



STUDY OF LASER LIGHT IN MEDICINE WITH INTERACTIVE TEACHING METHODS

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ANNOTATION

Currently, when studying the interaction of laser radiation with biological tissue and when developing modern methods and technologies of laser medicine, it is necessary to take into account both the structure of certain laser radiation pulses in such a way as the wavelength and energy dose.

For continuous laser radiation power of pulsed laser is equal to radiation power of a medium size, while the power of the pulsed laser exceeds three or four rules. Therefore, the effect of laser radiation, which has a continuous and pulsed mode of operation, on the whole organism, as well as the effect on individual systems and organs, can be radically different.

KEYWORDS: *pulsed and continuous mode of operation, pulsed structure of laser radiation, application features.*

Аннотации: В настоящее время при изучении взаимодействия лазерного излучения с биотканью и при разработке современных методов и технологий лазерной медицины необходимо учитывать как структуру тех или иных импульсов лазерного излучения таким образом, как длина волны и энергетическая доза.

Для непрерывного лазера мощность излучения импульсного лазера равна мощности излучения среднего размера, в то время как мощность излучения импульсного лазера превышает три-четыре нормы. Поэтому воздействие лазерного излучения, имеющего непрерывный и импульсный режим работы, на целостный организм, как и воздействие на отдельные системы и органы, может быть радикально различным.

Ключевые слова: импульсный и непрерывный режим работы, импульсная структура лазерного излучения, особенности применения.

INTRODUCTION

At present, modern teaching methods are widely used in the educational process. The use of modern teaching methods leads to high efficiency in the teaching process. When choosing teaching methods, it is advisable to choose based on the didactic function of each lesson. While maintaining the traditional form of teaching, enriching it with methods that activate the activities of various learners leads to an increase in the level of mastery of learners. To do this, the lesson process should be organized rationally, the teacher should constantly stimulate the interest of students in the learning process, divide the teaching material into small pieces, open their content, brainstorm, work in small groups, debate, problem situation, orientation. using techniques such as text, project, role-playing, and encouraging learners to perform practical exercises

independently. These methods are also called interactive or interactive methods.

The Interactive Method is an integral part of the learning process, a set of teaching methods aimed at activating both the professor and the student at the same time.

Interactive methods are methods that activate learners and encourage independent thinking, learning at the center of the learning process.

When these methods are used, the educator encourages the learner to actively participate. The learner is involved throughout the whole process. The use of a number of interactive methods is also important in the application of lasers in medicine.

The general and characteristic features, mode of operation, as well as the structure of radiation pulses of modern lasers are considered. A comparative analysis of the pulse structures of laser radiation shows that, firstly, they are very diverse, and secondly, the structures of radiation pulses can



differ from each other even for one type of laser, e.g., shape, amplitude, duration, and frequency. Third, the level of radiant energies, i.e., the degree of energy density, i.e., the magnitude of the light and energy dose of the radiation, is compatible, but the structure of the radiation pulses may also differ. Thus, in studying the mechanism of interaction of laser radiation with bio-tissue and in the development of modern methods and technologies of laser medicine, both the wavelength and energy dose, as well as the pulse structure of a particular type of laser must be taken into account. In addition, the types of laser active media used in medicine, the characteristics of different laser radiation, they are one-dimensional indicators of radiation quality, general recommendations for their application are considered. In particular, it has the property of multifunctionality (wavelength generation range 510.6 nm; 578.2 nm; 600 ÷ 750 nm), as well as the ability to adjust the average power of laser radiation with an accuracy of ~ 1.0 mJ, keeping the radiation dose in the range 0.001 ÷ 15 W The certified and registered KULON-MIS laser medical device, made on the basis of lasers in copper vapor, can be used as a universal instrument for the production of modern methods and technologies for clinical and scientific medicine.

For pulsed-mode lasers, the energy characteristics can be represented by at least two parameters, for example, peak power and pulse energy, peak power and radiation pulse duration, pulse energy, and radiation pulse duration. It is also necessary to specify the frequency of the radiation pulses for a more complete characterization of pulses operating in the pulse mode.

Brainstorming Method - it is a method of gathering the free thoughts and opinions expressed

by learners on a problem and using them to come to a definite solution.

There are written and oral forms of the mental attack method. We consider the impulse operation of lasers in the written form of such a method.

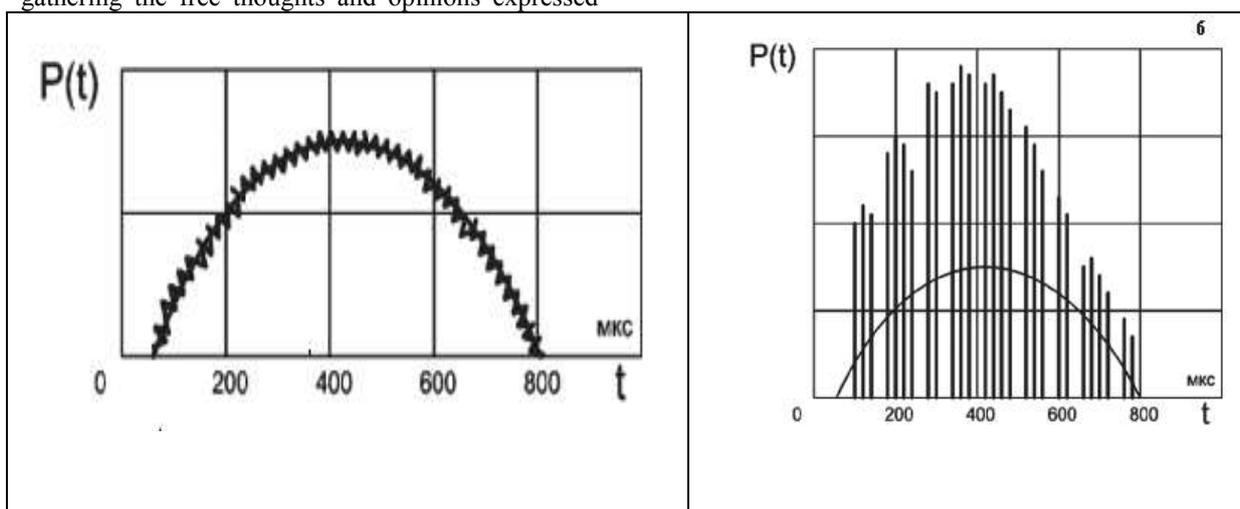
The operation of lasers in pulsed modes is characterized by three parameters in addition to the wavelength of radiation: the peak (maximum) intensity of radiation, pulse duration and pulse frequency (specified in the passport data).

Note: The order of pulsed laser radiation of constant amplitude and periodic series radiation is called pulsed-periodic (or quasi-continuous) depending on the order of pulse generation, in which the periodic sequence is broken and the pulses come with random amplitude and frequency.

Average power (W) is an integral characteristic of a pulsed mode laser, obtained by multiplying all three of the above quantities with sufficient accuracy to be used in medicine for the pulsed periodic mode, and all other characteristics of the laser are derived from this parameter.

Pulse frequency correction allows medical procedures (technologies) with an average power of one milliwatt to 15 W when operating with a laser at a nominal frequency range (15 kHz) at a frequency of 1 Gts.

The shape of the modulated radiation pulse is shown in the diagram in Figure 1. It should be noted that the modulation does not change the pulse energy and the power of the peaks in the group increases accordingly, resulting in a redistribution of the pulse energy equal to 1J, which is proportional to their quantity. The increase in power also depends on the location of the peaks along the pulse duration.



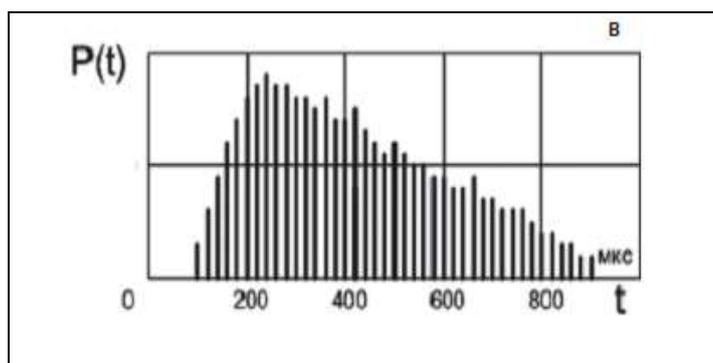


Figure 1. Some views of radiation pulse structures — neodymium-activated glass lasers, where a - free generation mode, b - modulated mode of laser operation; v - pulse laser pulse operating in free generation mode

Keys: The surgeon slowly guided the laser scalpel and cut the tissue. Due to the fact that the surgeon exceeded the depth of the incision beyond the established norm, a lot of blood loss was observed in the patient. To investigate the situation, the chief doctor ordered the head of the department to conduct an investigation. In this case, the head of the department noted that the surgeon performed all the procedures correctly but there was a defect in the laser scalpel device.

Questions about the case

1. In this case, did the head of the department correctly state?
2. Describe ways to solve the problem based on this situation?

CONCLUSION

The conclusion of this article is that the planned scientific, experimental and clinical results in modern laser medicine, taking into account the differences in the order of operation of lasers and the structure of radiation pulses, can be achieved by calculating the required energy dose of laser radiation and the time structure of radiation pulses. which, in turn, must be expressed in the passport and recommendation on the operation of the medical laser or laser medical device.

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