



Helical Tomotherapy and Its Benefits Helikal Tomoterapi ve Sağladığı Avantajlar

Kemal Ekici, Öztun Temelli

İnönü University, Faculty of Medicine, Department of Radiation Oncology, Malatya, Turkey

Dear Editor,

As a result of rapid technological developments in radiotherapy in recent years, a great progress has been recorded from conventional radiotherapy methods to three-dimensional conformal radiotherapy (TDCR) and intensity modulated radiation therapy (IMRT). Reducing the radiation dose affecting normal tissues while increasing the tumor dose, which is also the basic principle of radiotherapy, constitutes the main rationale of TDCR and IMRT. Using these methods effectively with potent planning, increased tumor dose increases tumor control rate and thus the treatment gains while it also reduces toxicity due to decrease in normal tissue dose (1).

The quality controls for each plan and accuracy of the administered doses are determined in IMRT but a single control is not enough for organ motion and setup errors. Developed to overcome this issue, Image Guided Radiation Therapy (IGRT) is a control operation of the two and three-dimensional anatomic imaging operated in the treatment room as well as the treatment area. With a simple definition, IGRT is a treatment application that compares the imaging acquired in the treatment room with the imaging performed before, during, and after the treatment; it is also a way of applying the radiotherapy by considering the accuracy of the applied radiotherapy along with setup errors (systematic and random) and organ movements between fractions. Today, in IGRT, practitioners prefer using kilovoltage (kV-kV) imaging, kV or megavoltage (MV) cone beam computed tomography (CBCT) imaging, kV fluoroscopy, radio-frequency, optical methods, and ultrasonography (USG). MV computed tomography is preferred in helical tomotherapy (2, 3).

The idea of helical tomotherapy was first put forward by Mackie et al. in 1993 (4). Commercially used all over the world nowadays, tomotherapy is a 6MV small LINAC; it is based on the idea that the gantry makes a ring rotation of 360 degrees at an 85cm distance from the main shaft. With this rotation, it is possible to obtain volumetric MV CT images just before the treatment and in the treatment position. After this process, imaging doses reach to 0.5-3cGy (5). Currently there are 9 tomotherapy devices in Turkey and the first university

hospital to establish tomotherapy in Turkey is Inonu University, Faculty of Medicine Hospital.

Prior to each set of treatment, practitioners take CT images in the treatment area, adjust patient's position to validate the accuracy of the position, and start treatment. During the treatment, the multileaf collimator (MLC), gantry, and treatment table move in coordination. Rotating 360 degrees around the patient with a helical movement, the system adjusts the intensity of the beam and performs the irradiation. This enables treatment of tumours in different locations simultaneously. In other words, helical tomotherapy has the capacity to apply irradiation to multiple masses found in various parts of the body at the same time. While other devices treat a mass in a single location during a treatment session, tomotherapy can perform uninterrupted irradiation on a 40x160cm area in a single treatment session in a reliable and accurate way. All these make tomotherapy an effective treatment method especially in whole body irradiation and in cases when the brain and spinal cord need to be irradiated concurrently.

Helical tomotherapy is clinically used in many cancer types. It gives very good results especially in head-neck cancers, brain cancers, prostate cancers, gastrointestinal tumours, and some breast and lung cancer types (Figure 1).

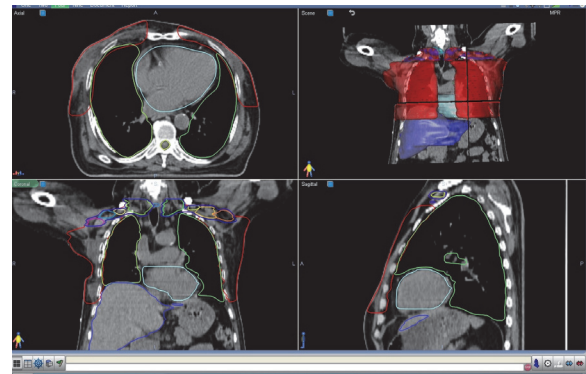


Figure 1. A sample helical tomotherapy image of one of our patients

Today, radiotherapy has become a safer and a more effective method thanks to technological advances in radiation oncology. Providing helical tomotherapy treatment with IMRT and IGRT, we believe that our centre will serve patients in the Eastern and South Eastern Anatolia regions accurately and effectively.

Respectfully,

REFERENCES

1. Meyer JL, Verhey L, Pia L: New Technologies in the Radiotherapy Clinic in Meyer JL ed IMRT, IGRT, SBRT

- Advances in the Treatment Planning and Delivery of Radiotherapy. Karger 2007;1-17.
2. Hurkmans CW, Remeijer P, Lebesque JV, Mijnheer BJ: Set-up verification using portal imaging; review of current clinical practice. Radiother Oncol 2001;58:105-20.
3. Atalar B, Özyar E. Radyoterapide Teknik Gelişmeler ve IGRT (Görüntü Kılavuzluğunda Radyoterapi). Acıbadem Üniversitesi Sağlık Bilimleri Dergisi 2010;1:57-61.
4. Mackie TR, Holmes T, Swerdloff S et al: Tomotherapy: a new concept for the delivery of dynamic conformal radiotherapy. Med Phys 1993;20:1709-19.
5. Ruchala KJ, Olivera GH, Schloesser EA, Mackie TR: Megavoltage CT on a tomotherapy system. Phys Med Biol 1999;44:2597-621.

Received/Başvuru: 18.04.2014, Accepted/Kabul: 22.04.2014

Correspondence/İletişim

Kemal EKİCİ
İnönü University, Faculty of Medicine, Department of
Radiation Oncology, MALATYA, TURKEY
E-mail: drkemal06@hotmail.com

For citing/Atıf için

Ekici K, Temelli O. Helical tomotherapy and business benefits. J Turgut Ozal Med Cent 2014;21:321-2 DOI: 10.7247/jtomc.2014.2055