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Integration of surgery and radiosurgery

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Standing between neurosurgery and radiation oncology, radiosurgery has spearheaded advances in both specialties. Radiation oncologists rapidly integrated and enhanced the benefits of the stereotactic frame, as well as adopted the concepts of frameless stereotaxis, seeing a revolution in their practice. Better target definition and delivery of radiation with exquisite accuracy permitted decrease in number of radiation fractions with more focus on tumor kill, instead of relying strictly on the principles of radiobiology to avoid side effects. This has brought enthusiasm to the radiation oncologists witnessing excellent results with more patient comfort and economy of resources. They are progressively abandoning the term stereotactic for one more akin to their specialty. Image Guided Radiation Therapy (IGRT) has been the center of discussion in the major Radiation Oncology Congresses; radiosurgery concepts are now applied to the whole body, leaving the realm of neurosurgery.[1,2] Terms unfamiliar to neurosurgeons such as "gross tumor volume" (GTV), clinical tumor volume (CTV), dose volume histogram (DVH), complete response (CR), partial response (PR), and no response (NR) have invaded radiosurgery, making radiosurgery concepts far more distant from the neurosurgeon's day-to-day practice.

Neurosurgery has lagged behind in this development. Although stereotactic radiosurgery has made a great impact in neurosurgery, representing 15–20% of the caseload in the major neurosurgery departments,[5] traditionally neurosurgeons insist on the use of the stereotactic frame to justify their participation in this rapidly evolving and exciting field. Radiosurgery lacks the familiarity with the operating room that characterizes the personality of the neurosurgeon. A small number of neurosurgeons dedicated to radiosurgery–usually stereotactic–oriented individuals with mathematical and minimally-invasive mind sets–have carried and maintained the field. There is, however, a threat for neurosurgeons not to be involved in radiosurgery, as the radiation oncologists become familiar with and adapt neurosurgery's navigation tools to their needs–tailoring them to linear accelerators, and improving their own knowledge of the nervous system anatomy. Radiation oncologists are also becoming very familiar with neurosurgery's benign diseases such as acoustic neuromas, trigeminal neuralgia, skull base meningiomas, and arteriovenous malformations–which are easier and more attractive to treat than the oncological pathologies they have struggled with over the years.[4]

Now that the stereotactic frame is no longer necessary[3] and imaging is quasi–capable to define histology, surgical skills are becoming unnecessary in the management of pathologies previously thought to be the most challenging for neurosurgeons. Results of radiosurgery have in some instances surpassed what can be obtained with exquisite neurosurgical techniques, a concept that is difficult to accept by neurosurgeons with years of experience. With an early imaging diagnosis, before going through the hardship of neurological symptoms, patients are reluctant to accept surgery, and are enticed to embrace the benefits of radiosurgery; the same feeling is shared by their relatives and health care payers. For them, the

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specialist taking care of the disease is irrelevant, as long as the treatment offered is effective, with the fewest possible side effects, allows them to keep working, and is affordable.

This issue of *Surgical Neurology International Stereotactic* focuses on this integration of radiosurgery, image guided surgery, operating room imaging, and novel applications of stereotactic surgery. Having the paradigm of traditional surgery threatened during the end of the last century with the trend persisting and following the fast pace of neuroimaging improvement, neurosurgeons need to rapidly adapt to this reality. MRI with functional and chemical analysis and molecular imaging progressing are rapidly obviating the need of histological confirmation for treatment of several neurosurgical diseases, i.e., acoustic neuromas, meningiomas, arteriovenous malformations, and others. While neurosurgery will always exist, neurosurgeons and those training the future generations have to bring these technological advances in to the training programs and assure that neurosurgery continues to participate as the main integrative specialty in the treatment of these traditionally neurosurgical diseases–while also extending the horizon toward the neurological degenerative diseases and recapturing leadership in the management of vascular disorders, which in large part passed to the realm of the interventional radiologist.

Mass effect needs surgery; it must be dealt with a consciously planned and performed decompressive surgery, now possible with software dedicated to this approach. The neurosurgeon has to keep in mind intact neurologic function, avoiding the risks of radical surgery, relying on the advances of radiosurgery, stereotactic radiotherapy, and endovascular interventional techniques. Brainlab, Inc., dedicated to bridge imaging developments, radiosurgery and surgery, has generously supported the publication of this issue of *SNI Stereotactic*.

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