

Verification of Patient Positioning in Proton Therapy based on Digital X-ray Images

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To conduct the verification of the target position relative to the beam, a digital X-ray imaging apparatus by Konica Minolta Company has been installed at the Medico - Technical Complex of the JINR, Dubna. This method is applied instead of the old one with X-ray films.

Methods

This method presents the superposition of the X-ray image which is taken by the digitizer, with a digital reconstructed radiogram (DRR) calculated from the slices of the X-ray computer tomography. The application of this method allows less time for the proton beam therapy.

There are two stages to define the necessary correction. First: the corresponding DRR of the patient is printed. Then the DRR contour is drawn out on transparent film (for example, the bone structures of the skull). Also the target isocentre is marked at the DRR that defines the position of the beam axis relative to the patient on transparent film.

Second: the digital X-ray image is loaded and displayed on the screen. Then the transparent film of the DRR is put on the screen. The drawn contour on the transparent film is superposed onto the X-ray image in the monitor (superposition for the bone structures of the skull).

After the superposition, the distance is measured from the center cross of the digital X-ray image to the target isocentre of the transparent film. Then, positioning the patient, the target isocentre is adjusted in the superposition to the axis of the beam.

Results

Production of the digital X-ray image by digitizer REGIUS170 of Konica Minolta Company takes 20 seconds. With the old method with X-ray films, the same X-ray image is produced in 3 minutes. The application of the developed program together with the digital X-ray imaging technique will allow us to reduce the verification time down to one minute. Therefore, we can increase approximately 1.5 times the number of patients treated at the Medico - Technical Complex.

Conclusions

This program is the first version. In this version the superposition can't be made without an operator. The next version of the program is being written now and it will have a function for the automatic superposition.