



ESTRO Technology Transfer Grant (TTG) Report

A report on a recent visit to an oncology institute to gain experience regarding Intensity-modulated radiotherapy and volumetric modulated arc therapy in the treatment of head and neck cancers

Host Institute: Fondazione IRCCS Istituto Nazionale dei Tumori, Via Venezian 1, Milan, Italy

Date of visit: 15/04–11/05/2019

Aim of the visit

This paper is a report on a visit undertaken to a large oncology institute to gain experience in modern radiotherapy techniques, including intensity-modulated radiotherapy (IMRT) and volumetric modulated arc therapy (VMAT) in the treatment of head and neck cancers.

Scientific content of the visit

The Oncology Institute Prof. Dr. Ion Chiricuță is one of the three most important oncology institutes in Romania and a member of the Organisation of European Cancer Institutes, with patients attending from all regions of Romania. According to the Epidemiology Department, each year more than 300 new cases of head and neck malignancies are treated at the Institute; the most frequent are oropharyngeal cancers (90 patients), followed by laryngeal tumours (85 patients), cancers of the oral cavity (55 patients), and hypopharyngeal (50 patients) and rhinopharyngeal malignancies (40 patients).

The multidisciplinary treatment approach to such patients requires radiotherapy to be given, either postoperatively or with radical intention as a primary treatment. Nowadays, IMRT is the standard technique in treating head and neck malignancies, although it is not yet available throughout Europe. With the support from the Ministry of Health and financial assistance from World Bank, the Oncology Institute Prof. Dr. Ion Chiricuță has recently acquired a second linear accelerator (linac), and, in the autumn of 2019, with the advice of other institutes, is planned to implement IMRT and particularly VMAT.

The Fondazione IRCCS Istituto Nazionale dei Tumori, based in Milan, Italy, began using IMRT in clinical practice more than ten years ago, and started using VMAT routinely in head and neck cancer treatment in 2014. During my recent visit there to gain further experience in IMRT and VMAT in preparation for its implementation at the Oncology Institute Prof. Dr. Ion Chiricuță, I was assigned to Dr. Ester Orlandi, radiation oncologist at National Cancer Institute, focused on salivary gland and paranasal sinuses cancer radiotherapy, who coordinated my four-week visit. She introduced me to the rest of the radiotherapy department, and at multidisciplinary meetings. She also made sure that I understood the discussion around each particular case as the conversation,

apart from when it was within our team, was mostly in Italian.

Under her supervision, I participated in initial consultations with patients and in follow-up reviews. I presented some clinical cases at the multidisciplinary weekly meetings and undertook target volume delineation in the cases to which I was assigned. I was provided with institutional and international guidelines on contouring, by using image co-registration from PET-CT and MRI scans. I gained experience in dose prescribing using the simultaneous integrated boost (SIB) approach.

The radiotherapy department of the National Cancer Institute consists of 6 linacs, each treating approximately 30 patients per day with three-dimensional conformal radiotherapy (3DCRT), IMRT, VMAT or stereotactic radiotherapy techniques. In treating head and neck cancer, a dedicated linac is used with on-board imaging, which allows for more precise and accurate treatment delivery; the gantry is able to move through a full 360° trajectory and has automated repositioning.

The major advantage of VMAT treatment is the shorter treatment time and a more precise dose distribution, which is achieved by a varying dose rate, the gantry speed and the incorporation of a multileaf collimator (MLC). The radiation is delivered from a continuously moving gantry, which allows the patient to be treated from any angle. As a result VMAT treatments allow for a greater number of patients to be treated compared to IMRT with the same dose conformity although it requires more laborious quality assurance and quality control measures.

During the final week, Dr. Ester Orlandi took me on a visit to the National Centre for Oncological Hadrontherapy (CNAO) facility, during which we had a multidisciplinary discussion on some clinical cases of salivary gland cancers. We reviewed the treatment planning of some of the cases with the medical physicists, including some plans which combined photon and particle beam treatment, and discussed potential future research directions. Given their relative radioresistance, patients with inoperable, macroscopic residual (R2), or recurrent salivary gland or adenoid cystic carcinomas could benefit from particle radiotherapy. To highlight the potential of particle radiotherapy, we plan to publish a clinical case report on VMAT being used to treat a secondary tumour from a medulloblastoma.

Outcome of the visit undertaken

From the autumn of 2019, the Oncology Institute Prof. Dr. Ion Chiricuță is expecting to implement VMAT treatments,

with tumours of the head and neck being among the first to be treated in this way, rather than the conventional 3DCRT. Besides the practical skills, I feel that I have also acquired the confidence that we will be able to implement VMAT successfully, as a result of the visit to the National Cancer Institute.



During my 4 week visit I was introduced to treatment planning using IMRT and VMAT techniques by the team of medical physicists.



Dr. Ester Orlandi, Dr. Alessandro Iacovelli with the team of residents during discussion of clinical cases





Together with Dr. Ester Orlandi we reviewed the target volume delineation and treatment planning for the clinical cases I was assigned to.



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