

# An Innovative Approach for Treatment of Nonmelanoma of Skin Cancer (NMSC) of Facial Region Using Patient Specific Custom 3D Mold with Yb-169 Novel Brachytherapy Source



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## INTRODUCTION

Patients with cancerous lesions in facial region are reluctant to surgery due to cosmetic reasons and for such patients Ir-192 HDR treatment with surface applicators is treatment of choice. Various investigators have reported that HDR surface brachytherapy gives better outcome as compared to external beam radiation therapy with electrons.

Patient Specific custom mold is designed to deliver uniform dose to tumor volume of curved region as a temporary implant. Each plan is generated to deliver 48Gy at depth in 72 hours implant duration. Each mold is loaded as dictated by treatment planning system to deliver uniform dose to entire target volume

As majority of NMSC lesions are superficially located therefore 100 KeV average photon energy makes Yb-169 more attractive for superficial skin tumors.

## METHODS AND MATERIALS

Ytterbium-169(Yb-169) radioactive seeds have been designed for possible application in brachytherapy. Ytterbium-169 emits photons with an average energy of 93 keV and decays with a half-life of 32 days that makes it more attractive as compared to Ir-192 for superficial treatment of skin lesions. This project is designed to evaluate use of Yb-169 sources for the treatment of NMSC of facial region as a temporary implants using patient specific custom 3D mold (PSC3DM). AAPM TG-43U1 recommended dosimetric parameters of Yb-169 are entered in commercially available Pinnacle treatment planning system.

Patient Specific custom mold is designed to deliver uniform dose to tumor volume of curved region as a temporary implant. Each plan is generated to deliver 48Gy at depth in 72 hours implant duration. Each mold is loaded as dictated by treatment planning system to deliver uniform dose to entire target volume. In this project applicability of PSC3DM for Lesions at Nose, Cheek and Chin were evaluated.



Figure 2: CT setup for Lesion at Chin, cheek and Nose.

## Results

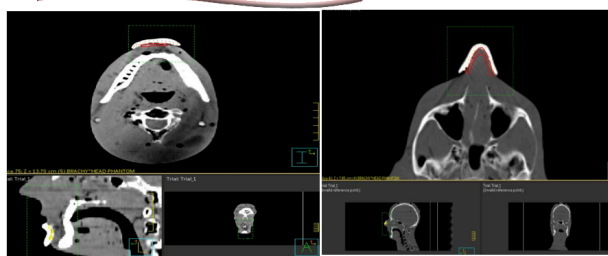
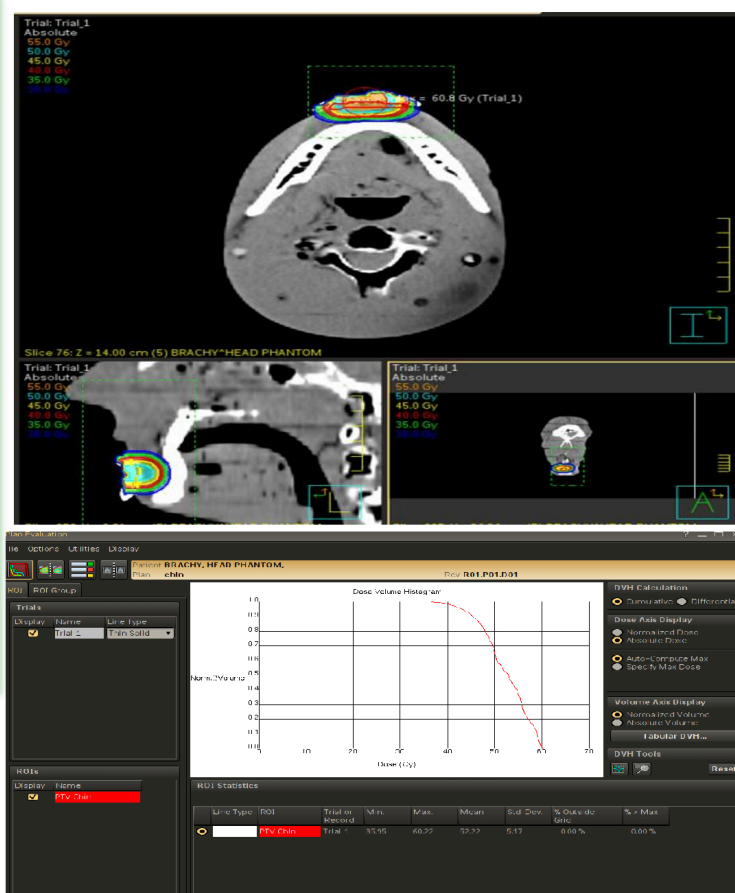


Figure 3: Treatment planning for lesions at nose and chin



Dose distribution DVH of temporary implant for chin is presented above. Results show an excellent conformal dose distribution to the target volume while allowing low dose to adjacent and beneath structures. Similar results were seen for cheek and nose implants. This approach not only provide delivery of prescription dose in a short time but also steep dose fall off to and lower dose to normal tissue.

Use of Yb-169 with 3D custom mold is very attractive option for treatment of NMSC of Facial Region. This will not only provide conformal dose distribution to target area. Our investigations dictate further investigation, including dosimetry, radiobiological, and clinical studies for clinical application of this innovative approach.

## References:

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Figure 1: Skin cancer of facial region, showing lesions at upper lip, cheek, nose and ear.