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Maskless H&N treatment using SGRT positioning and intrafraction monitoring

Our objective was to evaluate the feasibility and accuracy of a maskless surface-guided radiotherapy (**SGRT**) workflow in patients with advanced facial squamous cell carcinoma where conventional thermoplastic mask immobilization was no longer possible.

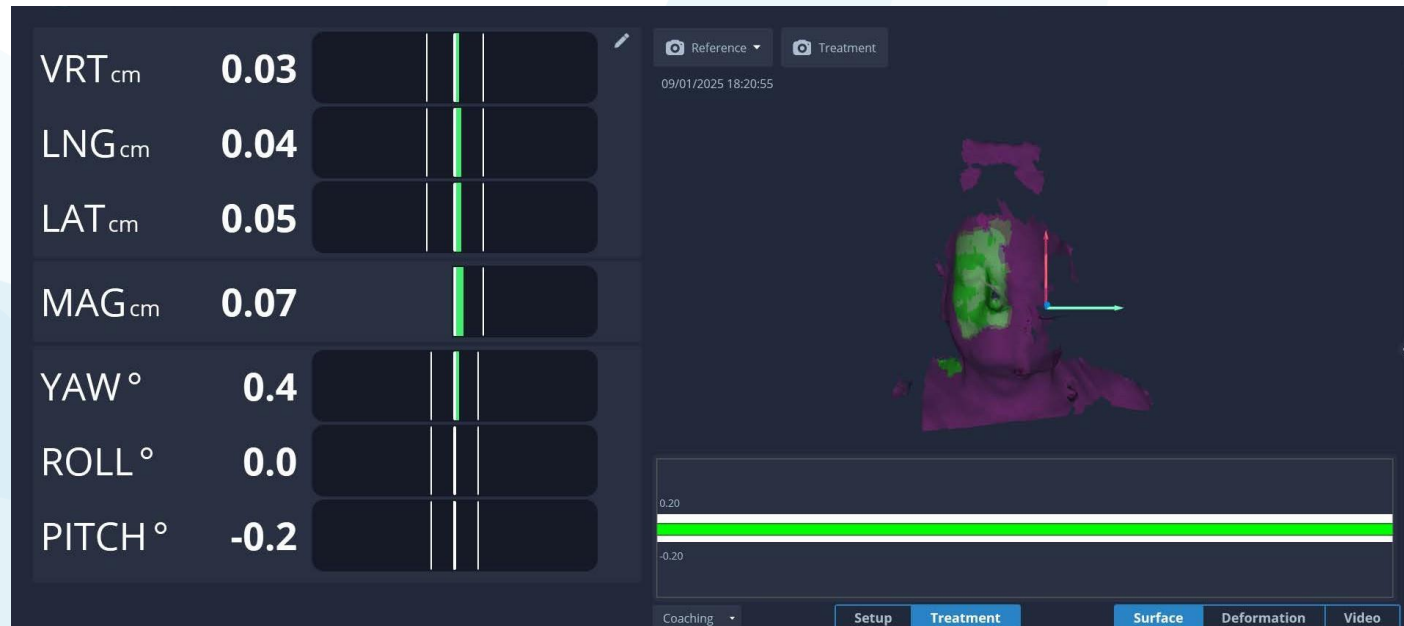
Regarding today's cases: the first patient began therapy with a Head and Neck mask but transitioned to a maskless setup mid-treatment. The second patient underwent their entire treatment session completely maskless .

First Case

- A 73-year-old male with advanced facial squamous cell carcinoma began treatment using a thermoplastic mask. After five sessions, inflammation prevented proper fitting. Treatment continued with a maskless **SGRT** workflow using **AlignRT InBore (VisionRT)**.

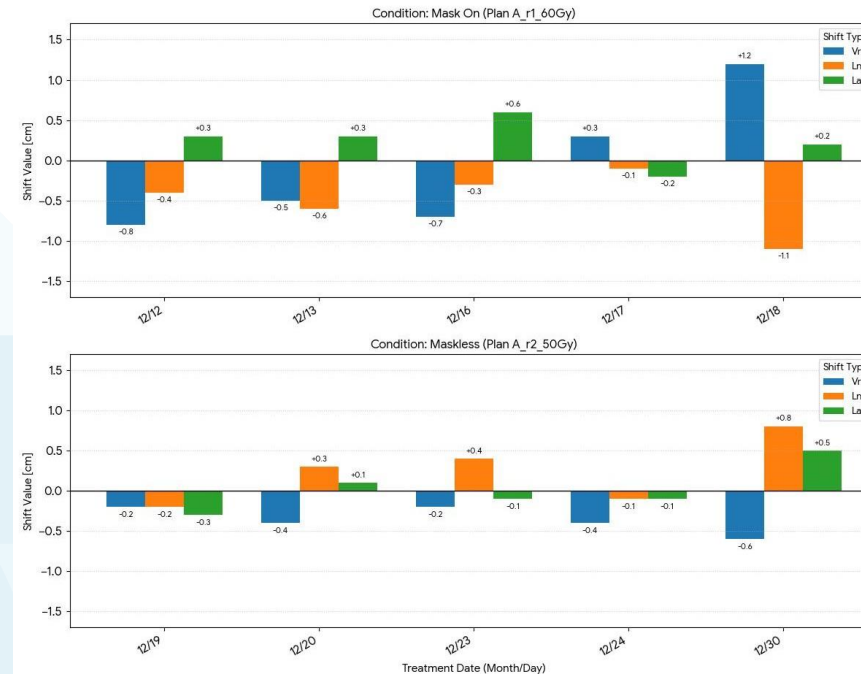


- A non-isocentric **ROI** on the unaffected side enabled real-time six-degree monitoring with beam pauses for deviations >2 mm or $>2^\circ$. **CBCT** verified positioning accuracy before and after the transition.



- **Setup verification:** Mask-based setup required multiple CBCTs in 3 of 5 fractions; maskless SGRT needed only one per session.

- **Accuracy:** Mean displacements improved from 0.23/0.29/0.28 cm (mask) to 0.17/0.22/0.21 cm (maskless), a ~25% reduction.



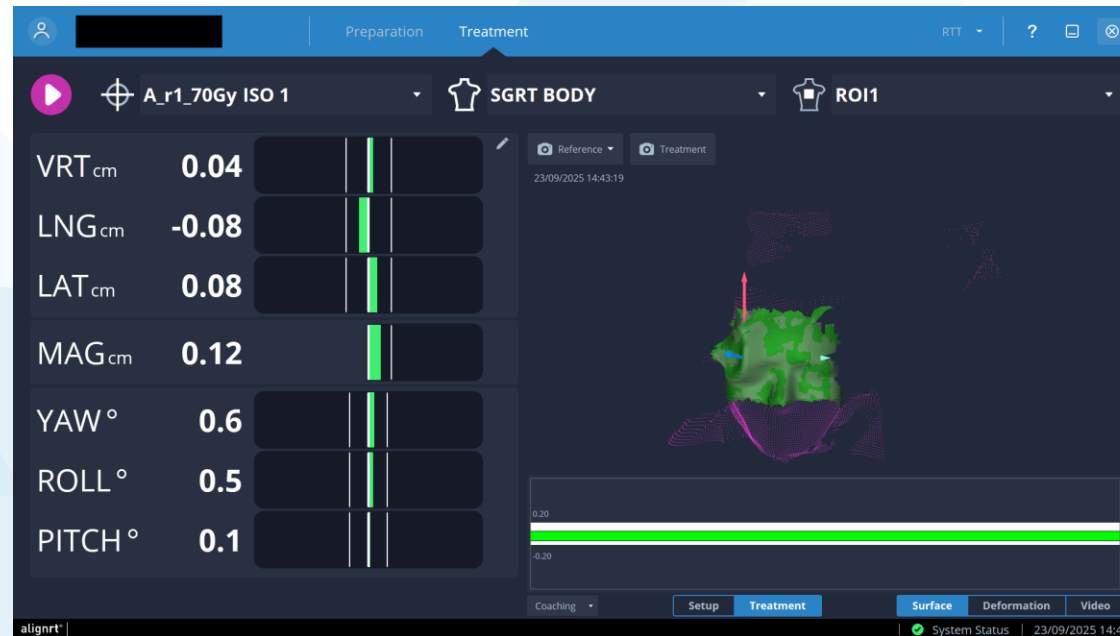
- **Treatment completion:** All sessions delivered successfully, with no interruptions.
- **Patient feedback:** Greater comfort and no motion-related errors.

Second Case

- Given the successful outcome of our first case, we decided to utilize a maskless treatment approach for a second patient who was unable to tolerate or use the Head and Neck mask.
- The second patient, a 85-year-old female presenting with advanced cutaneous squamous cell carcinoma, successfully completed her entire treatment course utilizing a maskless protocol.

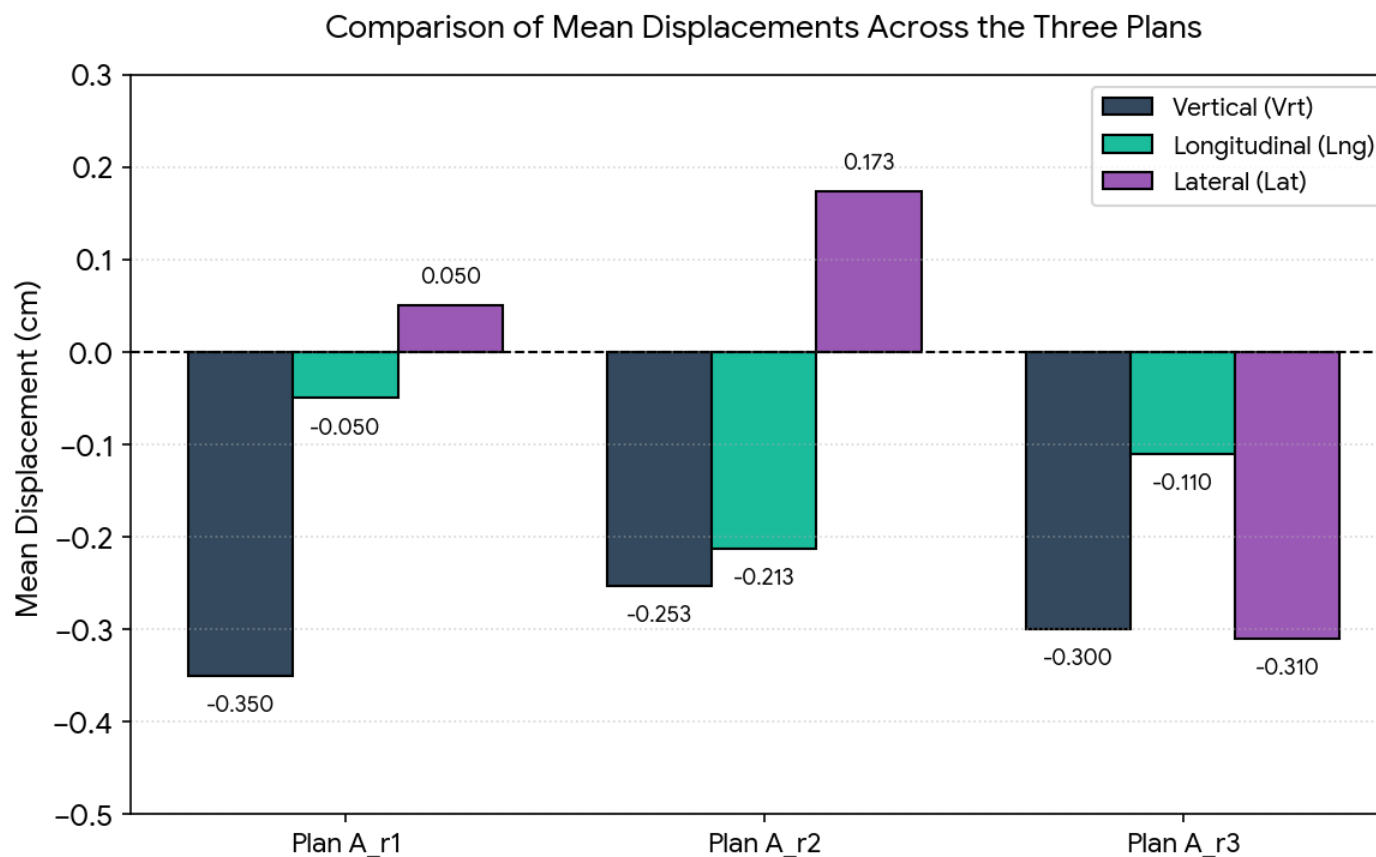


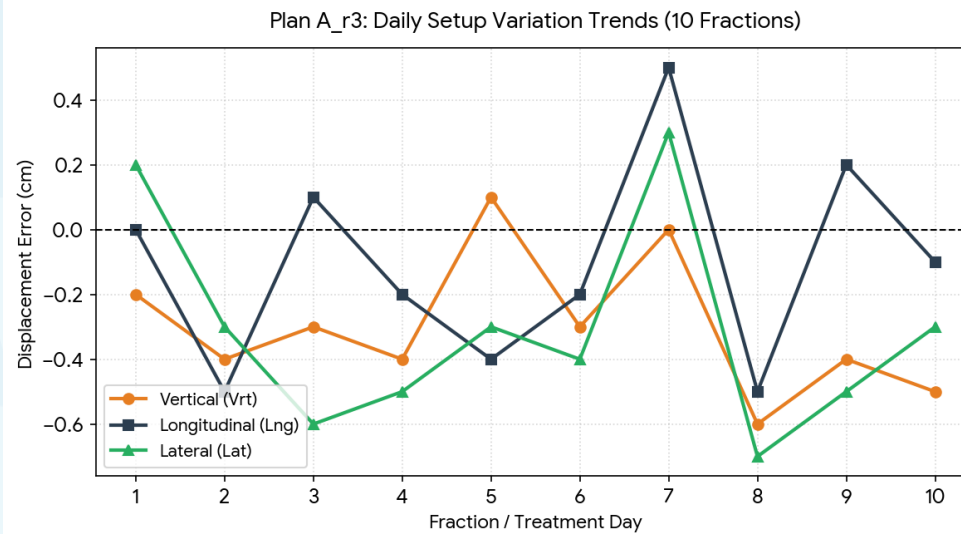
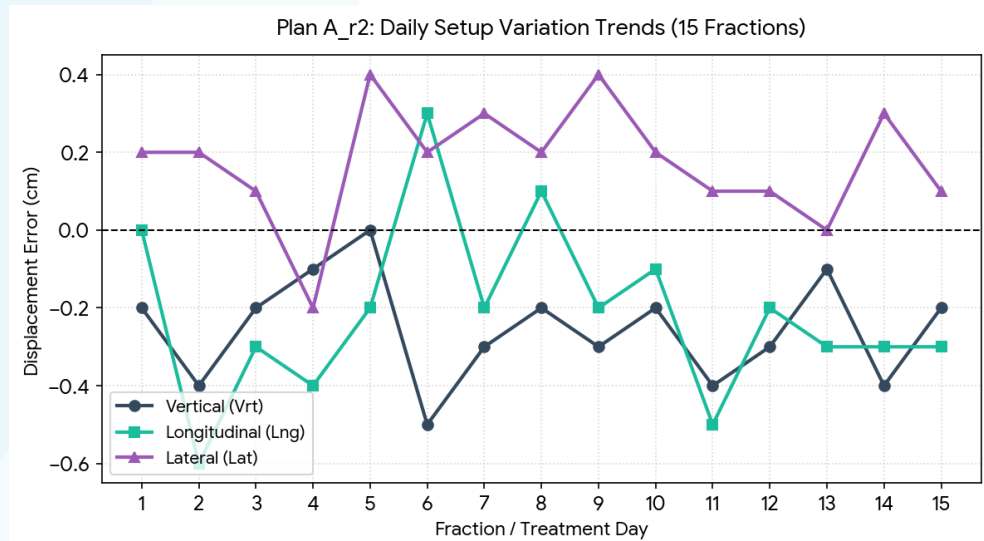
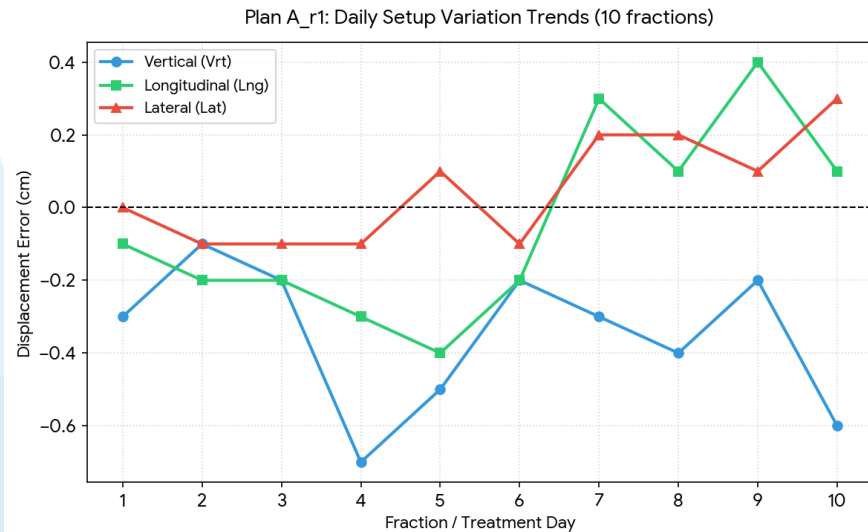
- Real-time, six-degree-of-freedom (**6DoF**) motion monitoring was performed utilizing a non-isocentric region of interest (**ROI**) to alert clinical staff to interrupt the beam for positional or rotational deviations exceeding 2 mm or 2°. Position accuracy was verified via **CBCT** both pre- and post-plan transition.



- **Intrafraction imaging** was highly consistent, with a second pre-plan **CBCT** needed on only two fractions.
- Two adaptive rescans were integrated into the workflow to account for substantial tumor regression.

- Across the three analyzed plans, the mean setup variations were **-0.35 cm, -0.25 cm, and -0.30 cm** along the vertical (Vrt) axis; **-0.05 cm, -0.21 cm, and -0.11 cm** along the longitudinal (Lng) axis; and **+0.05 cm, +0.17 cm, and -0.31 cm** along the lateral (Lat) axis.

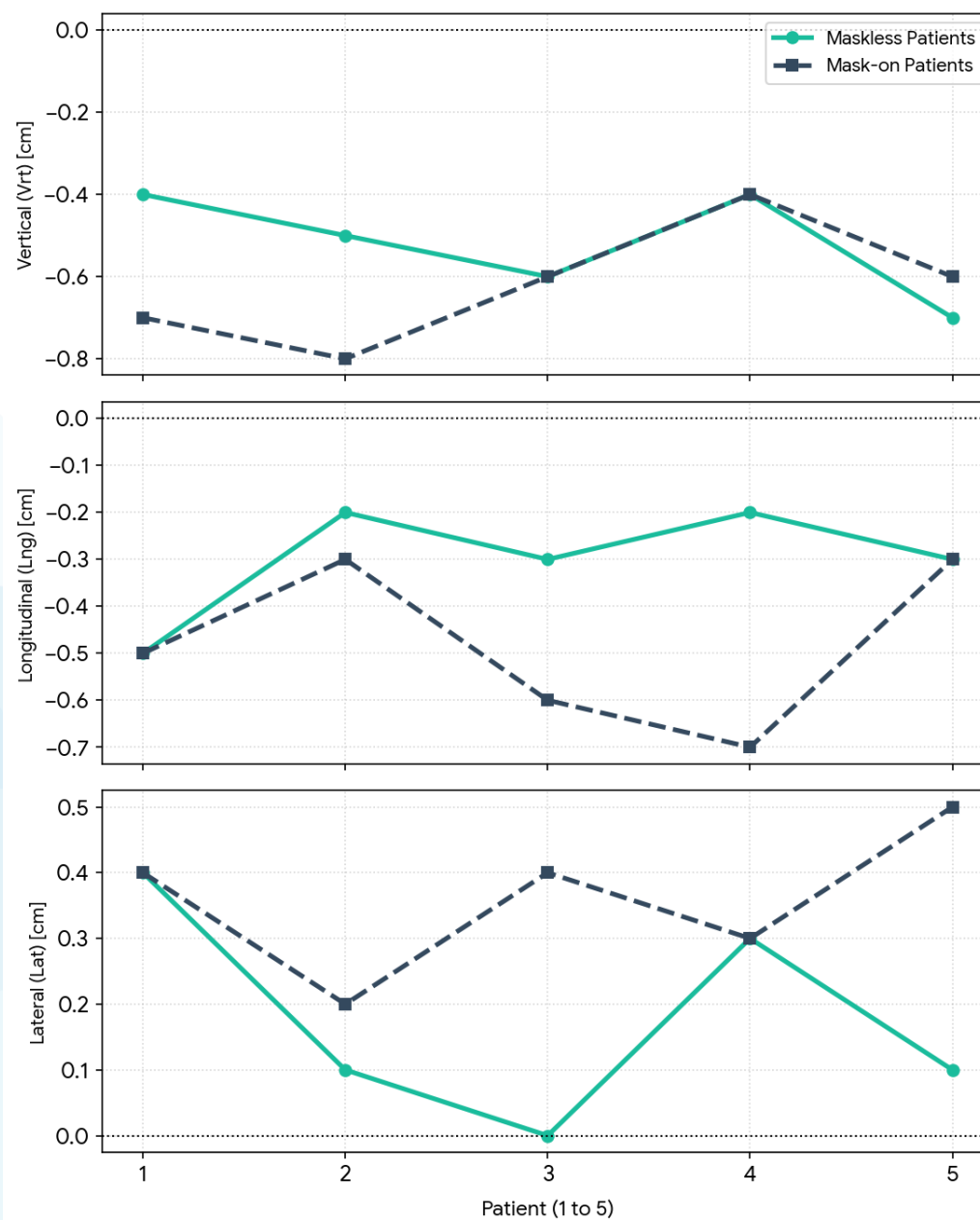




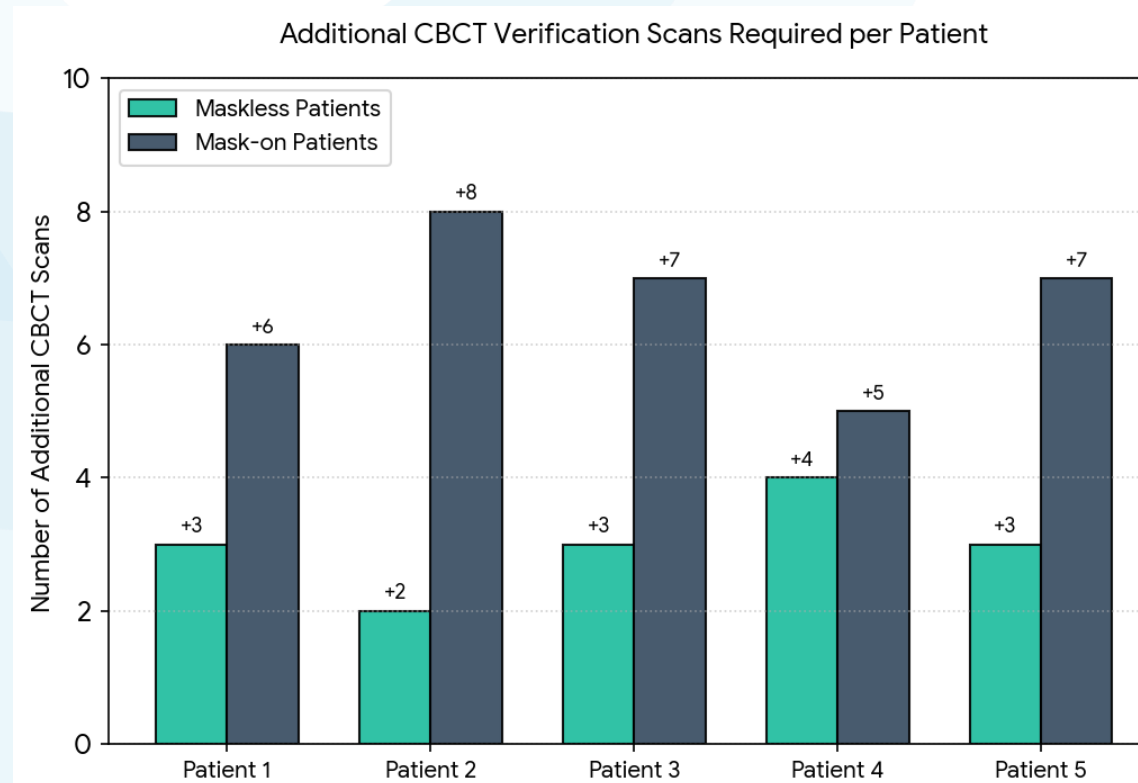
Treatment completion: All 35 scheduled fractions were successfully completed.

- Given the successful outcomes observed in our preliminary cases, we continued utilizing the maskless setup technique.
- This approach proved crucial for treating patients with large facial tumors, those physically or psychologically unable to tolerate conventional masks, and individuals meeting the specific criteria for maskless radiotherapy.
- To quantify our findings, we provide a comparison of mean setup variations and **CBCT** utilization rates between five random maskless patients and five standard mask-on patients.

Patient-by-Patient Setup Deviation Comparison



- Even though there is no substantial difference in the setup shifts applied for patient treatment, the primary distinction lies in the frequency of **CBCT** acquisitions.
- The number of **CBCT** scans required for mask-immobilized patients is significantly higher than for maskless patients.
- **AlignRT** provides a comprehensive solution by operating across all 6 degrees of freedom (**6DoF**), in contrast to mask-based treatments which are limited to only 3 degrees of freedom (**3DoF**).



- **Maskless SGRT** provided accurate, reproducible and comfortable patient positioning in a challenging head and neck radiotherapy case.
- Compared with mask-based immobilization, **SGRT** achieved comparable or improved setup precision and enhanced patient tolerance.
- This approach may serve as a viable alternative for patients unable to undergo conventional immobilization due to tumor burden, inflammation, or anatomical constraints.