

Back to the future: radiosurgery in the new frontier

From its inception more than sixty years ago by pioneer neurosurgeon, Dr. Lars Leksell [1907-1986], stereotactic radiosurgery (SRS) has been a radical departure from conventional fractionated radiation treatment, drawing a large number of doubters. Just the thought of applying a very large dose of radiation to a critical organ such as the brain brought back the bad memories of radiation treatment in its early days a century ago. The fundamental difference, however, is that the highly precise delivery of a single dose of radiation can effectively alter or destroy diseased tissue without significant toxicity. Initially, SRS started slowly with a small group of enthusiasts (neurosurgeons and radiation oncologists) who targeted intracranial pathologies that were treated unsuccessfully with microsurgery or fractionated radiation. Successful outcomes from multiple clinical series have resulted in a paradigm shift in both neurosurgery and radiation therapy by providing a new treatment modality, advancing the precision of treatment delivery and expanding the understanding of dose-response of diseases and radiation effects on normal tissues. The field of radiosurgery has attracted an increasing number of disciples and interest from technology providers. In the early days, most radiosurgeries were performed on the brain using mostly Gamma Knife system and some with particle beam therapy. However, the past couple of decades have seen a rapid and significant improvement in radiosurgery in many aspects: technological advances with multiple delivery flat forms, more accurate targeting with advanced 3-D and functional images, better treatment planning software, image guidance techniques and well-defined dose/volume tolerance and dose response relationships. The competition from various vendors has fueled innovation and lowered the cost of implementation, hence, making the technology available to many centers around the world and accelerating the generation of clinical data. Most importantly, the application of radiosurgery principles has moved beyond the cranium into other sites in the body through stereotactic body radiation therapy (SBRT). Although SBRT has more challenges than SRS due to the organ motions and deformations, it has also brought new clinical diseases to the field. Both SRS and SBRT share the same principle of delivering a large ablative radiation dose in one or a few treatments at high precision to a diseased target. We have an opportunity to witness the development of a new frontier in the making. Both SRS and SBRT have provided new and improved treatment options for more clinical sites for patients, are cost-effective in many sites and allow for re-treatment with radiation in selected cases.

This special edition of the *Translational Cancer Research* Journal represents the experiences of SRS and SBRT from experts at major radiosurgery centers in the U.S. The topics in this issue cover both intra-cranial and extra-cranial sites, malignant and benign tumors as well as functional targets. We begin with the extra-cranial sites of breast, lung, liver, pancreas, and prostate. In the second part, we detail experiences for intra-cranial diseases, tumors and functional diseases. We hope this collection of articles will lead clinicians, scientists, healthcare practitioners, and trainees to a better understanding of and appreciation for this new field with all of its potential and challenges. Although we have made significant progress in our understanding of SRS/SBRT, there are opportunities to accomplish so much more. Challenges make life interesting, and overcoming them makes life meaningful”.

This special edition has taken a year of planning and execution by a group of talented and dedicated individuals. First, we are grateful to the authors, who have given their time and expertise to this project. We would like thanks the vendors who have provided sponsorships for this important publication. Last but not least, we thank the editors and staff at the *TCR* Journals and Pioneer Science Publishing Company, for bringing their commitment and excellence to this project: Nancy Zhong, Molly Wang, Stephen Wang and Eric Chuang.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Translational Cancer Research* for the series “SBRT/SRS in Radiation Research”. The article did not undergo external peer review.

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.3978/j.issn.2218-676X.2014.08.05>). The series “SBRT/SRS in Radiation Research” was commissioned by the editorial office without any funding or sponsorship. SV served as the unpaid Guest Editor of the series. KTM served as the unpaid Guest Editor of the series and serves as an unpaid editorial board member of *Translational Cancer Research*. HG served as the unpaid Guest Editor of the series and serves as an unpaid Associate Editor-in-Chief of *Translational Cancer Research*. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Open Access Statement: This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.



Sandra Vermuelen



Kevin T. Murphy



Huan Giap

Sandra Vermuelen, MD

Executive Director, Swedish Radiosurgery Center, Swedish Medical Center, Seattle, Washington, USA (Email: Sandra.Vermeulen@swedish.org)

Kevin T. Murphy, MD

Department of Radiation Medicine and Applied Science, University of California, San Diego, USA (Email: kevinmurphy@ucsd.edu)

Huan Giap, MD, Ph.D

Chief of GI, Lung, and Breast Services, Director of Clinical Research, Scripps Proton Therapy Center, San Diego, USA (Email: hbgiap@gmail.com)

Submitted Aug 12, 2014. Accepted for publication Aug 13, 2014.

doi: 10.3978/j.issn.2218-676X.2014.08.05

View this article at: <http://dx.doi.org/10.3978/j.issn.2218-676X.2014.08.05>

Cite this article as: Vermuelen S, Murphy KT, Giap H. Back to the future: radiosurgery in the new frontier. *Transl Cancer Res* 2014;3(4):293-294. doi: 10.3978/j.issn.2218-676X.2014.08.05