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JOINT AAPM | COMP MEETING

Surface Guided Planning with MapRT: Clinical Applications, Workflow Integration, and Institutional Experience

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ABSTRACT

Purpose: As radiotherapy techniques grow more complex, treatment planning increasingly benefits from surface imaging and proactive collision detection. We summarize the clinical applications, reported benefits, and our initial institutional experience with Surface Guided Planning (SGP) using MapRT, a clinical SGP platform that enables non-coplanar planning, clearance mapping, and tighter workflow integration.
Methods: We performed a narrative review of SGP clinical scenarios — Brain SRS, Head & Neck, Lung SBRT, Breast (supine, prone, and DIBH), and an optical-only osteoarthritis workflow — and assessed integration across simulation, planning, and treatment based on early clinical implementation at our institution.
Results: SGP-enabled non-coplanar beam arrangements improved plan quality across sites, including better target coverage, organ-at-risk sparing, and reduced low-dose spillage. In a representative left-breast DIBH case, non-coplanar VMAT achieved **V95% = 96%** with markedly lower heart dose, versus failing coverage (**91–92.9%**) for 3D tangents and coplanar VMAT. Across the first 1000 treatments, collision prediction was accurate within a 2 cm safety buffer, 36 collisions were proactively avoided, and over 90% of high-risk scenarios were resolved preemptively, eliminating physical dry runs.
Conclusions: SGP with MapRT enhances plan quality, reduces OAR exposure, improves safety, and streamlines workflows. Our experience supports the feasibility and clinical benefit of routine SGP integration, while a novel optical-only workflow extends SGP beyond conventional

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INTRODUCTION

Surface Guided Planning (SGP) integrates surface imaging and collision detection into treatment planning to address challenges posed by increasingly complex radiotherapy techniques.

MapRT, a clinical SGP platform, enables non-coplanar planning, proactive clearance mapping, and improved workflow integration.

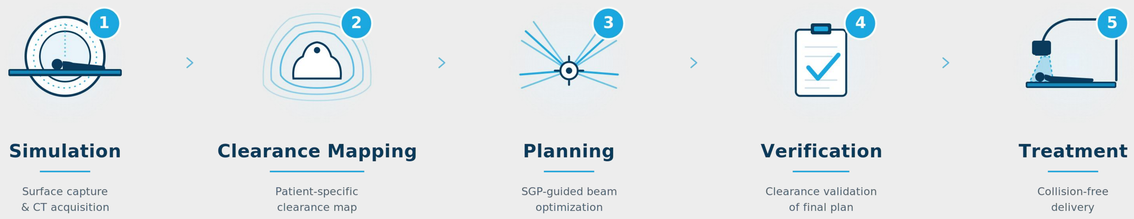
This work summarized clinical applications, reported benefits and our initial institutional experience with SGP

METHODS AND MATERIALS

Narrative review of SGP clinical scenarios where surface guided planning offers value was performed including:

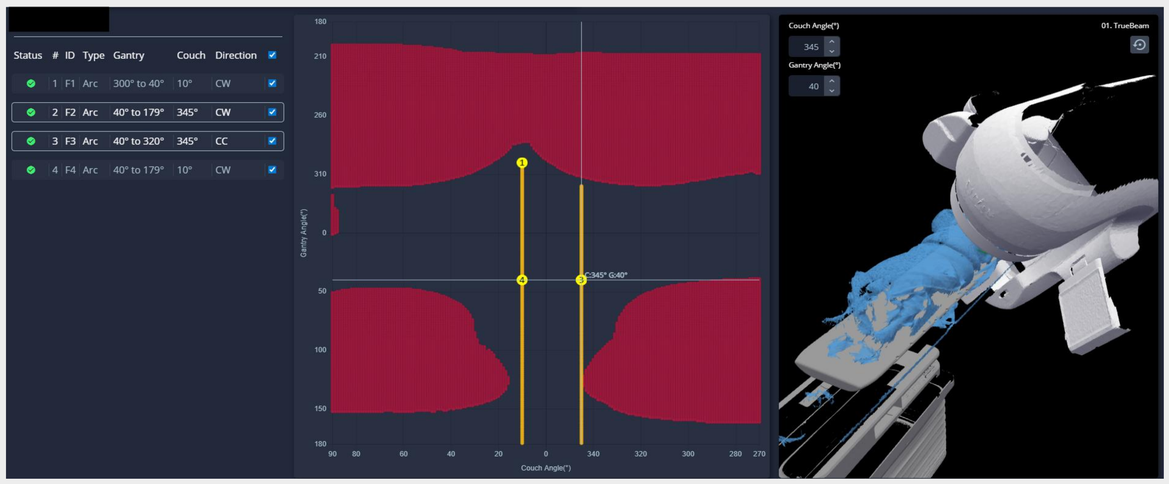
- Brain SRS
- Head & Neck
- Lung SBRT
- Breast (supine & prone, DIBH)
- Osteoarthritis (optical sim)

Workflow integration across simulation, planning and treatment was assessed, with emphasis on SGP functionality, using early clinical implementation of SGP at our clinic.



3D Tangent Plan

SGP-Guided Non-Coplanar VMAT



RESULTS

Dosimetric Advantages of Non-Coplanar Planning
SGP facilitated non-coplanar beam arrangements that improved plan quality.

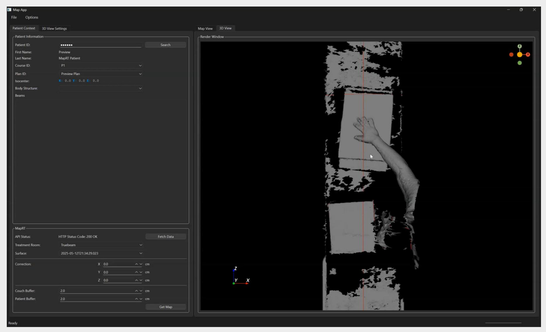
- **Brain SRS:** Improved coverage and optic structure sparing and improve dose fall-off.
- **Head & Neck:** Reduced salivary gland doses; improved conformity, homogeneity, and reduced intermediate-dose spillage
- **Lung SBRT:** better conformity, lower V25%, less low dose spillage, and 10–15% reduction in heart and lung OAR doses.
- **Breast: reduced** heart and lung doses, improved contralateral breast dose.

Institutional Case: Left Breast DIBH with SGP-Guided Non-Coplanar VMAT

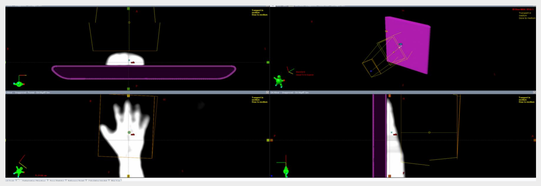
51 y/o female, left UOQ breast cancer, DIBH, body habitus raised clearance concerns. Standard 3D tangents: V95% = 92.9% (failed institutional constraint tolerance)
Coplanar VMAT: V95% = 91% (fail), elevated heart and contralateral breast dose.
Non-Coplanar VMAT: V95% = 96%, reduced hotspots, dramatically lower heart dose, acceptable contralateral sparing

Optical Simulation Workflow

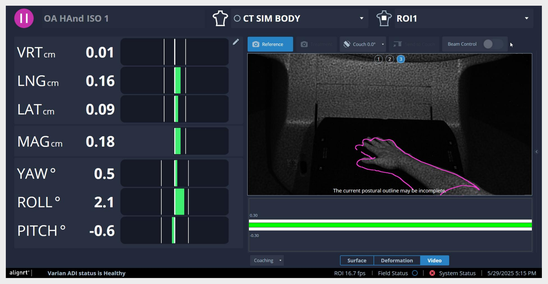
1. Capture



2. Plan



3. Treat



4. Verify

CONCLUSIONS

- SGP with MapRT enhances plan quality and reduces OAR exposure, improves safety, and streamlines workflows across a range of clinical scenarios.
- Our initial implementation saw accurate collision prediction with 2 cm safety buffer, and 36 collisions were proactively avoided in the first 1000 treatments using SGP. Over 90% of high-risk collision scenarios were resolved preemptively.
- We eliminated physical dry runs, reducing machine & staff time.
- Our experience supports feasibility and clinical benefit of routine SGP integration.
- A novel optical only workflow extends SGP beyond convectional indications, removing CT simulation for selected benign cases.

REFERENCES

- Sheng K et al. Adv Radiat Oncol. 2024.
- Gonod M et al. JACMP. 2025.
- Tallhamer MJ. MapApp. github.com/tallhamer/MapApp.

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