

# DEVELOPMENT OF RADIOSURGERY AT RADIOSURGERY NEW YORK

by: Gil Lederman, MD

One of the most frequently asked questions of doctors at Radiosurgery New York is how the hospital developed its world-renown brain and body radiosurgery program.

The answer to the question actually dates back nearly two decades and it started actually not here but elsewhere at a site of training. This story is a bit of a personal one and I intend to tell it as directly as possible - without "toots and whistles."

During medical school I had decided to train in hematology and oncology. My rationale was simple. I loved to take care of patients who needed intense care and liked the medical aspect as well as the personal aspect of these intense relationships. I was selected to train at the Harvard Medical School Dana Farber Cancer Institute after internal medicine training. I came to the Dana Farber Cancer Institute in 1981 as a Medical Oncology Fellow. There, I was to remain for the next six years - the first three years in training.

My experience was extensive and medically and emotionally fulfilling. However, it was obvious that medical oncology - chemotherapy - was not the answer to all diseases. Certainly, medical oncology has made huge strides in adjuvant treatment of selected breast cancers and for those with certain lymphomas and testicular cancers. As a Fellow we were always enthusiastic about receiving a potentially curative patient - a patient for whom our goal was complete and durable remission of their cancer.

However, the vast majority of patients seen were those with what would be considered incurable cancers - often primary but even more frequently, metastatic cancers. There, and in fact in medical centers across the nation, a variety of chemotherapeutic agents were being used. Some agents, like 5FU, had been used for decades. Others were new to be tried on a small group of patients. The vast majority left a great deal to be desired.

These small treatment groups of Phase I studies were those that determined the toxicity of therapy. The likelihood of benefit for the patient was small but obviously once in a great while, new drugs were found to be of acceptable toxicity yet efficacious which encouraged further study in human experimentation.

After years of seeing patients going through the chemotherapeutic process, I became interested in obtaining a broader scope of knowledge concerning the cancer patient and, therefore, sought to be trained in radiation oncology, as well.

Radiation oncology certainly offered a great amount of appeal. The vast majority of patients treated benefited. Palliative treatment usually improved symptoms for most and for potentially curative cancers, which were numerous including brain, head and neck, lung, breast, abdominal, prostate and others, the chance for impact was seemingly larger.

Furthermore at that time, combined modality treatment such as concurrent radiation and chemotherapy offered great appeal. If one was trained in both areas at such a prestigious medical school as Harvard and combined the knowledge of the best in both fields, it would certainly have a beneficial impact on the patients.

During my years in Boston, I became quite friendly with a man who was destined to develop the first sophisticated linear accelerator radiosurgery equipment in North America. Because of our friendly relationship (which continues to this day), I became intrigued about radiosurgery.

In the early years, single fraction radiosurgery was used but it was, in fact, quite limited. The limitations were that only smaller tumors could be safely treated. Patients, in general, disliked the head frame that had to be screwed into the head. Great innovations were, however, coming.

Early in this decade, we made a major breakthrough - that was the innovative use of fractionated stereotactic radiosurgery. Fractionation means division of dose and division of dose means more protection to the healthy normal tissues. Since there is an interface where the tumor stops and the normal healthy tissue starts, the shell of normal healthy tissue does always receive some radiation dose. By dividing the dose we were able to markedly diminish side effects compared to single-shot radiosurgery and yet, we were able to show, as well, an improvement in outcome. Our data has been presented at national and international medical meetings, in medical journals and textbooks.

For example, an acoustic neuroma treatment whereas single fraction radiosurgery has been used only up to tumors measuring 3 centimeters, we were able to treat tumors up to 5 centimeters and greater. Furthermore, the hearing preservation rate was 90% compared to about 50% with single-shot radiosurgery. Additionally, facial paralysis or weakness was seen in up to 50% of patients undergoing single-shot radiosurgery but essentially never seen with fractionated stereotactic radiosurgery. Similarly, trigeminal neuropathy (damage to the trigeminal nerve) was also seen in up to 60% of the patients and similarly here after fractionated stereotactic radiosurgery for acoustic neuromas. Thus, after 10,000 fractionated stereotactic radiosurgery treatments (and the number is quickly growing) by the physicians at Radiosurgery New York, there is a vast experience.

The next breakthrough came with our great interest in extending the field of radiosurgery to outside the brain. Developments from our doctors at Radiosurgery New York allowed for extracranial radiosurgery. This meant the principles of pinpoint radiation could be used for more than just brain tumors. New areas of cancer could now be targets for our fractionated radiosurgery.

Our good friends, Drs. Ingmar Lax and Henric Blomgren, were then responsible for the development and FDA-approval of the stereotactic body frame. Our doctors at Radiosurgery New York were the first in the Western hemisphere to gain access to this sophisticated equipment and offer patient care. Our early work improved technical features so that accuracy was greater with a higher comfort level to the patient and an enhanced degree of reproducibility. This meant a more confident reliability factor for identifying the tumor and avoiding the normal tissue.

Currently thousands of patients (and that number, too, is rapidly climbing) have been treated with this technique and the success or control rate is exceptionally high. Success means cessation of growth, shrinkage or disappearance of the treated tumor.

These treatments have been used for primary and metastatic cancers. They have been used for patients who are newly diagnosed as well as those with recurrent diseases. Diseases such as lung primary, lung metastases, liver primary and liver metastases as well as abdominal tumors including pancreas, sarcomas, prostate and others have been carried with this sophisticated technology.

Our current staff of physicians and physicists meets routinely along with a multi-disciplinary panel to discuss the best treatment options and approve patients for candidacy within our program.

The over-riding feature has been the "vision" aspect. One must have an idea of where the field should go before leading it. Our vision has been to improve the options of radiation oncology so that radiation can be used in more areas with greater success than ever before. Our fractionated stereotactic radiosurgery program both for brain and body has certainly been directed in this regard.

In twelve months alone, our doctors' work has been presented at ASTRO (American Society of Therapeutic Radiology and Oncology, the most important in the world. There, we discussed fractionated stereotactic radiosurgery. At the ECCO (European Cancer Conference) meeting in Germany, were several presentations and a lecture including "Acoustic Neuromas Treated by Fractionated Stereotactic Radiosurgery," "Improved Survival using Fractionated Stereotactic Radiosurgery and Concurrent Taxol for Recurrent Glioblastoma Multiforme" and "Modifying the Gill-Thomas-Cosman Head Frame to Expand the Range of Fractionated Stereotactic Radiosurgery." At International Congress of Radiation Oncology Annual Meeting in Beijing, China we lectured on "Acoustic Neuromas: Potential Benefits of Fractionated Stereotactic Radiosurgery" as well as "A New Treatment Approach for Recurrent Nasopharynx Cancers: Fractionated Stereotactic Radiosurgery with Concurrent Taxol."

At the LINAC Radiosurgery Meetings in Florida, we were invited to present two lectures on our current data concerning acoustic neuroma and glioblastoma multiforme with fractionated stereotactic radiosurgery. At the International Stereotactic Radiosurgery Surgery meeting held in Spain, we were requested to lecture on fractionated stereotactic radiosurgery with Taxol as a treatment for primary brain tumors and as well, for acoustic neuromas. Furthermore, lectures were presented at the Stereotactic and Functional Neurosurgery meetings held in France.

The National Society for Bloodless Surgery has become interested in these techniques because it offers such hope to those who cannot or refuse to undergo surgical procedures resulting in blood loss.

Papers were accepted for the American Radium Society annual meeting. Last week, we received invitation to submit our papers to an important medical journal and recently four new fractionated stereotactic radiosurgery papers have been accepted for publication in medical journals.

So, in summary, how did radiosurgery find its home with the doctors at Radiosurgery New York? Because it was obvious from an understanding of both the fields of medical oncology and radiation oncology that more needed to be done for the patients with cancers. Personally, being triple-trained and triple Board-certified helped identify the need of innovative, non-invasive treatment when neither chemotherapy nor radiation was suited. Radiation was highly effective but often caused irritation to normal healthy tissues. Body and brain radiosurgery offered the benefit of radiation more precisely to the tumor while offering greater protection to normal healthy tissues. There is seldom - if ever - benefit in radiating healthy normal tissues when similar superior results can be had by offering selective radiation to the tumor.

I often make the analogy of the plum and the bread box. Why radiate the whole bread box if the plum is all that needs to be irradiated. Body and brain radiosurgery certainly make that option available.

We have developed the facilities, equipment and staff to expand the field. Millions of dollars have been and are being directed to these efforts. As these words are being written, our staff are bringing on-line yet another state-of-the-art Varian linear accelerator and our researchers are compiling our data for upcoming meetings and medical publications. Currently patients from around the world seek care at Radiosurgery New York.

The field of radiosurgery is certainly expanding and vision about filling a need has been the most important driving force. It has been estimated that we are at least a decade ahead of most facilities nationally and internationally. By having the equipment, leadership, academic relationships and publication accessibility at Radiosurgery New York, our leadership in the field is likely to remain for quite some time to come. We haven't any plans to rest.