

PRIMERJAVA MED CYBER NOŽEM IN TOMOTERAPIJO V HOMOGENOSTI DOZE ZNOTRAJ PTV IN PRIZADETOSTJO REKTUMA PRI BOLNIKI Z RAKOM PROSTATE

COMPARISON BETWEEN CYBERKNIFE AND TOMOTHERAPY IN DOSE HOMOGENEITY
INSIDE PTV AND RECTAL SPARING IN PROSTATE CANCER PATIENTS

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IZVLEČEK

Uvod: Obstajajo različne tehnike obsevanja za zdravljenje bolnikov z rakom prostate, med katere spadata tudi zdravljenje s Cyber nožem (angl. Cyberknife, CK) in tomoterapijo (TT). CK je sistem 6-megavoltnega (MV) linearnega pospeševalnika na robotski roki in omogoča intrafrakcijsko premikanje ter sledenje tumorske tarče med obsevanjem. Zaradi te posebne lastnosti je zelo natančna tehnika zdravljenja z obsevanjem in omogoča dozimetrično ugodne rezultate za zdrave okoliške strukture, npr. rektum. Večina bolnišnic ne more zagotoviti zdravljenja s CK, zato se v takšnem primeru lahko odločijo za zdravljenje s TT. Zanj je značilna posebna spiralna pot sevanja okoli bolnika, ki omogoča konformno porazdelitev doze ter večjo zaščito zdravega tkiva okoli tarče.

Namen: Namen prispevka je raziskati razlike v homogenosti porazdelitve doze v planirnem tarčnem volumnu (angl. planning target volume, PTV) in prizadetostjo rektuma po obsevanju bolnikov z rakom prostate med obsevalnima tehnikama CK in TT. Prav tako je namen seznaniti radiološke inženirje z omenjenima obsevalnima tehnikama, ki se uporabljata v tujini.

Metode dela: Za pisanje znanstvenega članka smo uporabili opisno metodo zbiranja podatkov. Literaturo smo pridobivali iz podatkovnih zbirk, kot so Google učenjak, Cobiss+, PubMed in ScienceDirect. Časovni okvir iskanja literature je bil nastavljen od leta 2012 do 2022.

Rezultati: Rezultati pregleda literature kažejo, da tehnika TT zagotavlja višjo homogenost porazdelitve doze znotraj PTV. Parametra D2 % (CK: 46,37 Gy, 46,46 Gy, 45Gy, 39,8 Gy; TT: 45,19 Gy, 39,86 Gy, 37,5 Gy, 36,5 Gy) in D98 % (CK: 36,27 Gy, 36,95 Gy, 34,3 Gy; TT: 36,97 Gy, 37,37 Gy, 36,4 Gy) nakazujeta, da se pri CK pojavlja več vročih in hladnih točk v PTV kot pri TT. Pri TT so bili parametri D2 %, V20 %, V30 %, V50 % za rektum nižji kot pri CK.

Razprava in zaključek: Na podlagi rezultatov smo ugotovili, da TT zagotavlja višjo homogenost porazdelitve doze znotraj PTV, kljub temu pa sta obe obsevalni tehniki med seboj zelo primerljivi. Hkrati je TT pokazala boljše rezultate pri zaščiti rektuma kot CK, kar bi potencialno lahko vodilo do manjšega števila kasnejših stranskih učinkov.

Ključne besede: rak prostate, tomoterapija, Cyber nož, rektum, dozimetrična pokritost, homogenost

ABSTRACT

Introduction: Various radiotherapy techniques for treating prostate cancer have been considered effective non-invasive treatment options, for example tomotherapy (TT) and Cyberknife (CK). CK is a system of a 6-megavolt (MV) linac mounted to a robotic arm that provides intra-fraction target motion, which gives a very high delivery accuracy and can better protect organs at risk, for example the rectum. However, most hospitals cannot provide treatment with CK. Frequently, in the countries that can offer various techniques, prostate cancer patients are therefore treated with TT, which is also a very accurate radiation treatment.

Purpose: The purpose of this scientific poster is to compare the differences in dose homogeneity inside planning target volume (PTV) and rectal sparing in patients with prostate cancer between CK and TT treatment. We would also like to raise awareness about special techniques in radiotherapy among radiologic technologists in Slovenia.

Method: A descriptive method was used for the writing of this scientific poster. Literature was sourced from Google Scholar, PubMed and ScienceDirect, where the timeline was limited to articles published between 2012 and 2022.

Results: Results show that TT provides a higher homogenous dose distribution inside PTV than CK. Parameters D2 % (CK: 46.37 Gy, 46.46 Gy, 45Gy, 39.8 Gy; TT: 45.19 Gy, 39.86 Gy, 37.5 Gy, 36.5 Gy) and D98 % (CK: 36.27 Gy, 36.95 Gy, 34.3 Gy; TT: 36.97 Gy, 37.37 Gy, 36.4 Gy) indicate that CK has more volume of hot and cold spots inside PTV than TT. When considering the dose delivery for the rectum, parameters D2 %, V20 %, V30 %, V50 % were lower for TT than CK.

Discussion and conclusion: TT has shown to provide slightly higher dose homogeneity inside the PTV than TT, yet both techniques are comparable and therefore hospitals can decide to use either CK or TT. Additionally, there is a slightly better outcome in rectal sparing with TT than CK, which could potentially translate into the advantage of lower late rectal toxicity.

Keywords: prostate cancer, tomotherapy, Cyberknife, rectal sparing, dosimetric outcome, homogeneity

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