USING OF THE SYSTEM OF BREATHING CONTROL DURING IRRADIATION OF BREAST TUMORS

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The role of the device of active breath control during radiation therapy of malignant breast tumors is indicated. Considered the use of Active Breathing Coordinator™ device of Elekta Company to radiotherapy under the control of the breath in the Minsk city Soviet of clinical Oncology dispensary. It is shown that the use of this device is useful, but not in all cases effective.

Keywords: breath control, radiation therapy under breath control, breast tumor.

The internal movement of organs is an important factor in geometric uncertainty, limiting the reduction of PTV [1]. Chest movements caused by patients breathing are a well-studied form of organ movement.

Breathing is a complex process; it is controlled both consciously and automatically. For breath control it is possible to use different combinations of the muscles of the chest and abdomen, so the patient form may be different at the same phase of respiration. Each patient's breathing is specific.

The Active Breathing Coordinator™ device of Elekta Company is used for radiation therapy under the control of breathing in Minsk city clinical oncologic dispensary. The Active Breathing Coordinator™ device is intended for use in cases where it is necessary to reduce movements in the chest and abdomen caused by breathing and heartbeat. It is designed to provide breath-holding during simulation and remote radiotherapy (EBRT) using photons conducted with one or more fractions in the form of static and/or dynamic whole-body irradiation procedures or some of its areas for which such therapy is required.

The use of this device is indicated for breast tumors, including methods of complete and partial irradiation of the mammary glands, in which the fixation of the anatomical structure, provided by breath-holding in deep breath (DIBH), avoids excessive radiation exposure to vital organs by reducing the dose of radiation to the heart, lungs and other healthy tissues [2]. The use of active breath control system allows to reduce the movement of anatomical structures. This allows you to obtain images, perform radiation and other tasks at a constant volume of the lungs. The patient may perform an accurate breath-hold at a known volume. The patient learns to hold his breath with a certain amount of air in the lungs (threshold volume) during the briefing before radiation therapy.

The operator can monitor the delay periods of breathing of the patient on the laptop. The balloon valve, which is operated by the patient, is connected directly to the flow meter and helps the patient to hold his breath for a certain period at the same volume of lungs. This allows the irradiation to be performed and images to be obtained accurately during periods of breath-holding.

Using this device is useful, but not ideal for everyone. For some patients due to their anatomical features improvement is not observed (Fig.1).

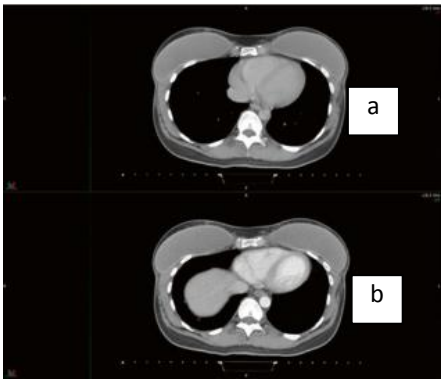

Fig. 1. Case of ineffective use of the device of active breath control on breath holding (a), free breathing (b)

For many patients using of the system of breathing control during radiation therapy it allows to minimize the negative effects of radiation, such as shortness of breath, shortness of breath, unproductive cough, pulmonitis.

BIBLIOGRAPHY

1. *Lee, N. Y.* Target Volume Delineation for Conformal and Intensity-Modulated Radiation Therapy, Medical Radiology. Radiation Oncology / N. Y. Lee. Springer International Publishing Switzerland, 2015. – P. 208–212.

2. *Климанов, В. А.* Радиобиологическое и дозиметрическое планирование лучевой и радионуклидной терапии. Ч. 1 / В. А. Климанов. – М : НИЯУ МИФИ, 2011. – С. 308–310.

SYNTHESIS OF NEW 11-ARYLSUBSTITUTED DERIVATIVES OF 5-HYDROXY-3,3-DIMETHYL-1,2,3,4,5,11-HEXAHYDROINDENO [1,2-B] QUINOLINE-1,10-DIONE

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The aim of this work was synthesis the new asymmetrical polycyclic derivatives of N-OH substituted 1,4-dihydropyridin. 5-Hydroxy-11-(4-hydroxyphenyl)-3,3-dimethyl-1,2,3,4,5,11-hexahydroindeno [1,2-b] quinoline-1,10-dione and 5-Hydroxy-11-(4-hydroxy-3-methoxyphenyl)-3,3-dimethyl-1,2,3,4,5,11-hexahydroindeno [1,2-b] quinoline-1,10-dione were obtained. It was shown that both obtained substances can be used as acid-base titration indicators.

Keywords: organic synthesis, Hanzsch reaction, 5-Hydroxy-3,3-dimethyl-1,2,3,4,5,11-hexahydroindeno [1,2-b] quinoline-1,10-diones.

In this work we synthesized two new polycyclic derivatives of unsymmetrically substituted 1,4- dihydropyridine which can be used as indicators of the basicity of the medium. To prepare the asymmetric derivative of 1,4-dihydropyridine, we carried out the reaction in two steps. Initially, an unsaturated diketone (IIIa or IIIb) was obtained by reacting the indanedione (I) with aromatic aldehyde (IIa or IIb) (Knoevenagel condensation), then dimedone (IV) and hydroxylamine hydrochloride were added to the reaction mixture, and through intermediates (Va or Vb, VIa or VIb) a pentacycle (VIIa or VIIb) was obtained which was an unsymmetrical derivative of 1,4-dihydropyridine (Fig. 1).

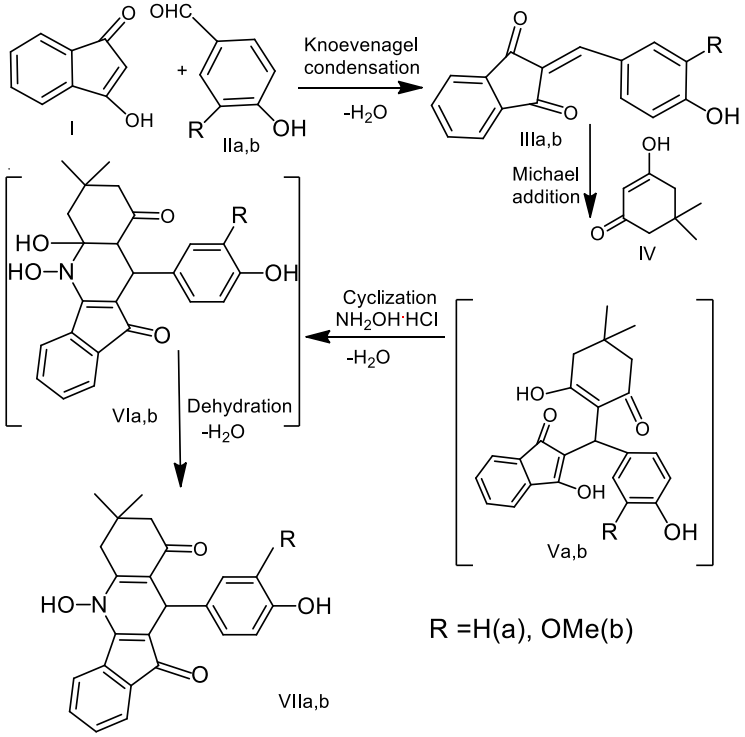

Fig. 1. Synthesis of 5-Hydroxy-3,3-dimethyl-1,2,3,4,5,11-hexahydroindeno [1,2-b] quinoline-1,10-diones VIIa,b