Analisis parameter dosimetri pada radiasi kraniospinal dengan teknik 3D conformal, intensity modulated radio therapy, dan helical tomotherapy = Dosimetric analysis of 3D conformal radio therapy, intensity modulated radio therapy, and helical tomotherapy in craniospinal radiation technique.

Anak Agung Sagung Ari Lestari, author

Abstrak

Latar Belakang: Radiasi kraniospinal adalah metode radiasi yang sering digunakan pada kasus keganasan sistem saraf pusat yang menyebar ke cairan cerebrospinal, sehingga area radiasinya sangat luas meliputi seluruh otak dan canalis spinalis. Akibat daerah radiasi yang luas, area radiasi harus dibagi menjadi beberapa lapangan yang menghasilkan kesulitan dalam mengatasi junction antar lapangan tersebut.Kesulitan lain adalah banyaknya organ kritis yang terlibat dan usiapasien yang mayoritas anak-anak. Saat ini belum terdapat data penelitian yang menganalisis radiasi kraniospinal dengan teknik Three Dimentional Conformal Radiotherapy 3D-CRT, Intensity Modulated Radiotherapy IMRT, dan IMRT-Helical Tomotherapy HT di Indonesia.
Metode: studi eksperimental eksploratorik dengan melakukan intervensi planning terhadap 10 data CT plan pasien kraniospinal yang diradiasi di Departemen Radioterapi RSUPN Cipto Mangunkusumo. Dosis 36 Gy diberikan dalam 20 fraksi.Cakupan PTV kranial dan spinal dievaluasi menggunakan indeks konformitas CI dan indeks homogenitas HI.Dilakukan pencatatan parameter organ kritis lensa mata, mata, kelenjar parotis, kelenjar submandibula, tiroid, paru-paru, jantung, ginjal, testis dan ovarium, serta paparan radiasi pada seluruh tubuh.Selain itu juga dilakukan pencatatan jumlah MU dan durasi sinar beam on time.
Hasil: Teknik HT adalah teknik terbaik dalam pencapaian angka HI dan CI serta perlindungan terhadap organ kritis, namun memiliki paparan radiasi seluruh tubuh tertinggi dibandingkan teknik 3D CRT dan IMRT selain nilai MU tertinggi dan durasi penyinaran terlama sehingga harus dipertimbangkan penggunaannya pada pasien anak-anak karena resiko secondary malignancy yang tinggi. Teknik 3D CRT dengan arah sinar opposing lateral untuk lapangan kranial dan dari posterior untuk lapangan spinal memiliki nilai HI dan CI terburuk dengan keterbatasan kemampuan melindungi organ kritis namun memiliki paparan radiasi seluruh tubuh dan MU terendah serta durasi penyinaran terpendek.
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Background: Craniospinal radiation is a method of radiation that is often used in cases of malignancy of the central nervous system that spread to cerebrospinal fluid, so that the area of ??radiation is very broad covering the entire brain and spinal canal. Due to the large area of radiation, the radiation area must be divided into several fields that produce difficulty in overcoming the inter-field junction. In addition, the number of critical organs involved and the age of patients with the majority of children result in separate considerations in the choice of craniospinal radiation techniques. Currently there is no research data that analyzes craniospinal radiation with Three Dimentional Conformal Radiotherapy 3D-CRT, Intensity Modulated Radiotherapy-Step and Shoot IMRT-SS, and IMRT-Helical Tomotherapy HT techniques in Indonesia.
Method: exploratory experimental study by planning intervention on 10 CT plan data of craniospinal

patients radiated in Radiotherapy Department of Cipto Mangunkusumo General Hospital. Dose 36 Gy is given in 20 fractions. Cranial and spinal PTV coverage was evaluated using the conformity index CI and homogeneity index HI. Performed recording of critical organ parameters of lens, eye, parotid gland, submandibular gland, thyroid, lung, heart, kidney, testis and ovary, and exposure to radiation throughout the body. In addition, also recorded the number of MU and the duration of the beam.
Results: The HT technique is the best technique for achieving HI and CI figures and protection of critical organs, but has the highest body-wide radiation exposure compared to CRT and IMRT 3D techniques in addition to the highest MU values and longest exposure duration so should be considered in children high risk of secondary malignancy. 3D CRT technique with opposite lateral beam direction for the cranial field and from the posterior to the spinal field has the worst HI and CI values with limited ability to protect critical organs but has the lowest total body radiation and MU exposure as well as the shortest duration of irradiation.