

## Current Practice Patterns of Spatially Fractionated Radiation Therapy: A Clinical Practice Survey

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### Abstract

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Nina Mayr<sup>1</sup>, Majid Mohiuddin<sup>2</sup>, James Snider<sup>3</sup>, Hualin Zhang<sup>4</sup>, Robert J. Griffin<sup>5</sup>, Beatriz Amendola<sup>6</sup>, Daniel S. Hippe<sup>7</sup>, Naipy C. Perez<sup>8</sup>, Xiaodong Wu<sup>9</sup>, Simon Lo<sup>10</sup>, William Regine<sup>11</sup>, Charles B. Simone<sup>12</sup>

1. NA, Michigan State University, East Lansing, USA 2. Radiation Oncology, Advocate Lutheran General Hospital, Chicago, USA 3. Radiation Oncology, University of Alabama School of Medicine, Birmingham, Birmingham, USA 4. Radiation Oncology, University of Southern California, Los Angeles, USA 5. Radiation Oncology, University of Arkansas for Medical Sciences, Little Rock, USA 6. Radiation Oncology, Innovative Cancer Institute, South Miami, USA 7. Clinical Research Division, Fred Hutchinson Cancer Center, Seattle, USA 8. Medical Physics, Innovative Cancer Institute, South Miami, USA 9. Radiation Oncology, Innovative Cancer Institute, Cyberknife Center of Miami, South Miami, USA 10. Radiation Oncology, University of Washington School of Medicine, Seattle, USA 11. Radiation Oncology, University of Maryland School of Medicine, Baltimore, USA 12. Radiation Oncology, New York Proton Center, New York, USA

**Corresponding author:** Nina Mayr, nar\_mayr@yahoo.com

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## Abstract

### Objectives:

Spatially fractionated radiation therapy (SFRT) is a major departure from current radiation oncology concepts by delivering profoundly heterogeneous dose to the tumor target. The observed impressive tumor responses with SFRT in pilot series and the low toxicity rates despite challenging bulky tumors have led to an increase in the clinical use of SFRT. However, prospective clinical trials and clinical guidelines are still lacking, and treatment approaches and techniques remain variable. The specific clinical practice patterns of SFRT are therefore unclear and not well understood.

The objective of this study was to assess the practice patterns of SFRT with GRID and Lattice therapy (LRT) from both the physician and physicist perspective.

### Methods:

An anonymous survey was designed to collect clinicians' practice patterns of SFRT. The survey was directed towards radiation oncologists and physicists, and was administered by the Radiosurgery Society. Survey questions were tailored to the responders' profession and the specific SFRT technologies used. Questions for radiation oncologists addressed clinical decision-making, patient selection, SFRT dosing, dose prescription, clinical use of dosimetric parameters and their observed correlation with local control, integration of SFRT with conventional radiation, SFRT platforms and techniques, and combination of SFRT with multimodality therapies. Questions for physicists addressed technical implementation, planning and dosimetric processes, SFRT delivery and quality procedures. Data were analyzed using descriptive statistics; comparisons were made with the Wilcoxon rank sum test.

### Results:

Among the 73 responders, 51 (69.9%) were radiation oncologists (27/51 practicing SFRT); 17 were physicists (12/17, respectively), and 5 basic scientists. The majority of radiation oncologists (72.7%) considered SFRT one of the accepted standard-of-care radiation therapy modalities for bulky/advanced tumors. Both the treatment of metastases/recurrences and non-metastatic primary tumors were accepted indications. Among palliative indications, metastases to lymph nodes (59.3%), intraabdominal structures (51.9%) and lung (51.9%) were most common. Among advanced/bulky primary tumor sites treated with curative intent, head and neck (59.3%), lung cancer (48.2%) and sarcoma (44.4%) predominated.

In palliative SFRT, regimens of 15-18 Gy/1 fraction (73.0%) predominated, followed by 20 Gy in 1 fraction (26.9%). In curative-intent treatment of primary tumors, the most common schedules were 15 Gy/1 fraction (33.3%) and fractionated SFRT (23.8%). In palliative SFRT, the combination of SFRT with conventional radiation therapy (cERT) was common (73.9%), and this was highly prevalent (90.0%) in primary malignancies. Sequencing of SFRT and cERT, however, was variable. Concurrent chemotherapy was supported by 44.0% for palliative and by 52.2% for curative treatment but was not favored on the days of the SFRT fraction(s), except for cervical cancer. Immunotherapy combinations were less common.

Radiation oncologists' clinical use of SFRT dosimetric evaluation parameters was highly variable, and this variability differed between GRID and LRT. While prescription dose and cERT dose were always used by the majority, the complex SFRT heterogeneity dose parameters were more commonly used and were more commonly thought by practitioners to influence local control for LRT than for GRID therapy.

For SFRT platforms and techniques, linear accelerators predominated (MLC based GRID, collimator-based GRID and LRT), while platforms varied widely and included TomoTherapy, CyberKnife and proton therapy.

Most practitioners (72.7%) had less than 9 years of SFRT experience and were in mid-career. A substantial proportion of radiation oncologists (40.0%) published their clinical outcome results; and 52.0% had access to a radiobiologist or molecular biologist.

Only a minority of residency/training programs included SFRT training (23.5%). All physicists had experience with patient specific QA, and 66.7% had SFRT commissioning experience.

#### Conclusion(s):

SFRT has evolved as a clinical practice pattern that is considered by practitioners to be one of the standards of care for advanced bulky tumors. Major clinical decision-making, SFRT dosing and technology choice are overall consistent and follow the SFRT literature, but SFRT–cERT combination and sequencing, the use of dosimetric evaluation parameters, and the understanding of their clinical significance are variable. These areas may be addressed by targeted education and standardization efforts, and knowledge gaps may be filled by incorporating these questions into future research investigations of SFRT.