CASE REPORT Libri Oncol., Vol. 35 (2007), No 1-3, 47 – 50

3D-CONFORMAL RADIOTHERAPY WITH ONE TARGET VOLUME IN A PATIENT WITH TWO PRIMARY TUMORS – A CASE REPORT

ZRINKA TRSTENJAK, MLADEN SOLARIĆ, DAVORIN BAGOVIĆ and MIRKO ŠAMIJA

Department of Radiation Oncology, University Hospital for Tumors, Zagreb, Croatia

Summary

A male patient, aged 54, was admitted to the University Hospital for Tumors for primary radiotherapy of neoplasms in the hypopharynx and mid-esophagus, by biopsy both shown as planocellular carcinoma. Prior to initial radiation, the patient underwent 3 cycles of chemotherapy (cisplatin + 5-FU).

The main problem occurring during the radiation planning was that the target volumes of the above mentioned primary tumors were detached, making together a unique, very big volume. In addition, part of that volume was to be irradiated only electively in order to prevent microscopic disease expansion, and another smaller part required an application of the full radical tumor dose. During radiotherapy, the continuation of chemotherapy was indicated (2 cycles of cisplatin and 5-FU). Despite the large target volumes irradiated and concomitant application of chemotherapy, the patient took the entire course of primary radiochemotherapy well and without a necessary recess. The patient was discharged with his general condition improved, and at the control visit three months after the completion of radiotherapy, the diagnostic evaluation showed no signs of residual disease.

KEY WORDS: *two primary tumors; 3D-conformal radiotherapy, clinical target volume*

PRIMJENA 3D-KONFORMALNE RADIOTERAPIJA JEDNIM CILJNIM VOLUMENOM U BOLESNIKA S DVA PRIMARNA TUMORA – PRIKAZ SLUČAJA

Sažetak

Bolesnik u dobi 54 godine zaprimljen je u našu Kliniku zbog provođenja primarne radioterapije neoplazme hipofarinksa i neoplazme srednjeg dijela jednjaka. Biopsijom obje promjene dobije se planocelularni karcinom. S obzirom na isti histološki tip oba tumora, prije početka zračenja bolesnik je primio 3 ciklusa kemoterapije cisplatinom i 5-fluorouracilom.

U pripremi i planiranju zračenja temeljni problem je bio što su se ciljni volumeni odvojenih primarnih tumora doticali te su činili jedinstveni veliki volumen. Uz to, dio tog volumena valjalo je zračiti samo elektivno sa ciljem suzbijanja mikroskopske bolesti, a tek u dijelu je bilo nužno aplicirati radikalnu dozu. Tijekom zračenja određen je nastavak kemoterapije i to 2 ciklusa s cisplatinom i 5-fluorouracilom. Unatoč velikim ciljnim volumenima zračenja i konkomitantno primijenjene kemoterapije, bolesnik je dobro i u cijelosti, bez stanke u zračenju, podnio primarnu radiokemoterapiju. Otpušten je u poboljšanom općem stanju, a na prvom kontrolnom pregledu, tri mjeseca po završenoj terapiji nije bilo znakova povrata bolesti.

KLJUČNE RIJEČI: *dva primarna tumora, 3D-konformalna radioterapija, klinički ciljni volumen*

INTRODUCTION

A male patient, C.R., born in 1952, was referred to chemo-radiotherapeutic treatment due to coexisting planocellular carcinomas of the hypopharynx (T3N1M0) and the esophagus (T3N0M0) (1). Prior to initial radiation, the patient under-

went 3 cycles of chemotherapy (cisplatin + 5-FU) (2-3).

The main problem occurring during the radiation planning was that the target volumes of the above mentioned primary tumors were detached, making together a unique, very big volume spreading across the upper trunk with very irregular contours (outlines). Part of that volume was to be irradiated only electively in order to prevent microscopic disease expansion, and another smaller part required an application of the full radical tumor dose. In order to avoid early and/or late complications, especially great care should be taken when planning the dose to be delivered to the lungs and spinal cord.

For esophageal cancer, the prescribed dose was 55.8 Gy in 31 fractions; for mediastinal lymph nodes, the dose was 43.2 Gy in 24 fractions (4). The irradiation dose indicated for hypopharyngeal tumor and lymphatic metastases was 66.6 Gy in 37 fractions; the dose for other neck lymph nodes was 50.4 in 28 fractions. During radiotherapy, the continuation of chemotherapy was indicated (2 cycles of cisplatin and 5-FU).

RADIOTHERAPY PLAN

As PTVs of the two tumor processes overlapped, it was necessary to design an integrated radiotherapy plan with a single isocenter (Figure

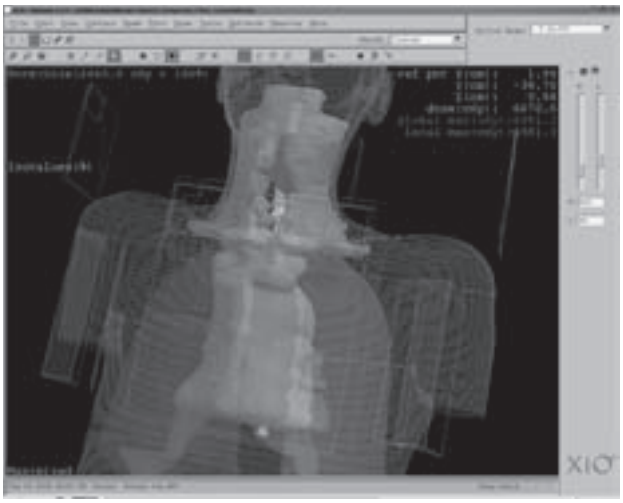

Figure 1.

Figure 2.

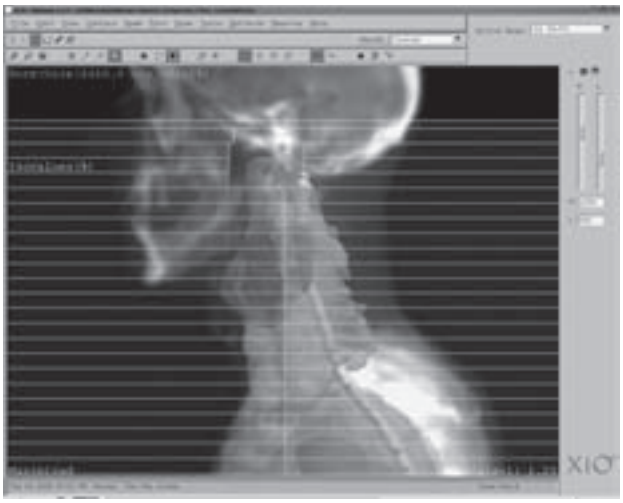

Figure 3.

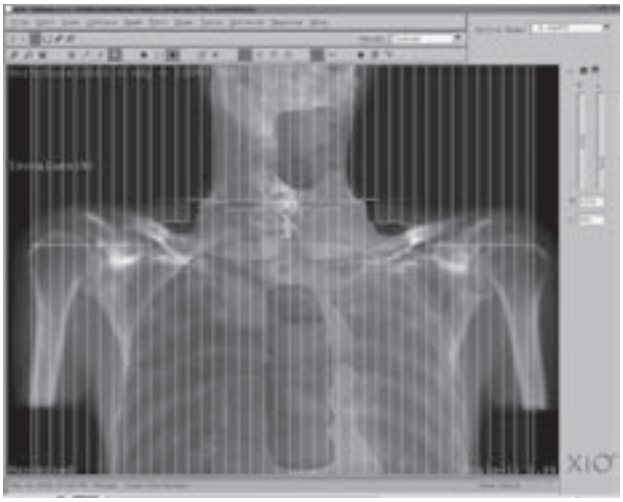

Figure 4.

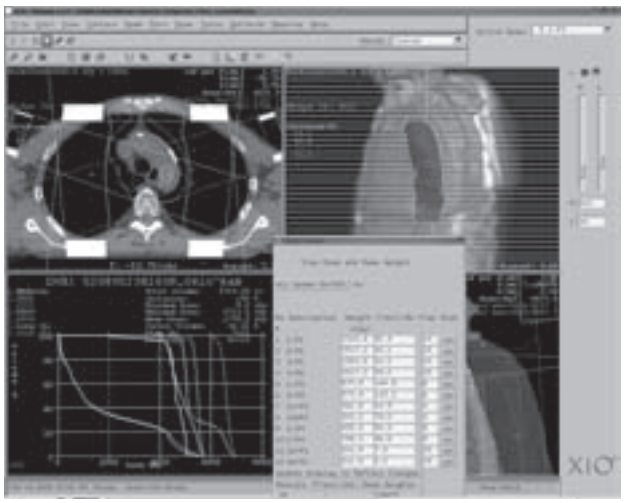

Figure 5.

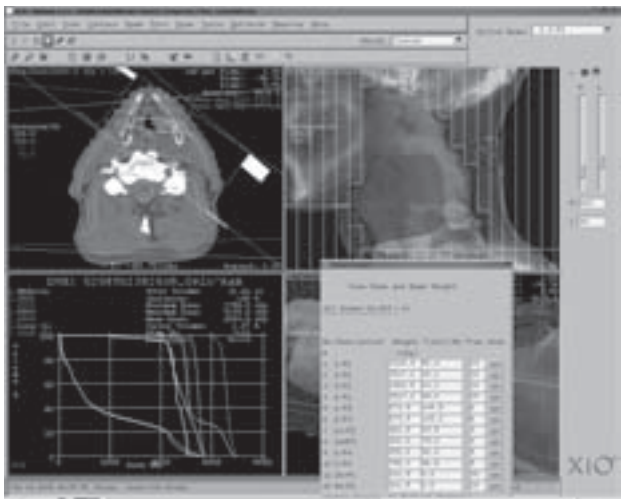

Figure 6.

1). Avoiding the usage of two isocenters increases the inter-fraction reproducibility of the treatment plan (5). The choice of the isocenter location was further limited by the separation of the two PTVs, which required treatment with maximum field opening of 40 cm (Figure 2). Technical limitations of the accelerator further prevented the usage of wedge filters on such large field openings, and limitations of the linear accelerator (maximum of 10 cm leaf overtravel) further complicated the planning process (Figure 3).

In addition, one of the problems that occurred in the region of the PTV's overlap was the different photon beam energy required for each PTV (Figure 4). The optimal energy for esophageal and hypopharyngeal PTV is 18 MV and 6 MV, respectively.

During the planning, special care had to be taken to properly perform junctions of diverging treatment fields, so as to avoid any dose hot or cold spots. (Figures 2 and 6)

The treatment plan for the first course consists of two beam groups. The group for the oesophagus consists of four beams in "inverted peace" configuration (290, 0, 70 and 180 degrees) (Figure 5), while the group for the hypopharynx consists of three beams in standard "T" configuration (90, 270 and 0 degrees) (Figure 6).

The second course is implemented with two separate isocenters for each tumor mass. Boost configurations were designed in tangential configuration for the hypopharynx and "inverted peace" configuration for the esophagus, both in order to limit the dose to the spinal cord.

In the course of planning, a CT simulator Siemens Somatom Sensation Open was used for CT simulation, CMS XiO 4.3.1 planning system for treatment planning and dose calculations, while the treatment was performed on a Siemens Primus Plus linear accelerator.

CONCLUSION

Despite irradiation of the large target volumes and concomitant application of chemotherapy, the patient C.R. took the entire course of primary radiotherapy well and without a necessary recess. The patient was discharged with his general condition improved.

At the control visit three months after the completion of radiotherapy, the diagnostic evaluation showed a good response to the implemented therapy. Hypopharyngeal tumor regressed completely, without any signs of residual disease. Esophageal neoplasm showed only partial regression, but the clinical improvement was significant. The patient could swallow without any difficulties, gained weight and was feeling well in general. We may conclude that the result of the aggressive course of radiation we conducted is an optimal and satisfying option.

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Author's address: Zrinka Trstenjak, M.D., Department of Radiation Oncology, University Hospital for Tumors, Ilica 197, 10 000 Zagreb, Croatia