TRAINING REPORT
ESTRO TTG

Mr. KENIDA Said
Centre anti-cancéreux
CHU Benbadis
Constantine
Algeria

I am very grateful to the ESTRO of having awarded me a grant of three weeks to attend a training at the radiotherapy department of the Hospital de la Santa Creu I Sant Pau , at Barcelona in Spain.

This training took place in January 2011 and focussed on " quality assurance of treatments units performing IMRT and IGRT ".
In radiotherapy, IMRT and IGRT quality assurance is a part of a required global quality assurance program, which should be performed in routine, and allowing to assure a high accuracy of radiation doses given to patients. This program is well established at the oncology radiation clinic I have visited. It consists of a set of periodical and pre-treatment physical measurements .

The periodical tests include the quality control of treatment units (mechanical, geometrical tests…), the verification of the EPID reliability involving two radiation schemes known as "TINTIN TEST " and "CHAIR TEST", the calibration in absolute dose of the "MAPCHECK" device, and the implementation of in vivo dosimetry with semi-conductors. Pre-treatment verification is performed for each patient and is based on the assessment of gamma index parameter measured with the EPID and the treatment planning system, for each treatment field separately and irradiating at gantry angle fixed at 0°. On the other hand, an absolute dose is measured with "MAPCHECK" for each treatment field and than in a solid equivalent water phantom and an ionisation chamber, and doses measured are compared with those given with the TPS.

The training was very useful in all its aspects and has given me the opportunity to share very nice job time with a helpful team and for whom I am very thankful.

TTG Report

Dr.SHANTANU SHARMA

SMS Medical College & Attached Hospitals Jaipur India

First of all I would like to thank ESTRO for giving me the opportunity to visit a centre of excellence in London. My visit to Royal Marsden Hospital London was a very fruitful visit, all credit goes to my mentor Prof Brada and his secretary Nicola Bixby. My academic schedule was very dynamic and busy as it consisted of learning Radiation oncology as well as the system also. My stay there was comfortable and training consisted of visiting the attached hospitals of Marden as well. The very first day I met Prof Brada at Royal Marsden Hospital Chelsea where I attended the outpatient clinic with him till late evening as clinics here run till late, in the clinic I had got opportunity to interact with Prof ,specialty registrars and research nurse and of course with the patients. Prof. was kind enough to take me along with all of patients in the clinic, I could see the SPR evaluating the patients and then discussing the relevant reports with Prof as well as among themselves and then finally interacting with the patients. I had the opportunity to have discussion at length with James Bedford (senior physicist) and plan a patient with Lung metastasis with him on the latest state of the art equipments and techniques. I had very fruitful interactions with Helen McNair (senior radiographer) who is an instructor for ESTRO courses too. I spent time on machines seeing patients treated with Active Breath Control (ABC) treatments that was altogether a new experience, I could see the radiographers interacting with the patients and teaching them how to use the ABC machine and get the treatment. Again I attended the Lung clinic and had fruitful interaction with the SPR as well as Consultants. One morning time Prof. spared for me exclusively for discussing the current Lung trials at Royal Marsden Hospital as well what we are doing back at my home institution, needless to say Prof is a great man with no egos the way he behaved with me was very nice and he never let me know that I am interacting with such a big man!.

I had opportunity to visit Royal Brampton hospital to attend Lung MDT (multi disciplinary tumor board meeting) there I could see people viz oncologists, chest physicians, cardiothoracic surgeons Radiologists and Pathologists discussing about patients of academic interests. I had opportunity to attend Outpatient clinic with Dr Sanjay Popat (Medical oncologist) again he was king enough with me to discuss all patients with me at length despite of the busy clinic. I had good interaction with the SPR working under Prof Brada to see Lung planning right from getting a CT scan data transferring and contouring on CT scan. I had a pleasant surprise there; I met one old friend of mine Dr Tarun whom I knew from Delhi he was working as SPR in Breast so in free time I could see planning and other aspects of Breast patients too. I had an opportunity to interact with Dr Popat again at Kingston hospital where I attended Chemotherapy and follow-up clinic with him, after the clinic we had a Lung MDT there again we discussed many patients in on a joint forum. I had opportunity to evaluate new patients with Dr Popat the same evening at Kingston hospital itself.

We had a video conference too with other hospitals eg St Georges and others there we discussed Lung patients at a length (again it was a al together a new experience for me). I also had the opportunity to attend Lung clinic with Dr Ahmed, where I saw new as

well as follow-up patients and went to treatment machine along with her for patients under treatment with Active Breathing Control. I had an opportunity to interact with Dr Mike Patridge who is a full time research Physicist with whom I had discussions regarding the running trials in department especially SPECT study predicting the impact of irradiating the SPECT active Lung on long term breathing functions. We also discussed in details regarding dose escalation for Non Small Cell Lung Cancer whether hypo fractionated schedules with a treatment time of 6 weeks or less are predicted to be more beneficial than short hyper fractionated schedules or prolonged conventionally fractionated treatments. I also had opportunity to have discussion with Dr Fiona McDonalds who is looking after the research work with Prof. Brada. We discussed at length some of the newer protocols and planning of patients. All together I had a very nice learning and a comfortable stay at London.

Technology Transfer Grant Report

Name of Technology Transfer Grant receiver:

Malgorzata Skorska, Greater Poland Cancer Centre, Poznan, Poland

Title of project:

Treatment planning and dosimetric Quality Control procedures for Tomotherapy.

Name and address of visited Institute:

UCL - St-Luc University Hospital
10 Av. Hippocrate
B-1200 Brussels, Belgium
Tel: (secretary office): 32-2-764.5431
Fax: (secretary office): 32-2-764.4749

Date of visit:

04 – 10.04 2011

The main objective of the visit was to compare treatment planning procedure for TomoTherapy in two independent centres. I wanted to get familiar with treatment parameters that are chosen (field width, pitch factor and modulation factor) for optimization of head and neck, brain and prostate cancer patients. Moreover, I wanted to learn what optimization strategy is preferred and how Delivery Quality Assurance (DQA) procedure is performed. TomoTherapy is a novel concept of radiation delivery. For this reason, it is very important to have qualified attendants because experience plays a very important role in performing good treatment planning, verification and irradiation. Greater Poland Cancer Centre is the beginner at TomoTherapy, therefore it is important to learn the practical aspects of treatment planning and dosimetric quality assurance from the world class specialists. Additionally I wanted to observe the workflow of Radiation Oncology department in St-Luc University Hospital and compare it to one in Greater Poland Cancer Centre during the Tomotherapy treatment planning. It was crucial to witness the whole process of treatment planning, from the imaging, through contouring, optimisation and plan acceptance to comprehend and transmit it to co-workers. It helped to improve the work quality in Greater Poland Cancer Centre.

During my visit in St-Luc University Hospital I got familiar with treatment planning procedure for different clinical cases: head and neck, brain, lung and prostate. Breast cases are not considered, because both centres perform this irradiation on conventional linacs. For most patients layer thickness during imaging is 3mm, because a margin of this magnitude is applied

to create a PTV. An exception is made for cranio-spinal axis irradiation where only for brain layer thickness of the CT is 3mm and for the rest of the patient's body CT slices are every 5mm. All organs at risk and target volumes are contoured in external software and PRV to spinal cord, brain stem, chiasm and optic nerves is added. For all cases a modification structure of 3cm around PTV is added. Moreover, for pelvic irradiations a 1cm margin around rectum is added to minimize a dose to this organ. The optimization strategy is to keep PTV in agreement with ICRU protocol and lower the dose to organs at risk. This strategy is different in my hospital, as we push as much as possible the dose to OARs and after it we improve the PTV. For this reason optimization of the plan can take around 1000 iterations, whereas in St-Luc University Hospital the optimization is finalized after ca. 300 iterations. In St-Luc University Hospital treatment planning parameters are the same for all cases: field width = 2.5 (for long targets) or 1.05 (for short targets), pitch = 0.287 and modulation factor = 2. This is different in Greater Poland Cancer Centre as we adjust the parameters depending on the complexity of the PTV. However, this usually results in a longer beam-on time. For overlap priorities both centres have very similar strategy. Acceptable doses in St-Luc University Hospital for organs at risk are summarized in table 1. The acceptable coverage of the target volumes is always followed by ICRU protocol.

Table 1. Acceptable doses in St-Luc University Hospital for organs at risk. Dmax is a dose in 1% of the volume, Dmean is an average dose.

Organ at risk	**Dose**
PRV optic nerve	Dmax ≤ 59 Gy
PRV brain stem, retina	Dmax ≤ 60 Gy
PRV chiasm	Dmax ≤ 54 Gy
PRV spinal cord	Dmax ≤ 50 Gy
Salivary glands	Dmean ≤ 26-30 Gy
Lungs	V20Gy ≤ 35% V10Gy ≤ 50% V5Gy ≤ 70%
Esophagus	D33% ≤ 60Gy D66% ≤ 45Gy

	D100% ≤ 40Gy Dmax ≤ 80Gy
Larynx	V45Gy ≤ 5%
Oral cavity	Dmean ≤ 30-35Gy
Rectum	V50 ≤ 50% V70 ≤ 20%
Bladder	V65 ≤ 50% V70 ≤ 35%
Small bowel	V15 ≤ 120cc

Furthermore, during my visit in St-Luc University Hospital I have witnessed the whole process of the DQA procedure. From preparing of the DQA plan, through irradiation of the phantom, to analysis of the verification plan. The DQA plan is prepared for the Cheese phantom (layer thickness of the CT scans is 2mm). Verification is done using film positioned in sagittal plane and 4 point dose measurements in transversal plane. EDR2 films are used to verify only the dose distribution. Absolute dose is verified with ion chambers always (if possible) placed in a high dose region, far away from a sharp dose gradient. Analysis of the films is based on dose profiles and gamma method (dose tolerance = 3%, distance to agreement = 3mm). There is no numerical acceptance criteria for film verification, however the rule in St-Luc University Hospital is that gamma > 1.2 should not be present on the film. For ion chambers the difference between measured and planned dose should not be higher than 5%. However, discrepancy up to 10% can be accepted when the measurement is done in a high dose gradient. For demanding treatment plans like cranio-spinal axis irradiation two DQAs are prepared: the first is for brain verification and the second one for spinal cord. It is important to remember that the distance between green and red lasers cannot be higher than 20cm. Otherwise, the green lasers should be shifted.

Thanks to the opportunity I was able to witness the world class specialists in TomoTherapy treatment process. The experience gained in Brussels is already used in Greater Poland Cancer Centre as we treat a large number of patients on TomoTherapy machine. Moreover, this visit may contribute to introducing stereotactic irradiations on TomoTherapy in Greater Poland Cancer Centre.

REPORT FROM THE VISIT OF MAASTRO CLINIC VIA TTG-ESTRO

Radovan Vojtíšek
Department of Oncology and Radiotherapy, Teaching Hospital Plzeň, Charles IV University
Doudlevecká 69, 301 00 Plzeň, Czech Republic

Between the period May the 30th and June the 10th I visited MAASTRO Clinic in Maastricht, the Netherlands, which was granted by TTG-ESTRO.

MAASTRO is one of the leading radiation oncology department in whole Europe, I think, and this was one of my reasons to visit it. MAASTRO is divided into several divisions – clinic, physics, trials, lab and school. I had the occassion to visit all these divisions, but most of my time I spent in the clinic, which focuses on the patient care and particularly radiotherapy treatment. Their capacity is very interestning, they have 7 linear accelerators (3 of them have cone-beam CT option), 2 CT simulators and 1 PET/CT simulator, several treatment planning systems for different kinds of radiotherapy – IMRT, brachyradiotherapy, radiosurgery, etc.

My visit was focused on the use of PET/CT in radiotherapy planning of non-small cell lung cancer. When I came to MAASTRO on the very first day, I received the programme for whole two weeks, which was very helpful. My days were divided into several sections and I was supposed to stay couple of hours with different people according to their core interests and specializations. I also took part in daily routine practise, meaning visiting CT or PET/CT investigations, discussions about patients´ cases. Of course I was able to create my own treatment plans. I was happy for that, because everytime is better to do anything than just to look a listen. Well, not always.

I was very happy that I could spend some time with people whose articles I have read before and who influenced my work very much. I really think it was extremely helpful and I am glad (again) and grateful that I took part in, thanks to ESTRO.

The last, but not least thing worth mentioning is that Maastricht (as the rest of Netherlands) is very pleasant and easy-going town and from my point of view very nice place to live. I took advantage of „bike-habit“ here and I rented the bike as well, which I used instead of public means of transports.

As a social event I made the trip to Amsterdam and I fell in love, from the first sight.

As a conclusion I have to say that I thank to ESTRO very much that they facilitate such visits for young people and if there will be another possibility to repeat that, I will avail it.

TTG Mobility Grant ESTRO

Ewelina Gruszczyńska
Cancer center and Institute of Oncology, Warsaw, Poland

AKH Hospital Vienna 4-19.06.2011

I visited Radiotherapy Department in AKH Hospital in Vienna from 6 of June to 17 of June. I spent most of the time at the Brachytherapy Department. This Department has three HDR machines (Nuceltron, Flexitron, Varian), one PDR machine, one MRI machine Simens 0.2T and X-ray machine in all operating rooms. They use several Treatment Planning System (TPS) like: Oncentra Brachy 4.0, Oncentra GYN, Flexiplan, Brachyvision, Oncentra Prostate, Variseeds. For most of the systems they have two computers: one for normal clinical work and second for scientific work. They are members of the GEC-ESTRO Group and they are working on new techniques and applications in gynecology. For that reason they do a lot of academic work.

I watched brachytherapy procedures in different localizations. The procedures are almost the same like in Warsaw but there are differences in responsibility of different group of staff. In my department the technicians are responsibility for patient irradiation and for making localization picture (CT, X-ray). In AKH technicians are more involved in planning. They are making some simple plans, reconstruct applicators, do dosimetry. In seeds implant doctor with technician making a plan and physicist checking it before implantation.

For most of the patients at the brachytherapy department they use magnetic resonance MRI on which they make a plan. It is very useful for doctors because they clearly see where the tumour is. Observation at MRI procedure was my purpose because in Warsaw we have started using this modality for gynecology patients. We found a problem with applicator visibility. We use a marker but it is not visible on MRI slice. In AKH they use Oncentra GYN planning system. This system have applicator library which is very useful to reconstruct applicators especially on MRI. They recommend using ready applicator rather than reconstruct it on MRI slice because it may produce big reconstruction errors. They showed me how they did it before they had started to use applicator from library. This information is very useful for us because we have treatment planning system without applicator library.

During my visit I saw how they make a plan for patient with breast cancer. I was especially interested in APBI procedure. The procedures are almost the same as in Warsaw but they use different optimization and they use MRI images to define the target. In my hospital we treat patients using HDR. In AKH they use PDR for treat patient with recurrence. I saw planning for patient with breast cancer as a boost after teletherapy. They give one fraction and technician make standard plan which is checked by physicist before irradiation.

Interesting was to follow gynecology procedure with Hayman aplicator. This applicator is used for treatment of the corpus uteri. We do not have this applicator and for this kind of patients we use Rotte applicator. I saw patient with Vienna ring applicator too. For all gynecology patients they measure the dose in rectum using PTW dosimeter. In my department we used it to measure the dose in rectum in prostate patient. After the change of the technique we stopped to do it. For the gynecology patient after surgery they use standard plan for irradiation as we do in Warsaw.

During my stay at the brachytherapy department I saw two patients which were treated with seeds implant. We use this technique in Warsaw but it is not very common and I wanted to compare our procedure with theirs. In my hospital the common procedure to treat patient with prostate cancer is HDR. In AKH they stopped use this technique and they use LDR

technique only. They use the same seeds from Bebig like we but we have different treatment planning system. I was very interested in measurement of the activity of the iodine seeds and I had possibility to see it. For that they use Standard Imagining HDR 1000 plus 70010 well chamber in sterile conditions. The whole LDR procedure is almost the same like we do but there are same diffenences. They use different activity of the source and different number of seeds. They use X-ray machine during implantation of needles into the prostate. This machine helps them to see if they correct put seeds into planning place. We do not use it. After putting all seeds into the prostate they count seeds under fluoroscopy. After one month later they do CT and postplan dosimetry on it.

I was involved too in measurement at source path in the ring for Flexitron source. They have three dedicated applicators (they removed half of applicator to see source path). We recorded source path for this applicators. We expected, like for Nucletron source, that there will be difference compared with markers source path which we see on images (CT, X-ray, MRI). We saw this differences on recorded tape.

I spent one day on Teletherapy Department. At that Department they have five Elekta machines: three for conformal treatment, one for stereotactic and IMRT treatment with micro-MLC, one for IMRT and one cobalt machine which they use for calibration radiotherapy equipment. They use Monaco, iPlan (Brainlab) and Oncentra MasterPlan Treatment Planning System. During that day I saw how physicist made stereotactic plan for the patient with three metastasis in brain. First patient had magnetic resonans (MR) on which physician contour planning target volume (PTV) and organ at risk (OAR). After that physicists started making plan. They used iPlan version 4.1. It was not standard plan because there were three PTV, three isocenter and two schemes of fractionation: PTV1 received one fraction – 18Gy and PTV2 and PTV3 received two fractions of 9Gy. One week after MR patient started the treatment.

I spent active time at the radiotherapy department in AKH hospital in Vienna. I saw various kinds of applications in different localizations. I learnt a lot during this short time. Thank you very much for allowing me to visit this department.

Summary Report for ESTRO TTG Grant recipient, Dr.Nikhilesh Gajanan Patil .

Dates: 21st November 2011 – 25th November 2011.

Venue: Cancer Institute Gustave Roussy

Address: 39 Camille Desmoulins, 94805 Villejuif , France.

Primary Objective: London Regional Cancer Program (LRCP) has a well-established brachytherapy program and the purpose of this visit was to learn more about MRI guided adaptive gynecological brachytherapy from the world expert Prof. Haie-Meder.

Institute Gustav Roussy (IGR) has done pioneering work since 1921 when the Paris system for brachytherapy was written. IGR has done several implants for various tumor sites and have excelled in the field of brachytherapy. As a resident I always wanted to visit IGR and this dream came true under the auspices of ESTRO TTG grant. During my visit I got to see ample brachytherapy cases. Got an opportunity to follow these cases right from operation theatre to treatment delivery. Picked up some areas where we need to improve on, especially in image quality of the MR scans and applicator reconstruction. Most important part was the tumor delineation that the radiation oncologists have to do. I got first-hand experience to discuss the volumes with the involved physicians at IGR. These simple but practical points are beyond the scope of any publication that one gets to learn by experience. The vaginal mould technique that IGR follows is something unique to this institute that no other centre in the world knows how to do it. It is very patient specific and certainly IGR has maintained the lead in this area.

I got to participate in the brachytherapy tumor board along with Prof. Haie-Meder where we discussed a lot of interesting case scenarios and how she approaches these patients. At LRCP we are now doing MRI guided procedures for all cervical cancer patients. I have taken the responsibility to contour and work on the CT/ MR fusion images for all the cases.

We are interested in participating in EMBRACE study, I have sent out official email communications to the trial managers. We are awaiting there reply.

Apart from cervix cancer I also got to see HDR Intra-operative prostate cases on Monday. I think we have a lot in common and can collaborate on HDR Prostate monotherapy clinical trial.

I was also lucky to see a pediatrics brachytherapy case that had his prostate implanted by Prof.Haie-Meder, this was one of the toughest implant I have ever seen. Not to mention the other brachytherapy that I got to see. I was in the OR every day.

The staff was excellent and everyone was very receptive despite me not being Franco phonic.

Iam very pleased with the visit and I think my objective was well met. We also look forward to send our physics and therapy staff if needed.

Would like to thank ESTRO TTG for supporting this effort. This would not have been possible without your help. We hope to have more collaboration with ESTRO members.

Thanking you

Yours truly

Dr.Nikhilesh G. Patil MD,DNB

Brachytherapy Fellow, Radiation Oncology,

London Regional Cancer Program,

790 Commissioners RD East,

London, Ontario. N6A 4L6

Tel: +1 (519) 685 8650

Fax: +1 (519) 685 8627

Email: drnikhilesh@yahoo.com , drnikhilesh@gmail.com

ESTRO Technology Transfer Grant (TTG) Report

Dr. Alexey Lozhkov

COMPARISON IMRT AND HDR BRACHYTHERAPY TECHNIQUE FOR BOOST IN HEAD AND NECK CANCER PATIENTS

Date of visited from 04 December to 18 December 2011
Institute and country visited:
Institute Universitätsklinikum Freiburg
Address Robert-Koch-Straße 3
D-79106 Freiburg (Germany)
Tel+49(0)761 270-94610
Fax+49 (0)761 270-94720

During my visit to the clinic in Freiburg we discussed together with German colleagues a number of critical issues. Such as the role of CT and MRI in delineating primary tumor and lymph nodes. The importance of position and size of the primary tumor for adequate planning of the boost befor the treatment regardless of the positive in the treatment process. Optimal choice of immobilization with face mask and bite block. Has been demonstrated technology of stereotactic masks. A lot of time was spent discussing the volume of irradiation for different clinical cases and delineation Organs at Risk. Three volumes have been determined.

-PTV1 = primary tumor and lymph complete adjuvant (50 Gy)
- PTV2 = primary tumor and infected LKN 1cm> LKN <2cm (60 Gy)
- PTV3 = primary tumor and infected LKN> 2cm (70-74 Gy)

Criteria was defined to optimize the dose distribution in PTV and OAR for IMRT.

- Spinal Cord max 45 Gy
- Brainstem, optic nerve, chiasm, internal ear-max 54 Gy
- Salivary gland medium <26 Gy, (or 50% <30 Gy)
- anterior mouth area <34 Gy
- mandible max 70 Gy

Significant role in realization IMRT is the implementation of portal images with Cone Beam CT. The optimal frequency of perform of portal images was determined. Perform image the first three days then times per week. Dual registration has been demonstrated with clipbox and mask.

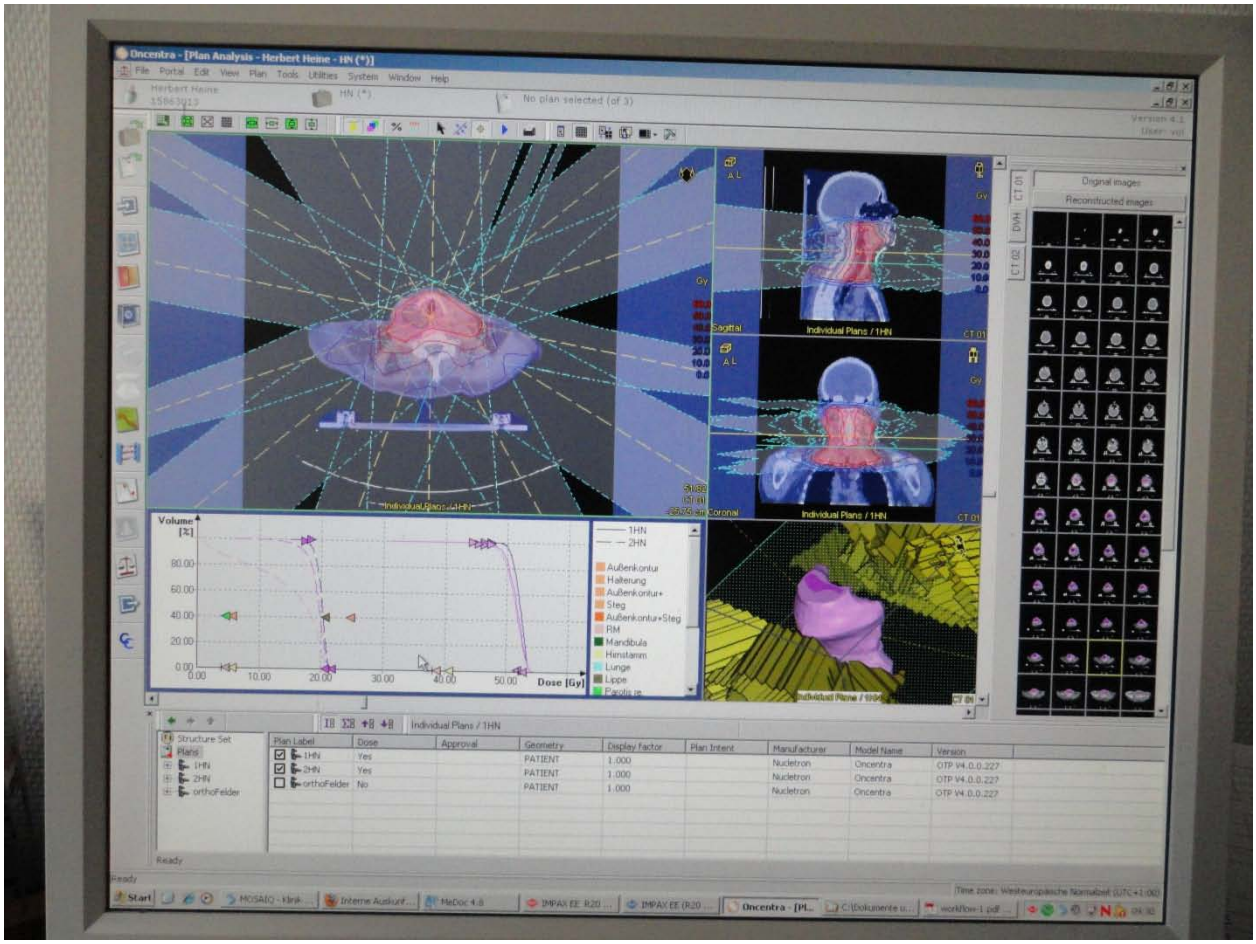
We have also discussed the technique for implantation of different locations, such as the floor of the mouth, tongue, oropharynx, lip and neck. The rules of the Paris system were discussed. It was very interesting to study the use of CT images for planning brachytherapy. Advantages and disadvantages of fractionation regimes were discussed, such as 6 Gy per week with a total dose of 12 Gy and the use of implanted twice. The optimal regime of fractionation was chosen 3 Gy twice a day at intervals of 6 hours with a total dose from 18 to 24 Gy. In this mode implantation is performed only once.

Experience and knowledge gained in the University Hospital of Freiburg will be a good basis for a protocol of our Research for comparison IMRT and HDR brachytherapy technique for boost in head and neck cancer patient. I am grateful to Professor Dr. A-L Grosu for the opportunity to visit the clinic, as well as all employees were involved in my training. Special thanks to Dr. Natalie Volegova-Neher for her special contribution.

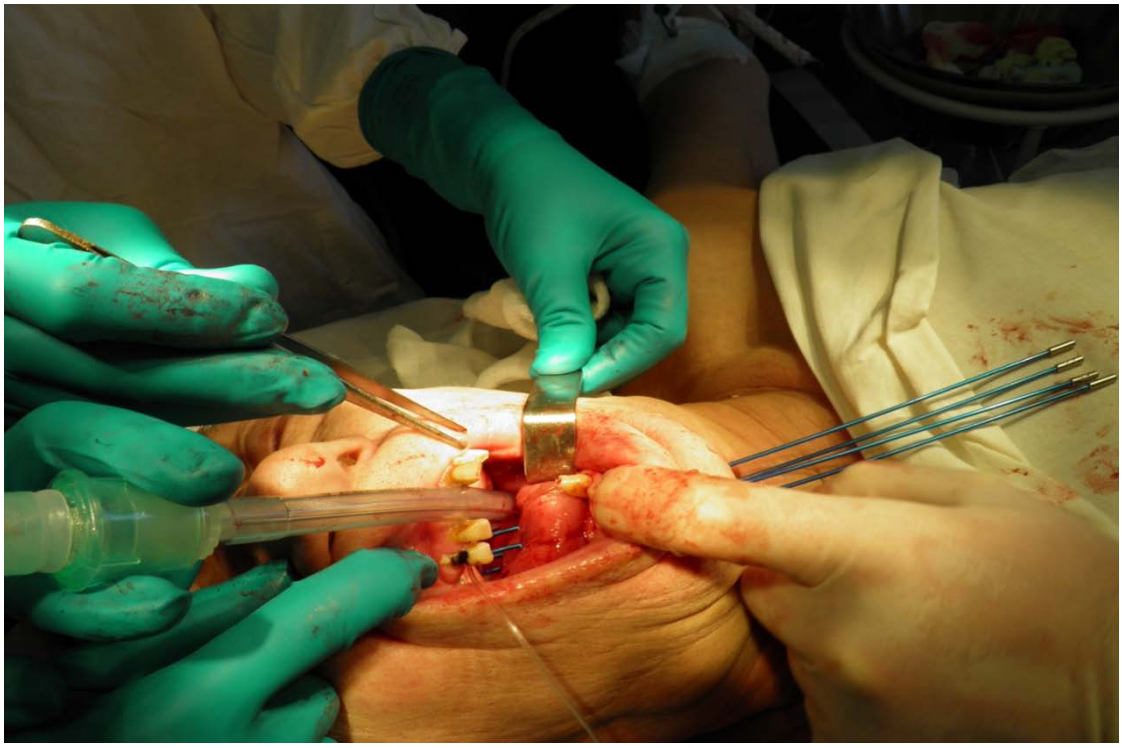
Foto:

General picture of Clinic

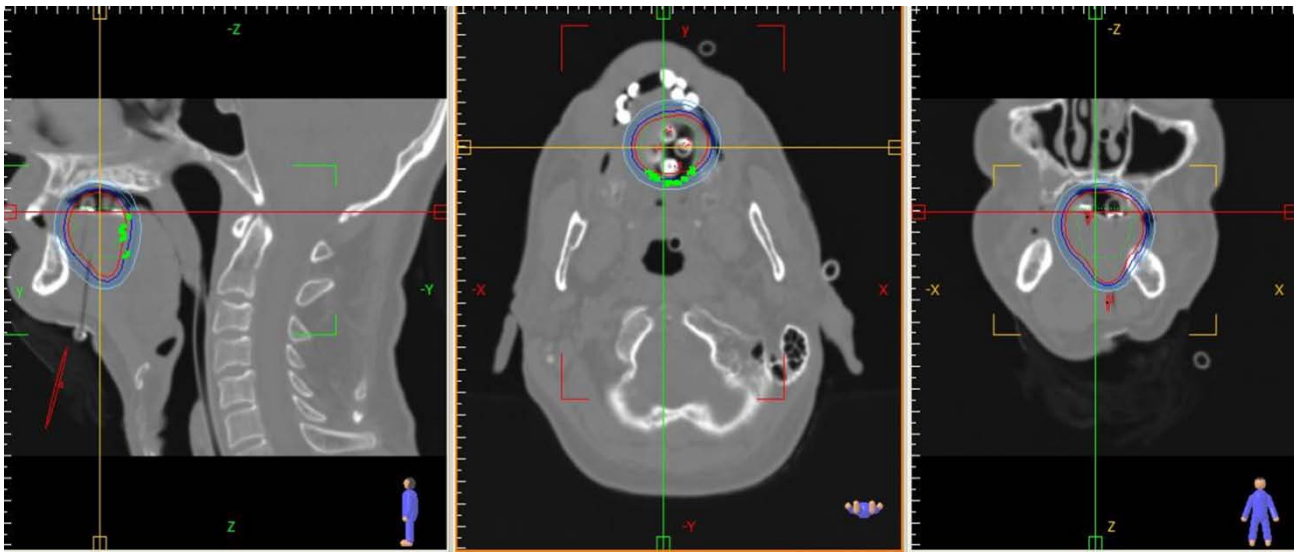
Use of masks for immobilization



IMRT plan estimate



Inserting of intrastats



CT plan of brachytherapy

Dr. Lozhkov Alexey ,
Radiation Oncologist
Chelyabinsk Regional Oncol.Centre
Address Blukhera str. 42,
454087 Chelyabinsk (Russian Federation)

Tel +7 9049777313
Fax +7 351 232 78 79
Email Al615@mail.ru

TECHNOLOGY TRANSFER GRANT REPORT

Sebastian Adamczyk

Name of Technology Transfer Grant receiver:

Sebastian Adamczyk, Greater Poland Cancer Centre, Poznan, Poland

Title of project:

Image-guided radiotherapy: technical and clinical aspects.

Name and address of visited Institute:

ERASMUS MC – DANIEL DEN HOED CANCER CENTER
DEPARTMENT OF RADIATION ONCOLOGY
GROENE HILLEDIJK 301
3075 EA ROTTERDAM, THE NETHERLANDS

Date of visit:

05 – 09.12.2011

The main objective of the visit was to compare clinical applications of image-guided radiotherapy in my home institution and Erasmus MC – Daniel den Hoed Cancer Center.
I wanted to gain some experience in adaptation of radiation dose distribution due to differences in tumor and organs at risk positions between treatment fractions as well as during dose delivery.
Additionally I wanted to find out what is the connection between accuracy and precision improved by doing in-room imaging and reduction of the planning target volume margins around the location (both systematic and random errors).
Modern radiotherapy based on very precise delivery of dose distribution, which is characterised by very steep gradients (often with high fraction doses), requires exact patient positioning. Patient set-up, using skin markers, offers insufficient precision for very complicated treatment procedures. IGRT is a novel concept of radiation delivery based on sophisticated imaging procedures as assistance for precise dose targeting. For this reason, it is very important to have qualified attendants because experience plays an important role in performing good treatment planning, verification and irradiation.

Erasmus MC – Daniel Den Hoed Cancer Center is a place, which makes a constant effort to improve patient care. It is a place in which several IGRT startegies (like ultasound, cone beam CT, orthogonal kV and MV imaging, fiducial markers or CyberKnife tracking) are in constant use and development.

First of all I had an opportunity to discus imaging modalities used in wide spectrum of clinical cases such as prostate tumors, liver metastases, breast cancers, cervical tumors, single vocal cord cases or intra-cranial lesions.

I got to know how the knowledge about advantages and disadvantages of particular IGRT strategies helps with connecting tumor localisation with proper imaging modality.

Very important was the opportunity to observe the whole workflow of Radiation Oncology Department Erasmus MC – Daniel Den Hoed Cancer Center. It was crucial for me to witness the whole process from the imaging, through the image registration, dose distribution verification and plan acceptance to comprehend and transmit it to co-workers. It will for sure help to improve the work quality in Greater Poland Cancer Centre.

Moreover in Erasmus MC – Daniel den Hoed Cancer Centre patients with lung tumor are mostly treated using Cyberknife machine. During my stay I got very detailed explanation connected with practical exercises about treatment planning procedures and different tracking possibilities used for moving target.

What is more I had a possibility to compare the scheme of verification, its frequency and other technical or software modalities used in Erasmus MC and Poznan to find out how in-room imaging process can improve both efficiency as well as efficacy.

Besides the clinical aspects I found that technical aspects of IGRT procedures are also very important in routine work.

I got the opportunity to learn methods (equipment and Quality Control procedures) of verifying the precision of specific IGRT strategies.

What is more people who work in Department of Radiation Oncology develop methods to make patient care as effective as possible. I had an opportunity to got familiar with software development for adaptive radiotherapy including image fusion and rigid / non-rigid registration.

One-week period in Rotterdam was a perfect time to get a general overview about implementation of different IGRT strategies and its schemes used in clinical practice in leading European institute.

Thanks to the opportunity I was able to witness the world-class specialists in IGRT treatment process. The experience gained in Erasmus MC – Daniel den Hoed Cancer Center is going to be implemented in Greater Poland Cancer Centre as we are going to start treatment a large number of patients taking into account target movements.

Sebastian Adamczyk
Medical Physicist in training
Medical Physics Department
Greater Poland Cancer Centre
Poznan, Poland

sebastian.adamczyk@wco.pl

Technology Transfer Grant Report

Name of Technology Transfer Grant receiver:

Vedran Rajevac, Katarina Antunac, Igor Grubisic,
Division of Radiation Oncology, Department for Tumours, University Hospital Center Sisters of Charity, Ilica 197, 10 000 Zagreb

Title of project:

"Improving a quality of the radiotherapy using gold marker in prostate"

Name and address of visited Institute:

Universitätsklinikum Carl Gustav Carus
an der Technischen Universität Dresden
Fetscherstraße 74, 01307 Dresden

Date of visit:

5 – 29.11.2011

The main aim of this multudisciplinary project is to improve the quality of the radiotherapy from the implantion of the golden seeds till the irradiation on the linear accelators. This project involve a different procedure(implantaion of the golden seeds, patient preparation, simulation, delination and dose prescription, planning, plan verification, QA of the patient and irradiation on the linear accelator)

Implantation of the golden seeds:

The golden seeds are implanted one week prior to simulation, on the urology department, 3 gold seeds are being inserted(2 in base and 1 in apex). The procedure and equipment is similar to those used for biopsy, under ultrasound control, through the rectal wall.

Patient preparation:

The patient was prepare in such way that position of the patient itself as well as of the target volume and organs of risk is as much reproducable as it possible. It the radiotherapy department all the procedure was defined by protocoll:
45 minutes prior to simulation patient is requested to empty the bladder and drink 500 ml of water and also bowel should be emptied. As criteria of the empty bowel/rectum is used following limitation: rectuma size on any CT slice should be LL<3 cm and in AP<4.5 cm

Simulation:

Simulation procedure starts on the conventional simulator where is reference point is being determined (5 mm below upper margin of the symphysis on anterior projection and on the anterior margin of the symphysis on lateral projection); afterwards patient goes on CT simulation with distance between CT slices of 2 mm. Outer markers (cca 3 cm long) are being placed on lasers.

Delination and dose prescription:

RTT delineate organs at risk(OAR): bladder, rectum, femoral heads and outer patient contour. Each patient has an also MRI, either performed in outer institution, either here. In latter case, MRI is performed after the implantation of gold seeds; in most of the cases seeds are not visible on MRI.
After CT-MR fusion radiation oncologist contours anterior and posterior rectal

wall separately, sygmoid colon, anal canal, small bowel (in case of lymph nodes within the target volume) and target volumes: prostate +/- seminal vesicles +/- lymph nodes(LN), depending on the risk factors, according to institutional guidelines.
For low risk patients margin on GTV to get PTV is 10 mm in each direction, except towards rectum, here consists of 5 mm; total dose on prostate is 72 Gy. For high risk patients margin on GTV of 3 mm is given to get CTV and then 10mm for PTV (except posteriorly where margin added on CTV to get PTV is also 5mm); total dose on prostate is 76 Gy, last 3 fractions are given with smaller margins on GTV: 5 and 3 mm, respectively.

Planning

For the planning is using or conventional 3D planning or IMRT. 3D planning is performed on the Master plan with colapse cone algoritm, 3D plans usually use 5-7 main direction. IMRT planning is always used when a LN is target volume and also when target volume is concave around OAR. IMRT is done in Pinnacle and checked with Master plan, in the IMRT planning is used 5-filed technique.

Plan verification:

Physicist presents plan to the least 2 oncologists, contours are verified and doses on PTVs and organs at risk are being discussed and, finally, approved. When plan is approved a second physists check a dose in the record and verficaing system(Mosaiq). The criteria of the accepance of the plan is on the radiotherapy protocoll based on ICRU 50 and 62 reports as well as on the literature data on the OAR. For the target volume exist minor tolerance for the cold and hot spot. Dose limitation on the rectum is V70<25%, V60<50% and also on the frontal and back side of rectum. Front side should not receive more than prescribed dose, and on back side of the rectum must exist a region which receive less than 40 Gy. Whole procedure form CT simulation till treatment planning approval lasts about 7 days.

QA of the patient and irradiation on the linear accelator:

On conventional simulator resimulation is being performed and all major fields are checked. Before first fraction oncologist with RTT check position of the patient. Prior to every fraction position of prostate (gold seeds) is being checked with EXACTRAC system. It has 2 RTG tubes in kV region which intersect in prostate region. Beam source is situated in the floor of the treatment room and detector systems are on the ceiling. Received images are being compared to basic ones and system calculates requested movement of the treatment table. These checkups are done every day. For certain proportion of patients that does not get gold markers (about 30%), check ups are done with 4D CT in the treatment room, every day for first 5 fractions and in case of no major prostate movement, further check ups are done also via EXACTRACT but according to bones as reference points. In the department is performing QA program which is applied on linear accelator, CT, conventional simulator as well as on ExacTrac.

Acknowledment:

Thanks to the opportunity I was able to witness the world class specialists in radiotherapy treatment process. The experience gained in Dresden is already used in Department for Tumours, Moreover, this visit may contribute to introducing IMRT in prostate treatment.