PRIMERJAVA OBSEVANJA RAKA DOJK V ANTERO-POSTERIORNI IN POSTERO-ANTERIORNI SMERI

COMPARISON OF BREAST CANCER IRRADIATION IN SUPINE AND PRONE POSITIONS

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IZVLEČEK

Uvod in namen: Obsevanje pri raku dojk se danes izvaja v antero-posteriornem (AP) kot tudi v postero-anteriornem (PA) položaju. Cilj raziskave je predstaviti, ali položaj obsevanja, starost bolnice in število frakcij obsevanja pomembno vplivajo na velikost interfrakcijskih premikov pri geometrični verifikaciji v lateralni, longitudinalni in vertikalni smeri.

Metode: Raziskava je bila zasnovana retrospektivno s sekundarno statistično analizo podatkov. Analiza o interfrakcijskih premikih se je izvedla pri 25 bolnicah, ki so obsevale raka dojk v AP položaju na podlagi Breastboard (CIVCO), in 25 bolnicah v PA položaju na podlagi Sagittilt (Orfit). Geometrična verifikacija je bila v vseh primerih izvedena v prostem dihanju pred obsevanjem. Pri obsevanju v AP položaju je bila uporabljena 2D/2D (2D – dvodimenzionalno) verifikacija kilovoltnih (kV) slik. Pri obsevanju raka dojk v PA položaju je bila uporabljena verifikacija s CBCT (angl. cone beam computed tomography, računalniška tomografija s stožčastim snopom). Verifikacijske slike so bile zajete s sistemom XVI (angl. X-ray volumetric imaging system).

Rezultati: Rezultati pri AP položaju so pokazali največje interfrakcijske premike v longitudinalni smeri, najmanjše pa v lateralni smeri. Z Mann-Whitney U testom smo dokazali statistično značilno razliko med lateralno in vertikalno ($p = 0,008$) ter med lateralno in longitudinalno smerjo ($p = 0,002$) v AP položaju. V PA položaju so bili največji premiki v lateralni, najmanjši pa v longitudinalni smeri. S Kruskal Wallis testom smo dokazali, da pri PA položaju obsevanja v lateralni, longitudinalni in vertikalni smeri ni statistično značilnih razlik med premiki ($p = 0,220$). Ugotovili smo, da je povprečje premikov v vseh treh smereh večje v PA položaju (Slika 1). Največja povprečna razlika med položajema obsevanja je v lateralni, najmanjša pa v longitudinalni smeri.

Neparametrični Mann-Whitney U test pokaže statistično značilne razlike v premikih v vseh treh smereh glede na položaj obsevanja ($p < 0,05$). Starost bolnic ($p > 0,05$) in število frakcij obsevanja ($p > 0,05$) nimata statistično značilnega vpliva na velikost premikov med AP in PA položajem obsevanja.

Zaključek: S primerjavo vpliva položaja obsevanja, starosti bolnic in številom frakcij obsevanja na velikost interfrakcijskih premikov pri geometrični verifikaciji z drugimi študijami, smo prišli do enakih ugotovitev. Pri vseh translacijskih premikih obstajajo statistično značilne razlike med obsevanjem v AP in obsevanjem v PA položaju ($p<0,05$), premiki so večji pri PA položaju obsevanja.

Ključne besede: obsevanje raka dojk, antero-posteriorni in postero-anteriorni položaj, interfrakcijski premiki

ABSTRACT

Introduction and purpose: Today radiation therapy for breast cancer is performed in both - supine and prone position. The aim of the study is to present if the patient position, age and the number of fractions of radiation, have a significant influence on the size of inter-fraction displacements during geometric verification in lateral, longitudinal and vertical directions.

Methods: The study was designed retrospectively with secondary statistical data analysis. The analysis of inter-fraction displacements was performed in 25 patients that underwent breast cancer irradiation in supine position (Breastboard, CIVCO) and 25 patients in prone position (Sagittilt, Orfit). All patients received radiation therapy with free-breathing geometric verification performed before the irradiation - 2D/2D (two-dimensional) kilovoltage (kV) image verification in supine and cone-beam computed tomography (CBCT) in prone position. The images used for verification purposes were captured using the X-ray Volumetric Imaging System (XVI).

Results: The results showed that, on average, the largest inter-fraction displacements in supine positioning are in the longitudinal direction and the smallest in the lateral direction. The Mann-Whitney U test showed a statistically significant difference between lateral and vertical displacements ($p=0.008$) and between lateral and longitudinal displacements ($p=0.002$) in supine positioning. The Kruskal-Wally's test showed that there were no statistically significant differences in the lateral, longitudinal and vertical directions in prone positioning ($p=0.220$).

The average displacements in all three directions are larger in prone position (Figure 1). The largest average difference between the two irradiation positions is in the lateral direction, while the smallest is in the longitudinal direction. The non-parametric Mann-Whitney U test shows statistically significant differences in the inter-fraction displacements in all three directions, depending on the patient's position ($p<0.05$). Patient age ($p>0.05$) and the number of fractions of radiation ($p>0.05$) do not have a statistically significant effect on the size of displacements between the supine and prone positions.

Conclusion: Comparing the influence of the patient's position during breast cancer irradiation, the age of the patients and the number of fractions of radiation on the size of the inter-fraction displacements in geometric verification with other studies, the same conclusions were reached. For all translational displacements, there are statistically significant differences between irradiation in the supine and prone position ($p<0.05$), with larger displacements in the prone position.

Keywords: breast cancer irradiation, supine and prone position, inter-fraction displacements

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