Treatment Planning in Brachytherapy HDR Based on Three-Dimensional Images

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Purpose
Treatment planning in High Dose Rate (HDR) brachytherapy based on three-dimensional (3D) imaging allows for prearranging and realization optimal treatment process. This process consists of procedure planning, the choice of applicators, adjusting the appropriate implantation technique, and planning of three-dimensional distribution of dose in computerized treatment planning system. 3D images used in treatment planning in HDR brachytherapy allows for choosing the most appropriate application technique. This in turn allows for the best area coverage by reference dose with simultaneous protection of critical organs. Treatment planning on 3D images assures individual planning of dose dispersion in target area.

Methods
Several techniques will be presented based on 3D imaging in location such as lung (Fig.1.), skin cancer (Fig.2.), breast (Fig.3.), and prostate cancer (Fig.4.5.). For each location, relative cases will be provided where different applicators and techniques were applied. These examples are going to present images from before and after performed application along with the pictures from computer treatment planning system. In each of described locations, relative advice and rules of conducting accurate application will be provided.

Conclusions
Computer tomography allows for establishing individual treatment solutions that provide optimal approach to every patient as in skin cancer. With more and easier access to three-dimensional imaging, new ways of applying HDR brachytherapy open in new location as well as in form of radical treatment. With the use of imaging, we are now able to introduce catheters precisely into the tumor area with putting the patient at risk of post treatment complications. It allows the treatment of people that no more qualify for other forms of treatment. Thanks to different optimization forms based on 3D images, HDR brachytherapy is applied not only in palliative treatment but also in new ways of radical treatment.