the bottom is irradiated once for 2 minutes. If pain persists after filling, then additional irradiation is performed in the area of the neck of the tooth.

## CONCLUSION

Currently, the advantages of using lasers in dentistry have been proven by practice. There are certain pros and cons of using laser therapy using a helium-neon laser.

Pros:

- 1) Safety of use.
- 2) Possibility of precise regulation of exposure parameters and dosage accuracy during procedures.

Cons:

- 1) High cost of laser dentistry.
- 2) Rarely used in municipal institutions.

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