CASE REPORT: RADICAL RADIOTHERAPY PLANNING TECHNIQUE OF WHOLE SCALP SQUAMOUS CELL CARCINOMA AFTER SURGICAL FAILURE

R. Griškevičius, L. Kasulaitytė, R. Mickevičius
Institute of Oncology, Vilnius University
Squamous cell carcinoma (SCC) is the second most common skin cancer among caucasian population. Despite the fact that these tumours are largely preventable, the incidence of SCC is rising every year, and shows no signs of abating.

While ultraviolet radiation is the most common cause of this type of cancer, other factors including ionising radiation, human papilloma virus, chemical agents, immunosuppression, and chronically injured or inflamed skin also predispose to SCC development.
Clinical background

Patient has been diagnosed with squamous cell carcinoma in 2003. Since then, 5 surgeries were performed and 3 courses of chemotherapy were administered. After last surgical failure, radical radiotherapy treatment was administered.

A combination of two treatment modalities – **IMRT** and **brachytherapy boost**, was developed and performed to achieve radical treatment results for this patient.
Intensity modulated radiotherapy technique (IMRT) has the advantage of modulating photon beam fluence in each treatment field and achieve more homogenous dose distribution in the target volume and fewer doses for organs at risk (OAR).

Brachytherapy boost treatment technique allows increasing dose to unresponsive lesions right after IMRT treatment stage.

The aim of this case was to develop IMRT and brachytherapy techniques for irradiation of big SCC lesions.
Prior to making thermoplastic shell customized helmet was made to smooth patient scalp skin surface and to increase build up region for high energy photons. The helmet was made using fixed thickness dental wax plates. The total thickness of the helmet was 9 mm.
Treatment workflow II

Treatment plans were generated using treatment planning system (Varian Medical Systems, Palo Alto, CA). A dose of 20 Gy was prescribed to the PTV_cervical with 10 fractions and 34 Gy were prescribed for PTV_scalp with 17 fractions respectively. The PTVs were created by adding 1,0 cm margin with adjustment to CTVs in all directions. Outlined organs at risk (OAR) included eyes, lenses, chiasma, optic nerves, and spinal cord.
2 Coplanar IMRT treatment plans were generated for this patient. First phase with a cervical part, and second only with skin of scalp. Both plans had 7 fields each.
The IMRT plans were normalized so that 95 percent isodose was covering 99 percent of target volume. For dose optimization objectives, the minimum dose to PTV was set to be greater than 98 %, and the maximum dose less than 108 %. Additional optimization constrains were set for given OAR’s. Optimized dose was calculated using AAA algorithm.

Patient related IMRT QA was performed before treatment. During the treatment on-line verification was performed with CBCT before every session.
Tumor response was assessed clinically prior to and following boost brachytherapy. Brachytherapy boost was administered right after completion of the last IMRT session. Two personalized dental wax forms were made for contact brachytherapy. 10 plastic catheters inserted among wax plates were used to cover 2 separate lesions.
Total boost dose of 31.5Gy in 9 fractions was delivered to two PTV\_cervical biggest lesions. Target volumes and organs at risk (spinal cord) were delineated following local clinical protocols. Dose was prescribed to both targets, so 95 % of prescribed dose covered 95% of target volumes and maximum dose to 1% of spinal cord volume is less than 45Gy.
Brachy dose distribution
Conclusions

The target volume of whole scalp SCC is very complex. Due to target concave shape and different distance from skin surface it is possible to achieve homogenous dose distribution in the target only using personalized surface compensators and combined modality treatment technique.