patients with locally advanced HNSCC, major improvements were obtained with the combination of concurrent CT and RT (CCRT) providing a substantial and statistically significant improvement in survival and loco-regional control, as compared to RT alone. CCRT has been also shown to preserve healthy tissue in almost two thirds of patients, without affecting survival. However, despite hundreds of clinical trials in patients with advanced disease, there is no widespread consensus about patient selection for altered fractionation regimens, type of chemo-radiotherapy association, radiation/chemotherapy dose schedule in LA-HNSCC. The state of the art of radiobiological models for tumor control and toxicity after CCRT will be presented together with methods of BED calculation. Model parameters will be introduced to be applicable to different chemotherapy schedules. The aim is to highlight the potential convenience of using radiobiology in the selection more effective treatment strategies. As secondary aim BED for combined CCRT with/without hyperthermia (HT) will be introduced to further stress the versatility of radiobiological concepts in predicting patient outcome and improving the efficacy of treatment strategies.

Symposium: Proton therapy, from rationale to planning and delivery

SP-0370 Clinical rationale
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Particle therapy offers distinct physical properties leading to reduction of integral dose. For low-LET particles, biology is relatively comparable to photons, however, if this often cited sentence is correct in detail, it is a matter of discussion. Albert known heterogeneities and differences, altogether, the relative biological effectiveness (RBE) is postulated to be around 1.1. Proton therapy requires elaborate, large and expensive facilities, leading to a cost that is several times higher than advanced photon treatments. Treatment planning for particle therapy is delicate, special knowledge and training is necessary, and caution must be met at all steps. In spite of all these challenges, there is a strong rationale that the physical benefits of particle therapy convert into a clinical benefit for the patient. To date, however, no randomized trial has shown these benefits. For certain indications, the argument for proton therapy is evident, such as some skull base tumors, or pediatric patients, when timely proton treatment is available. Currently, with many centers worldwide, research is ongoing in different disease groups, as well as in terms of further pre-clinical assessment, to define the therapeutic window or proton therapy.

SP-0371 Treatment planning for proton therapy ñ a challenge for the whole team
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The first Scandinavian Proton Centre, Skandionkliniken, is planned to treat its first patient in June 2015; a facility owned by the seven regions with university hospitals. Patients will be referred to Skandionkliniken through these hospitals utilising “distributed competence” [1]. The patients will be prepared for treatment at their “home centre”; immobilisation, CT-scanning and treatment planning will be performed at the university hospital. All treatment plans will be reviewed at joint teleconference meetings [2] prior to the treatment start. The patient and any individual immobilisation device will be sent to Skandionkliniken for treatment. Skandionkliniken will be a “spot scanning only” facility.
In order to prepare for the clinical start and to train a group of medical physicists, dosimetrists and radiation oncologists, working in different centres and with different treatment planning systems, in proton treatment planning we started the Proton School in January 2012 [3,4]. We have had a couple one day face-to-face meetings with lectures and workshops, two four day courses and biweekly teleconferences. The purpose with the face-to-face meetings was to give everyone the same basic knowledge in proton treatment and planning. It also gave the students a chance to get to know each other, which eases the discussions during the teleconferences. Prior to the bi-weekly teleconferences the centres were expected to create treatment plans for selected patient cases in the proton TPS. Also, as preparation for these sessions relevant scientific articles were distributed for discussions in the group. During the teleconferences, the desktop of the proton TPS was shared for everyone to view and/or demonstrate. The teleconferences consist mainly of discussions about the suggested plan solutions, patient immobilisation, margins, dose distributions and plan robustness. The four-day courses were mainly directed to dosimetrists and physicists and jointly arranged with Varian and with clinical experts to increase the skills in treatment planning for protons. Many of the participants of the proton school, has also attended other courses, like the PSI winter school, ESTROs ion and proton course as well as PTCOG meetings and courses.

Still we are faced with challenges; which patient groups do we treat in general, which do we start with? Thinking protons instead of photons has been the greatest challenge for the group as a whole. How do we create the best plan? This includes selecting robust beam angles and thinking about what the protons interact with on its way to the target volume. Discussions about target volumes has been frequent, as the use of them. Delineation is a major issue, not only for CTV/PTV but for other structures the protons might interact with in its beam path, as well as optimisation structures to provide the best plan and thereby "steer" the spots.

The school has worked out well with active participation both in planning and discussing, helping each other in gaining experience in a field where we are novices. An important step is now to use and produce standardized treatment protocols, a treatment planning manual and other types of common instructions and check lists so that all seven centres create plans in the same technical manner.

References
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SP-0372
The delivery of proton beam
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Proton therapy is a high-precision radiotherapy technique. Since 1996, image guided proton therapy (IGPT) has been applied at PSI, using the spotscanning technique. Patients are positioned and imaged remotely at a dedicated CT. In addition, the second generation Gantry 2 with an in-room sliding CT was taken into operation in November 2013. Fixation of the head is achieved by a bite block or mask. In the prone position, we mold a special head support which facilitates a reproducible and comfortable position for fixation. In small children, special care must be taken in forming the moulage to ensure that the airways are kept free. On a daily basis, a patient’s positioning is checked by means of orthogonal CT scout images. When the position is correct, the patient is transported with a robotic transport system to the treatment station, Gantry1, while maintaining the fixed position.

We estimate that our remote patient positioning method facilitates a patient throughput of up to 40% higher than in-room positioning, because the often time-consuming process of positioning and imaging takes place outside the treatment room.

In addition, and in contrast to photon therapy, proton therapy is very sensitive to range changes. It is therefore important that during the daily pre-treatment imaging process, changes in the patient’s anatomy (such as weight gain or loss) or body cavities (e.g. swelling due to sinusitis) need to be monitored and taken into account.

Based on a comprehensive analysis of 300 patients, it has been established that we achieve a positioning accuracy of less than 2 mm for head and neck cases. After almost 20 years of clinical operation, the proton delivery system at PSI has proven its reliability.

In the future, there will be a new challenge: The spot scanning technique will be used with Gantry 2 for target motion, as in the lung.

Symposium: Integrating health economics in research

SP-0373
Why health economics matters in radiation oncology research
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In developed countries, the total expenditures on health care have shown an almost continued increase over the last decades, and, not unexpectedly, the cost of cancer care has not been spared of this steady growth. The economic impact of health - and cancer - care can be measured as total spending, percent of national gross domestic product (GDP), or the cost to care for a single patient.

In 2010, the European Union member states devoted an average of 9.0% of their GDP to health spending, a significant increase from the 7.3% spent in 2000, but a slight decline compared to the peak of 9.2% reached in 2009, consequence of the economic crisis affecting many countries as of the middle of 2008. In Europe, cancer care costs consume about 5% of the global health care budget, ranging between 4.1% and 7%. To the best of our knowledge, radiotherapy only consumes about 5% of the global cancer care budget.

The variation in cancer care expenditures is more striking when focusing on the annual amount of money spent per capita: whereas the European average is 2,441€, some