

Interstitial and superficial brachytherapy for skin cancer

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Objective.

The main purpose of this work was to demonstrate the capabilities of brachytherapy in skin cancer treatment. Malignant skin lesions are highly frequent type of cancer. Between two main non-melanoma forms, basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), BCC accounts for about 70%, and SCC of about 30%. And while, in our practice, for treatment of SCC in some cases external beam radiotherapy (EBRT) was required to irradiate regional lymph nodes, BCC, which is almost always local, is perfectly suitable for monobrachytherapy treatment.

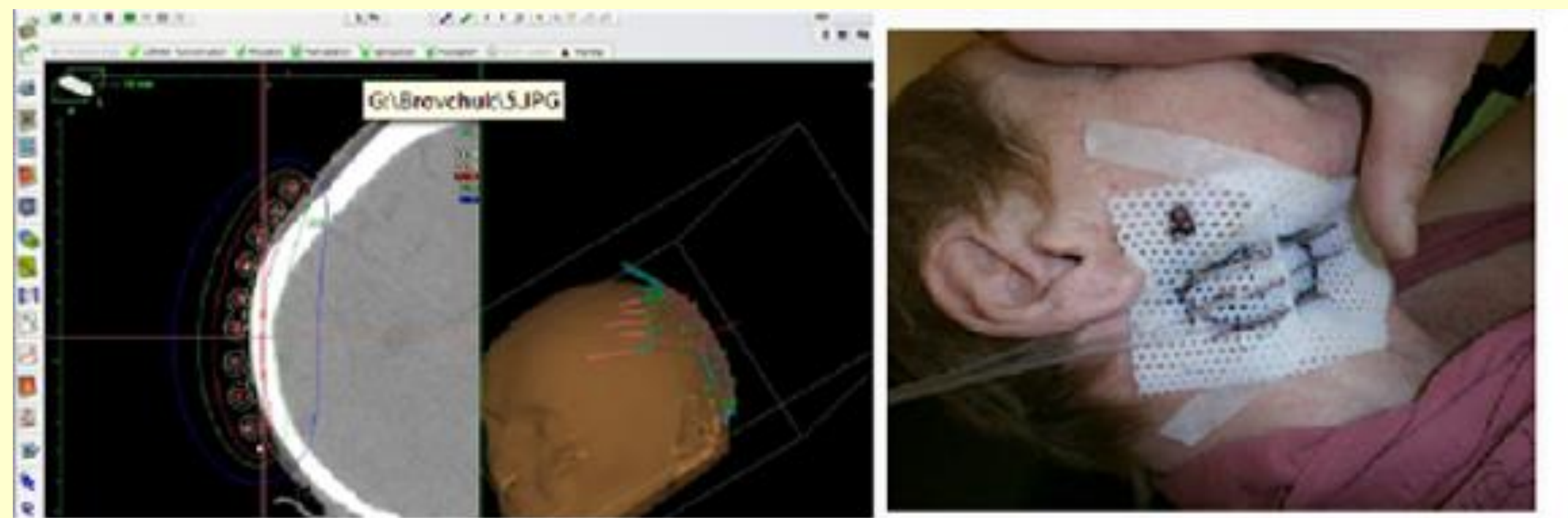
Methods.

In 70% of cases (in our practice more than that) skin tumors are located on head and neck, where high conformity is extremely important. If invasion of a tumor was less than 5 mm deep, accommodated to the surface mold applications were used, if invasion of a tumor 5 mm or more, interstitial implants were used (the examples are presented on following images).

Interstitial brachytherapy :



Superficial (contact) brachytherapy :



Combine method in case of two localizations :



Radiation dose was delivered using high dose rate (HDR) afterloader MicroSelectron from Elekta with Ir192 radioactive source and was prescribed in case of BCC at 0.5 cm from visible lesion (growth tumor volume GTV), the enclosed volume corresponds to clinical tumor volume (CTV), in case of SCC at 1-1.5 cm from GTV the enclosed volume corresponds to CTV (planning tumor volume PTV=CTV).

Dose fractionation (every day treatment, 5 days per week):

for BCC cases - dose per fraction (fr) 4Gy in 2 cases and the total dose (TD) of 48Gy (12fr), 5.2Gy per fraction in 39 cases and TD=41.6Gy (8fr), 6Gy per fraction in 5 cases and TD=42Gy(7fr);

for SCC cases - dose per fraction 5.2Gy in 5 cases and TD=46.8Gy (9fr), dose per fraction in 6.3Gy 2 cases and TD=44.1Gy(7fr).

Equivalent dose to standard fractionation was about 58-60 Gy (a/b ratio was taken 6-7Gy (BCC) and 10Gy (SCC)). Treatment planning was performed on CT images, the ratio of CTV that received 150% of the prescribed dose (CTV_{150}) to CTV_{100} was kept below 0.45 ($CTV_{150}/CTV_{100} < 0.45$), that constrain in interstitial technique, where radiation source is inside the tissue, is achieved when spacing between implants is 1-1.2 cm.

Example of BCC case with 3 month follow up:



Example of SCC case with 3 month follow up:



On the following images SCC case is presented where primary skin cancer was treated successfully, although metastatic lymph node was progressively worse, despite lymph node irradiation with TD of 46 Gy (standard fractionation). Patient came for observation after one year since the treatment.



Results. Totally 53 patients (46 – BCC cases, 7 – CSS cases) were treated according to the described method during clinical work in 2013-2014; median follow-up 2.5 years (range from 2 to 3 years); 4 patients had local recurrence and one lymph node failure (3-BCC cases and 2 (1 local+1 lymph node) – CSS cases).

Conclusions. Brachytherapy method of delivering radiation dose is naturally the most conformal, which also is challenging, but using interstitial implants or accommodated to the surface mold applications, gives good results. Dose per fraction of 6Gy and more lead to higher late complications (fibrosis in our experience).

