

2024 World Congress of Brachytherapy **Knowledge Without Borders: Empowering Local** Brachytherapy Through Global Collaboration

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Introduction

The Freiburg Flap applicator (Fig 1), commonly used for skin high dose rate (HDR) brachytherapy, is inadequate in treating lesions between fingers. In this case study, a novel approach utilizing a 3D-printed applicator with Clear Resin material was developed. It was successfully employed at our institute to treat skin lesions of the right hand including the areas between fingers using HDR brachytherapy.

Clinic aim

- T1N0 Merkel cell carcinoma, right hand.
- No prior RT, Rx: 8Gy x 1fx to 4mm depth.
- Treat both palmar and dorsal side of right hand, curved surface.

Materials & Method

- A 10 mm thick bolus structure was created from a body contour of CT images of a patient's right hand with slice thickness of 1.0 mm.
- FDA-approved water equivalent clear resin material.
- Adaptiiv 3DBrachy software was used to design the catheter channels in the bolus structure
- Inter-catheter distance = 10mm, catheter surface distance = 5mm
- The applicator was designed as two separate parts
 - software limitations in creating catheters within complex structure
 - ensure the optimal fit to the patient's anatomy
- Patient was re-CT with applicator and catheters.
- The Oncentra TPS was used for treatment planning

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A Novel 3D-Printed Surface Applicator for Treating Merkel Cell Carcinoma of the Hand with High Dose Rate Brachytherapy

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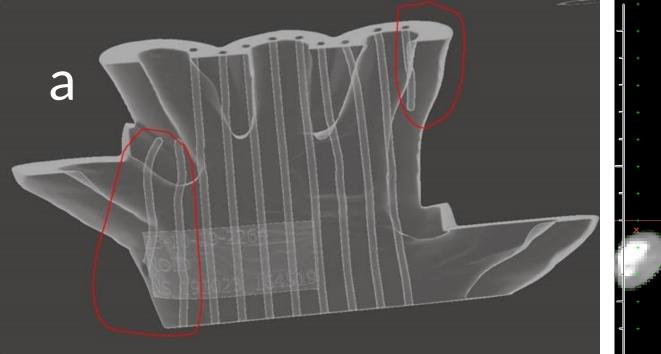
Fig 1. Freiburg Flap applicator was used to treat Cutaneous T-cell Lymphoma at Rt Arm, prescribed to 3mm with $4Gy \times 3$.

- Catheters can be designed with both open ends or one closed end.
- PTV: D95% = 96.7%
- Dmax RtHand: D(0.03cc) = 136% (10.85Gy)
- 27 catheters were used in final plan
- Delivery time = 36 min (~ 5 Ci), 15-20 min for setup
- Easy to verify applicator fitting and catheter position.





Fig 2.3D applicator designed to treat lesions on both dorsal and palm sides of right hand.



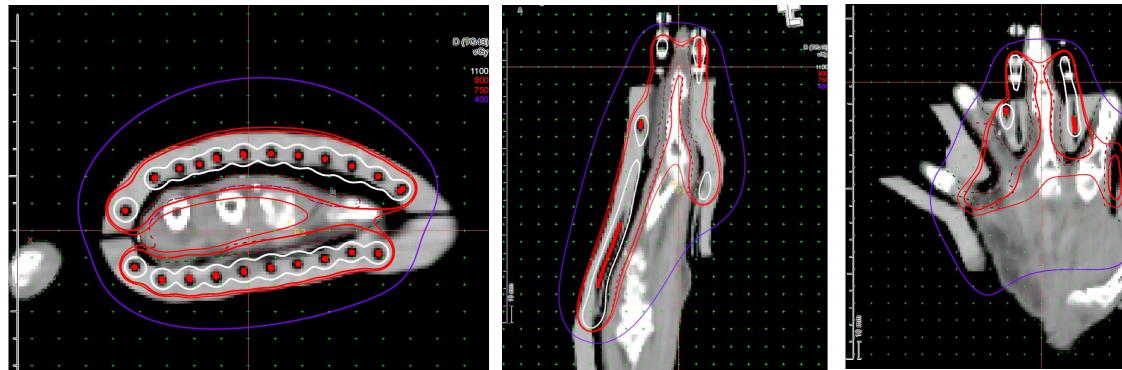


Fig 3.Catheters were designed inside 3D applicator using Adaptiiv 3D Brachy software (a). Axial(b), Saggital(c), and coronal(d) view of planned dose distribution from Oncentra TPS

Results & Discussion

Conclusions

We provide a practical and effective approach for treating complex skin lesions with a Nova Surface Brachytherapy Applicator in HDR brachytherapy. This approach has the potential to successfully treat lesions within narrow space, highly curved areas.

	Freiburg Flap	3D Applicator
Pros	 Treat large area Flexible Reusable 	 Easy setup Reproducibility Comfortable
Cons	Time consumingUncomfortable	 Cost Software

References

Introduction of novel 3D-printed superficial applicators for high-dose-rate skin brachytherapy, Emma-Louise Jones, et al., Brachytherapy 16 (2017), Mar-Apr, 16 (2): 409-414

Custom 3D-printed applicators for high dose-rate brachytherapy in skin cancer, Ismael Membrive Conejo, et al., Brachytherapy 20 (2021) Nov-Dec, 20(6): 1257-1264

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