VRIJE UNIVERSITEIT

Volumetric modulated arc therapy for stereotactic body radiotherapy:
Planning considerations, delivery accuracy and efficiency

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad Doctor aan
de Vrije Universiteit Amsterdam,
op gezag van de rector magnificus
prof.dr. L.M. Bouter,
in het openbaar te verdedigen
ten overstaan van de promotiecommissie
van de Faculteit der Geneeskunde
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De Boelelaan 1105

door
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geboren te Maleisië
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Volumetric modulated arc therapy for stereotactic body radiotherapy: Planning considerations, delivery accuracy and efficiency

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Nederlandse titel: Volumetrisch gemoduleerde arc therapie voor stereotactische radiotherapie: planning, bestralingsnauwkeurigheid en efficiëntie

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ACADEMISCH PROEFSCHRIFT ter verkrijging van de graad Doctor aan de Stereotactic body radiotherapy (SBRT) delivers a highly conformal and hypofractionated radiation dose to a small target with minimal radiation applied to the surrounding areas. The spine is an ideal site for SBRT owing to its relative immobility, the potential clinical benefits of high-dose delivery to this area, and the presence of adjacent critical structures such as the spinal cord, esophagus, and bowel. However, with the potential for radiation myelopathy if the dose is delivered inaccurately or if the spinal cord dose limit is set too high, proper treatment planning techniques for SBRT are crucial.

Open access peer-reviewed chapter. Spinal Stereotactic Body Radiotherapy (SBRT) Planning Techniques. By Jina Kim, Yunji Seol, Hong Seok Jang and Young-Nam Kang. Purpose: To verify dose delivery and quality assurance of volumetric modulated arc therapy (VMAT) for head and neck cancer. MLC acceleration during irradiation also reduces VMAT accuracy and the greater speed of MLC is mostly accompanied with increasing errors in delivering the planned doses [21]. Film and TLD's energy dependence, fading factor, inaccurate lm processing and TLD readout methods also reduces the accuracy of measurement of radiation doses [22, 23].

[7] Ong, C.L., et al., Stereotactic radiotherapy for peripheral lung tumors: a comparison of volumetric modulated arc therapy with 3 other delivery techniques. [8] Lutjeboer, S., et al., PV-0456: Volumetric Modulated Arc Therapy for patients with bilateral breast cancer. Volumetric modulated arc therapy planning method for supine craniospinal irradiation. Jianzhou Chen & Chuangzhen Chen & Todd F. Atwood & Iris C. Gibbs & Scott G. Soltys & Carolina Fasola & Lei Xing. Received: 7 March 2012 / Accepted: 23 April 2012 / Published online: 10 May 2012 # Springer-Verlag 2012. Keywords Craniospinal irradiation . Volumetric modulated arc therapy . RapidArc . IMRT. CSI, on the other hand, represents a challenging site where a systematic procedure for dealing with the disease using VMAT. Volumetric-modulated arc therapy treatment plans were generated using a Varian Eclipse TPS (Version 11.0) with 3 to 4 noncoplanar VMAT arcs, which were in the same geometry as the dynamic arcs in HA plans. Planning computed tomography image slice thickness was 1.25 mm. Density correction was applied and a grid size of 1 mm was used in both HA and VMAT plan dose calculations.

Hybrid arc, VMAT, volumetric-modulated arc therapy. Hybrid arc and VMAT plans, which have similar MU efficiencies, present similar dosimetric results in the fractionated intracranial radiotherapy. Authors' Note. The research was under an institutional review board approved study (#13D.221).