Contribution ID: **335**   Type: **Oral talk (15 min + 5 min questions)**

STUDY OF DOSE DELIVERY FOR TOTAL BODY IRRADIATION ON TOMOTHERAPY USING EXIT DETECTOR DATA

Friday, 15 July 2022 11:20 (20 minutes)

Optimized Conformal Total Body Irradiation (OC-TBI) is very complex and unique method of radiotherapy. It include irradiation of the whole body with dose of 12 Gy, except organs at risk: lungs, kidneys, liver and lenses. Because of its complicity, we need to pay attention to dose delivery in this method.

The evaluation of the delivered dose for patient received OC-TBI on TomoTherapy can be done using MVCT images and raw data from exit detectors. Exit detectors are an important part of TomoTherapy that needed to visualize patient anatomy right before the treatment. Also they store a huge amount of information about the beam characteristics throughout the procedure, that achieved by 640 xenon ionization chambers.

We used CIRS ATOM anthropomorphic phantom to find correlation between fluence of radioation that collects in detectors and the dose in each area of irradiation. 12 additional plans with different shifts were calculated and then performed on Tomotherapy. Signal from exit detectors was collected and analyzed with Gamma 0.5%/0.5 mm criteria.

Data from exit detectors during irradiation of patients were also used for analysis. We took 24 data from procedure of OC-TBI and analyzed them in our hand-made software in MatLab. MVCT images were taken before treatment for each fractions and then were exported in MIM software that has the opportunity to recalculate dose. For each fraction the patient CT was deformed using MVCT images, creating an synthetic CT (sCT). Dose recalculation was performed on the sCT. Planned and delivered doses were compared using Gamma 3%/1 mm criteria.

We found that coefficient of determination between fluence and dose for anthropomorphic phantom is bigger than 80% in all areas of irradiation: mean coefficient of determination is 87.9 ± 7.2 %. For patients coefficients of determination decrease due to micro movements and breathing. Mean gamma index in the area with minimum moving (head) is 96.0 ± 4.2 %, when in the area of breathing (chest) it decrease to 69.9 ± 12.6 %. It shows that signal from detectors very sensitive to any movement, which should be taken into account in further research.

The study showed that fluence and dose in OC-TBI procedures have a high correlation. That can lead to dose evaluation only from data from detectors.

The speaker is a student or young scientist

Yes

Section

1. Nuclear technology and methods in medicine, radioecology

Primary author: TOVMASIAN, Diana (1 Lomonosov Moscow State University, Russia 2 Dmitry Rogachev National Medical Research Center Of Pediatric Hematology, Oncology and Immunology)

Co-authors: LOGINOVA, Anna (Dmitry Rogachev National Medical Research Center Of Pediatric Hematology, Oncology and Immunology); CHERNYAEV, Aleksandr (Lomonosov Moscow State University, Russia); NECHESNYUK, Alexey

Presenter: TOVMASIAN, Diana (1 Lomonosov Moscow State University, Russia 2 Dmitry Rogachev National Medical Research Center Of Pediatric Hematology, Oncology and Immunology)

Session Classification: Nuclear technology and methods in medicine, radioecology.