

COMPARISON OF IMRT AND VMAT METHODS WITH ACTIVE BREATHING CORDINATOR AND WITHOUT USING RADIATION OF STOMACH CANCER

N. Sribnaya

*Belarusian State University, ISEI BSU,
Minsk, Republic of Belarus
nikol.sribnaya94@gmail.com*

For the planning of radiation therapy using breathing control, IMRT and VMAT. A comparative analysis of the methods, their shortcomings and advantages was made.

Keywords: oncology, stomach cancer, radiation therapy, breathing control, VMAT, IMRT.

Gastric cancer is the third most common cancer in the world and the second highest cause of cancer-related mortality. The stomach is an intraperitoneal organ that starts at the T11 vertebra and ends in the duodenum on the right side of the midline. Early gastric cancers usually have no symptoms or signs.

The treatment methods used depend on the stage. Stage I - Surgery alone. Stage I-IV - concurrent chemoradiotherapy. Postoperative chemoradiotherapy is standard therapy for all patients at high risk for recurrence of adenocarcinoma of the stomach or gastroesophageal junction who have undergone curative resection. The median overall survival in the surgery-only group was 27 months, as compared with 36 months in the chemoradiotherapy group.

Currently, in radiotherapy treatment, two dose fractionation schemes are mainly used - classical and enlarged. In classical fractionations, irradiation is carried out 5 times a week with a dose of 2 Gy per fraction, and in enlarged dose of 3-4 Gy per fraction daily 5 times a week.

Today's clinics use IMRT (Intensity modulated radiation therapy) and VMAT (Volume modulated radiation therapy) for treatment planning. Each of these techniques has its own advantages and disadvantages.

The stomach is a movable structure. If free breathing, the position of the tumor's focus can be shifted to 2 centimeters. In this case, the treatment field must include the entire area where the target may be in the treatment. Thus, the volume of cells, many times larger than the original tumor, is exposed to radiation. The tumor shift during respiration can be reduced by using the ABC (Active breathing Cordinator) system. In this case, treatment is only performed when the patient holds breath and the stomach is approximately the same position. This makes it possible to give a more accurate treatment dose to the region of interest.

Due to the fact that there are many methods of treating stomach cancer (IMRT and VMAT, with and without breath control), there is a need to identify their advantages and disadvantages. Comparing treatment plans with IMRT and VMAT were performed using ABC and without. This study led to the following conclusions:

- respiratory treatment reduces organ and tumor motion, which allows more accurate dose delivery and reduces exposure to surrounding healthy tissues;
- however, treatment with ABC is longer and difficult to tolerate for the patient. The need to hold breath for a long time is almost impossible for elderly and weakened patients;
- VMAT treatments are typically faster than IMRT. Shorter dose duration is essential for respiratory-controlled treatment;
- VMAT treatment increases the volume of healthy tissue covered with low dose due to continuous dose release during collimator motion. The IMRT technique can reduce the low-dose “swam”, but the time of the session increases.

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