

INTRODUCTION

Radiation therapy (RT) is a important role in treatments for oral cavity, head and neck (H&N) cancers. However, patients experience significant side effects because of RT. Although Intensity-modulated radiotherapy (IMRT) is used for H&N cancer treatment to eliminate side effects, side effect such as dry mouth, a sore and inflamed throat, and skin change remain.

In this study, we measured and evaluated the dose using 3D printing-based bolus that removes a air-gap generated when irregular surface was treated using a commercial bolus. The purpose of this study is to evaluate the dose distribution using a customized-3D bolus for irregular region.

MATERLALS AND METHODS

Workflow of manufacture a customized 3D bolus

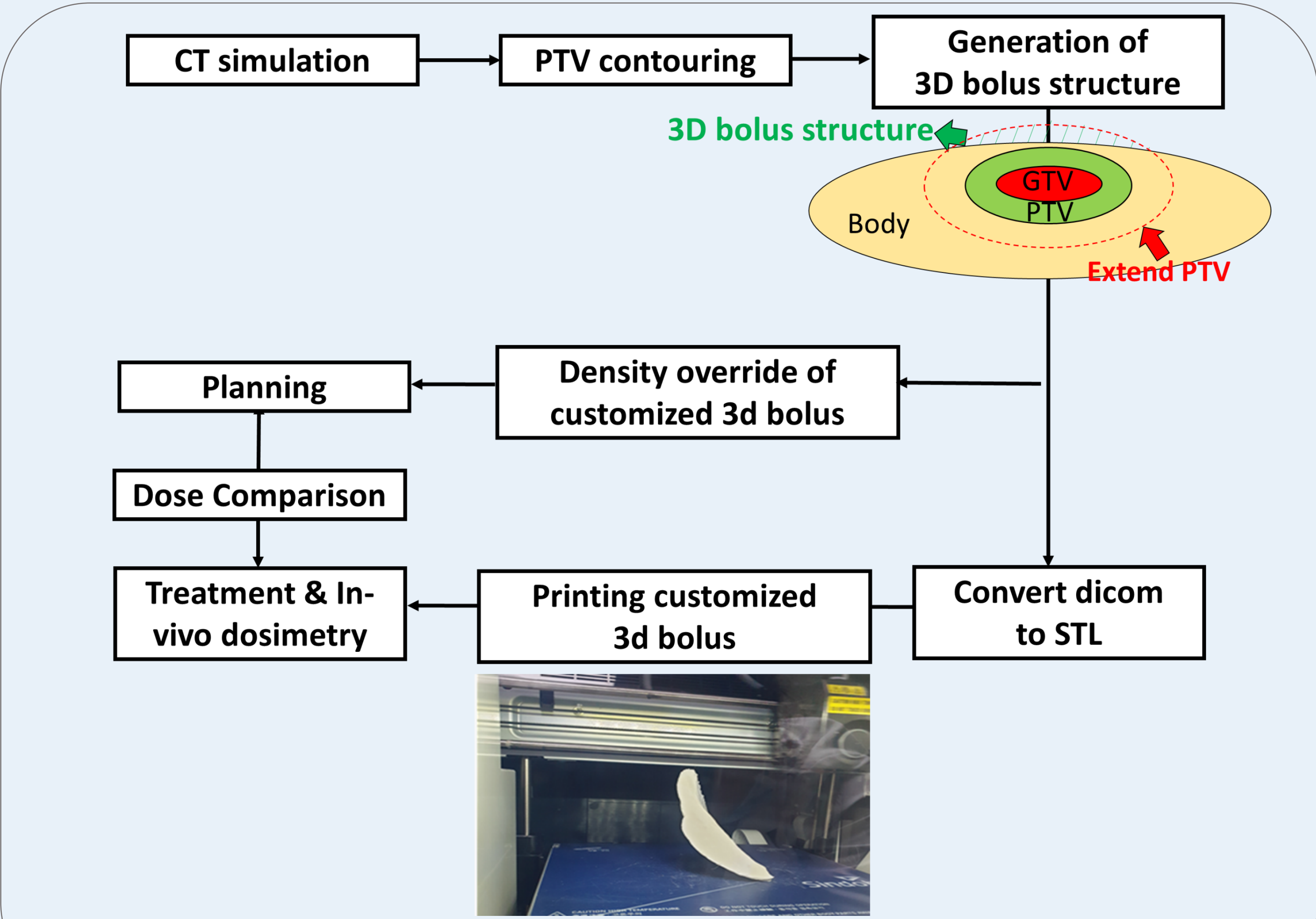


Figure 1. Workflow of manufacture a customized 3d bolus

Patients

Table1. Patient's Information

Patient1 (H&N)	Patient2 (Oral cavity)
- Prescribed dose: 66 Gy/30 fx (fraction size: 220 cGy) - Treatment technique: 2 full arcs, 6 MV - Treatment site: Hard Palate Mass - To reduce skin reaction, a patient who was treated with a full 0.5 cm bolus applied topically to the PTV area close to the skin for treatment	- Prescribed dose : 45 Gy/10 fx (fraction size 450 cGy) - Treatment technique: 2 full arcs, 6 MV - Treatment site: Hard Palate Mass - A patient who was treated by applying a mouthpiece and balloon during treatment. The balloon was replaced and customized 3d bolus was applied to PTV dose build-up and immobilization of tongue.

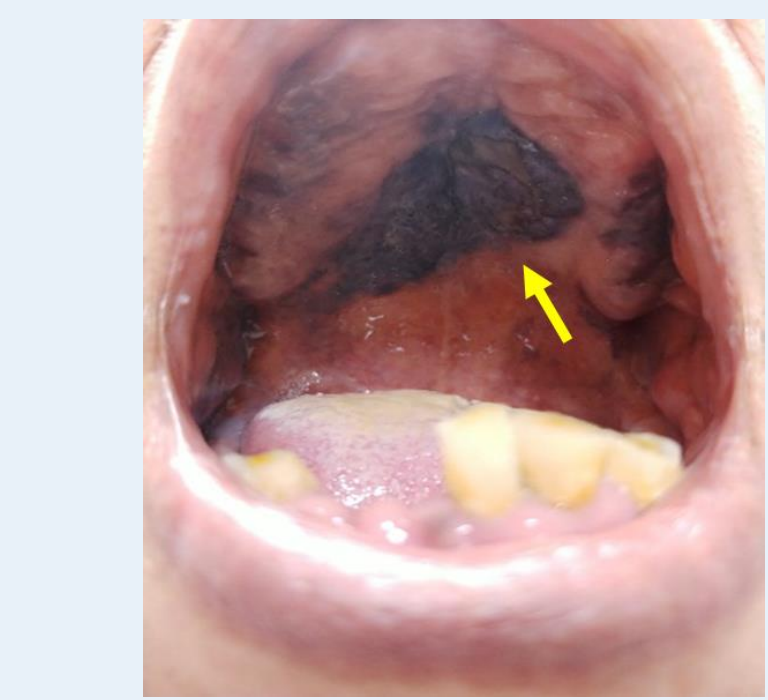


Figure 2. Treatment site of patient2

Dose Evaluation

- In order to find out the bolus thickness that is equivalent to the customized 3d bolus for patient1, it was compared with the commercial bolus.

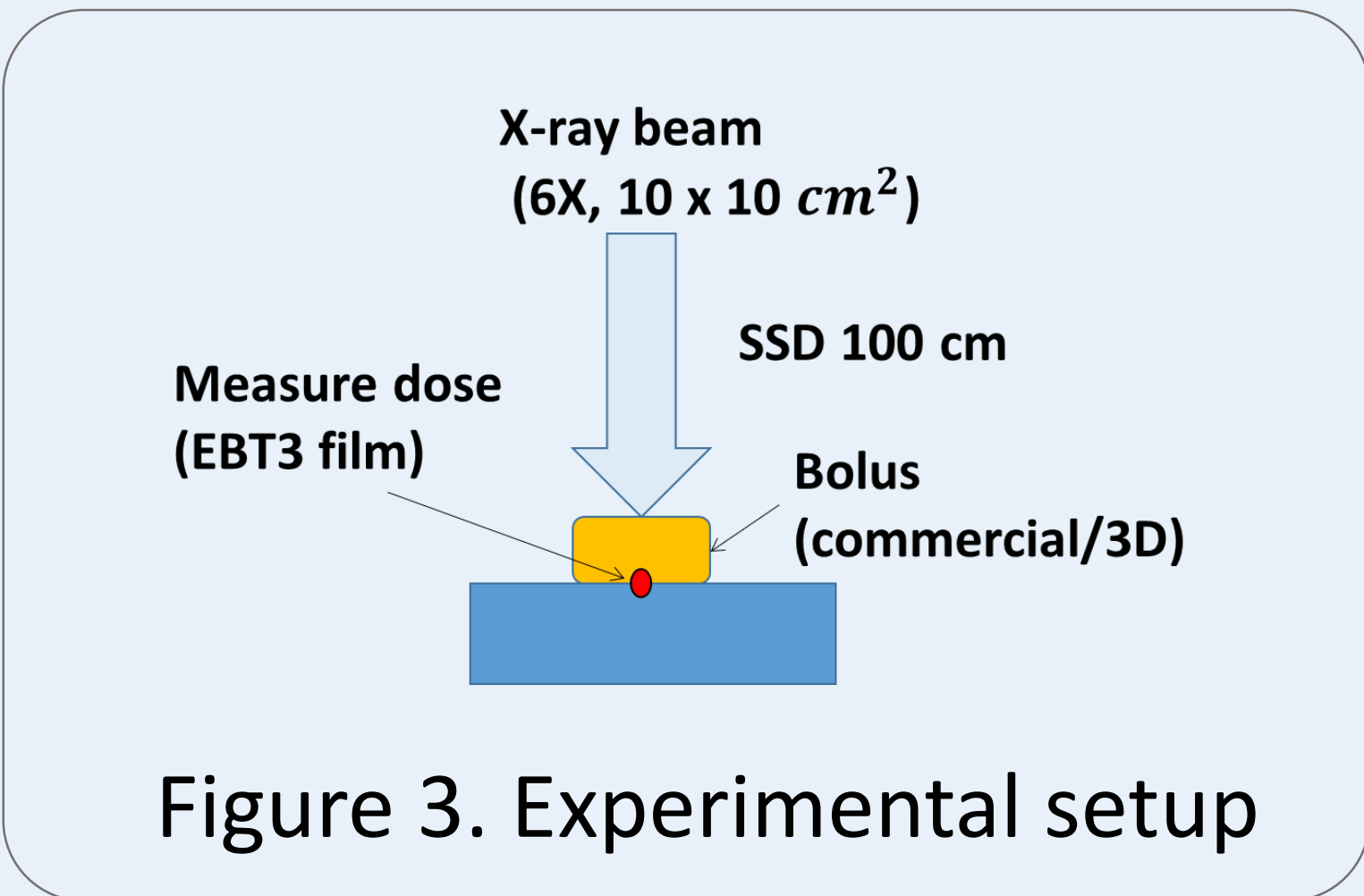


Figure 3. Experimental setup

- During patient treatment, the dose was measured in-vivo dosimetry using EBT3 film.

RESULTS

Patient1

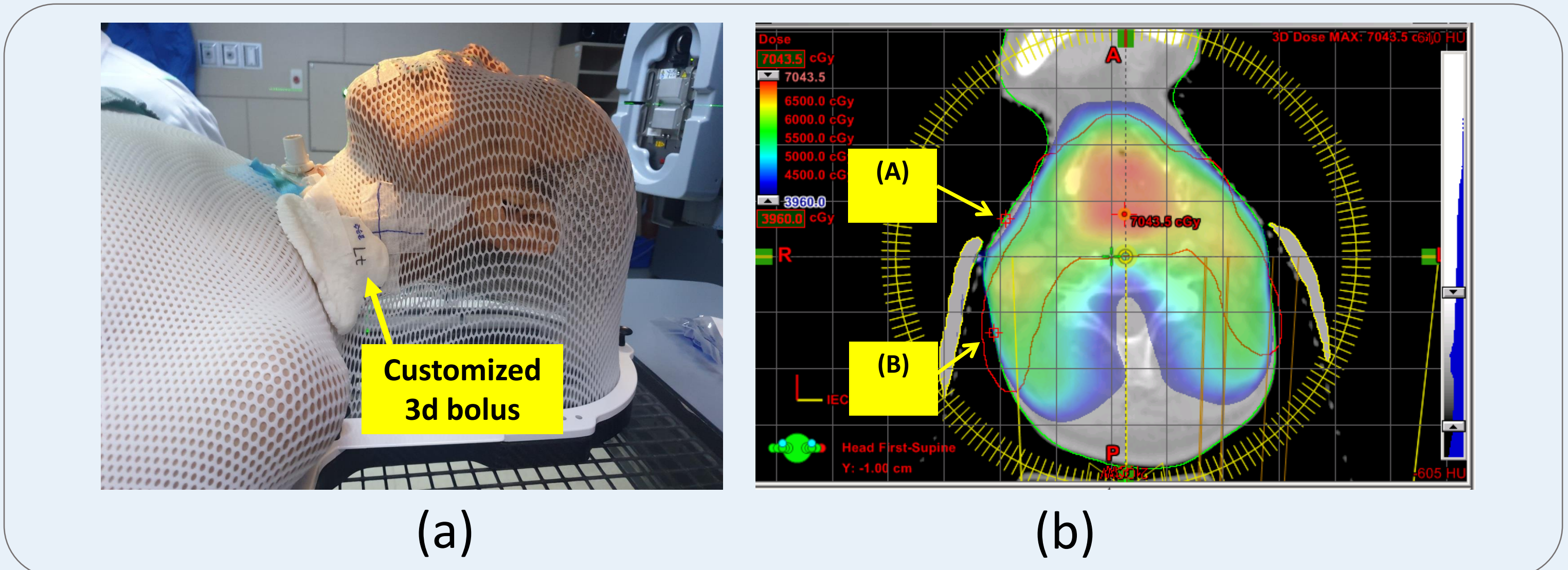


Figure 4. (a) Patient setup and (b) treatment planning

Table2. Relative dose comparison of in-vivo dosimetry for patient1

Relative dose compared to prescribed dose (%)				
Area	0.5 cm Bolus	Plan Customized 3d bolus	Meas. w/o Bolus	Meas. Customized 3d bolus
Skin sparing area (A)	73.0%	73.6%	34.8%	68.5%
Build-up area (B)	82.7%	95.4%	41.3%	91.8%

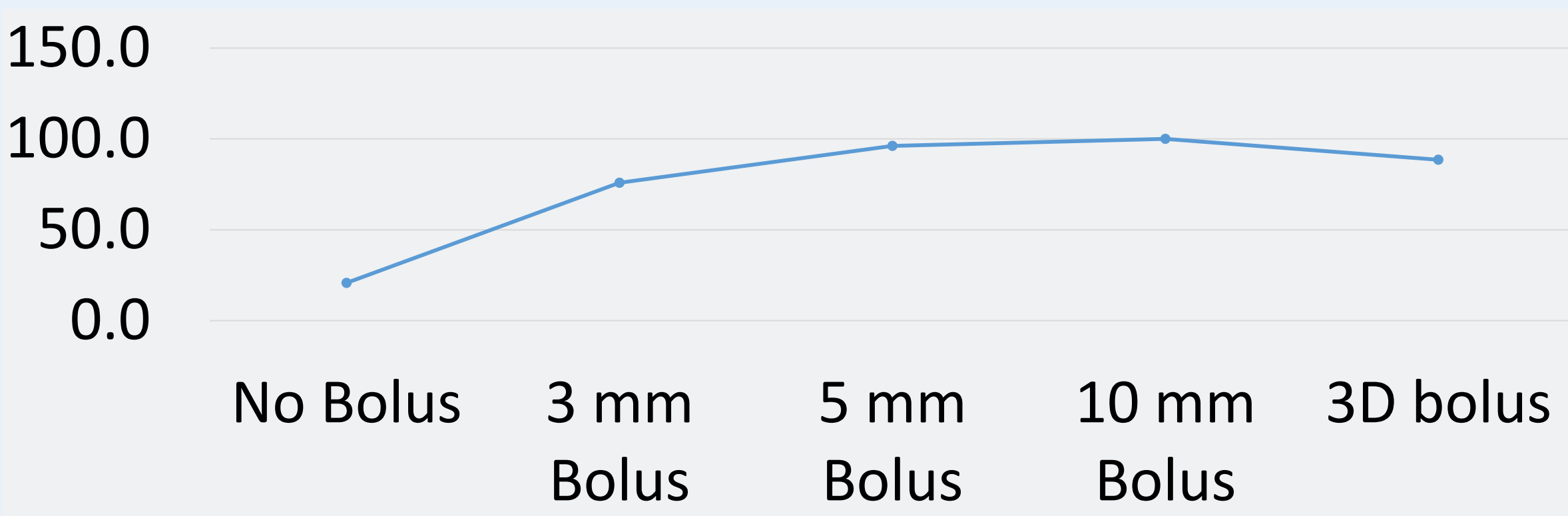


Figure 5. Relative dose comparison with commercial boluses and customized 3d bolus

Patient2

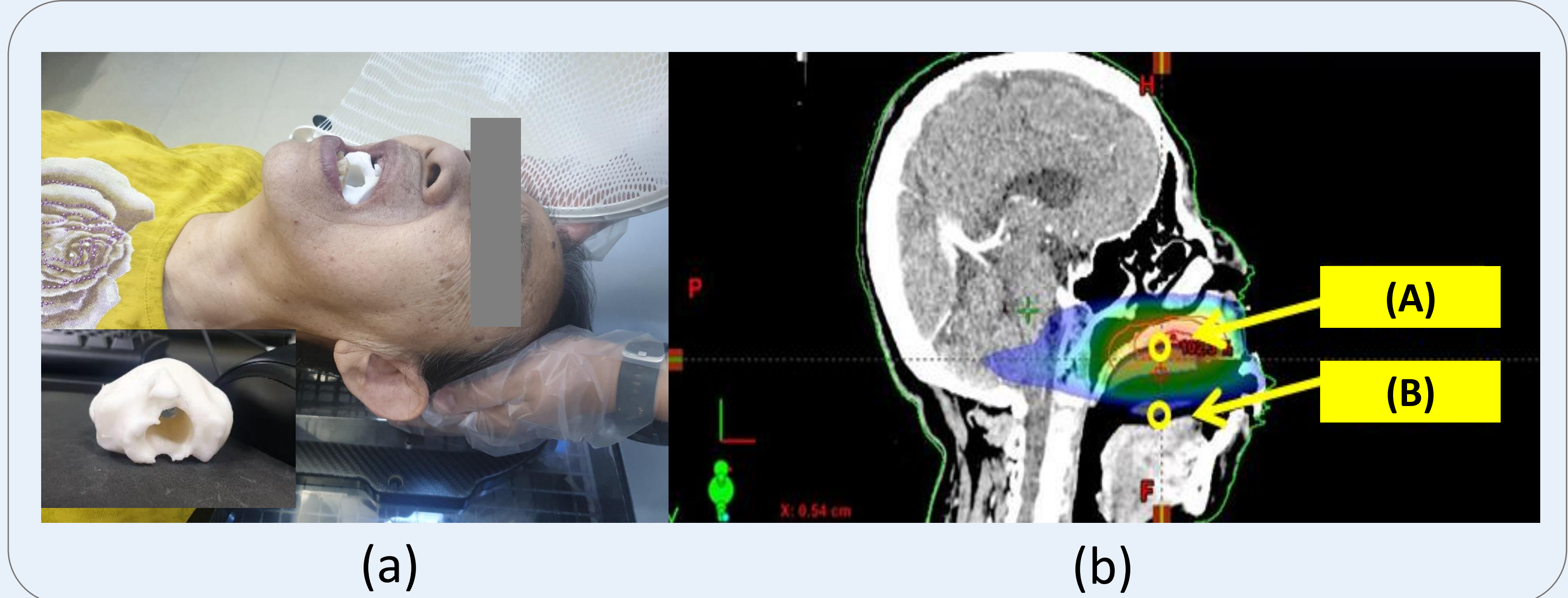


Figure 6. (a) Patient setup and (b) treatment planning

Table3. Relative dose comparison of in-vivo dosimetry for patient2

Relative dose compared to prescribed dose (%)		
Area	Plan	Meas.
PTV (A)	92.4%	93.8%
Tongue (B)	22.5%	8%

CONCLUSION

Using a customized 3D bolus recommends when RT is performed at a irregular surface such as a supraclavicle and oral cavity.