

Dr. Lederman responds to questions from Dr. Kornhauser regarding Body Radiosurgery

Dr. Gil Lederman responds to questions posed by Dr. Stanley Kornhauser on the newest innovation in radiation oncology, stereotactic body radiosurgery.

Dr. Kornhauser: I understand you have continued to produce a revolutionary change in the world of stereotactic radiosurgery.

Dr. Lederman: Correct. We are the first and currently the only hospital in this hemisphere performing stereotactic body radiosurgery.

Dr. Kornhauser: What is stereotactic body radiosurgery?

Dr. Lederman: Forty years ago, stereotactic brain radiosurgery offered the possibility to treat abnormalities in the brain precisely with radiation beams from many, many different angles. This technique maximized radiation dose to the target and minimized normal tissue receiving radiation dosage. Data accumulated over years for benign and malignant disease have shown a high degree of effectiveness with radiosurgery.

The principle appeal is precise delivery of higher radiation amounts to the tumor - be it benign or malignant - while normal healthy surrounding tissues are relatively protected from the beam. Because there is a gradient of radiation higher-dose to the tumor and markedly less beyond, much greater amounts of radiation can be delivered in much shorter time periods compared to standard radiation.

Current data shows marked increased effectiveness in using this technique for brain and now for tumors of the body.

Dr. Kornhauser: I understand you started extracranial stereotactic body radiosurgery years ago.

Dr. Lederman: Yes. Techniques adapted of radiosurgery have allowed us to move beyond the sphere of the brain to the head and neck area and treat other tumors - with great effectiveness. Early on we treated only brain tumors. Now, almost anywhere in the body can be treated using stereotactic radiosurgery.

Dr. Kornhauser: Have your results been presented at national medical meetings?

Dr. Lederman: Yes. In fact, our data was presented at the most recent American Society for Therapeutic Radiology and Oncology meeting (the national radiation oncology society) held in California. We have shown a high degree of precision in localizing tumors outside of the brain and as well, marked efficacy. Papers have been presented at the American Association of Neurological Surgeons meeting in Denver, Colorado, International Congress of Radiation Oncology meeting in Beijing, China, International Stereotactic Radiosurgery Society meeting in Madrid, Spain, the World Society for Stereotactic and Functional Neurosurgery meeting in Lyon, France, as well as meetings in Greece, New York, California and Germany.

Dr. Kornhauser: What kind of tumors beyond the brain are you treating?

Dr. Lederman: In the head and neck area we are treating recurrent head and neck cancers such as cancers of the nasopharynx, oropharynx, paranasal sinus as well as those involving the nose,

eyes and mouth area. Even difficult to reach extremity tumors are a target here when standard therapy is thought inappropriate or ineffective.

Dr. Kornhauser: And tumors within the entire body can now be localized using body radiosurgery?

Dr. Lederman: Yes. New techniques have been developed that allow us to precisely stabilize the body with an external frame of reference. Using the external frame of reference, we can be confident of the body's position and as well, the tumor's position within the body.

Our work repositioning the body with repeated CT scans shows a very high degree of accuracy giving us the confidence to proceed with body radiosurgery.

Dr. Kornhauser: Have others done this work as well?

Dr. Lederman: Currently we are the only medical facility in North and South America performing body radiosurgery. We are indebted to the work of Lax and Blomgren at the Karolinska Institute in Stockholm, Sweden, the developers of the stereotactic body frame.

Dr. Kornhauser: What is the data showing the benefit of body radiosurgery?

Dr. Lederman: Currently reported data of metastases treated shows a control rate of 94.5%. Metastases ranged in size from 2 cubic centimeters (cc) to 732cc, with a dose ranging from 1500 Centigray (cGy) to 4500 cGy with a mean of 288 cGy. Centigray is a unit measuring radiation delivered to the tumor. Patients had up to five treatments delivered and the follow-up ranged to 38 months.

Dr. Kornhauser: Were other tumors treated besides metastases?

Dr. Lederman: Yes. Primary tumors including the lung, liver and pancreas as well as other sites were indeed treated with generally good success using body radiosurgery.

Dr. Kornhauser: What is the experience in using body radiosurgery for primary liver tumors?

Dr. Lederman: A variety of primary liver tumors including hepatocellular, bile duct carcinomas and embryonal carcinomas were treated. The size ranged from 3 to 622cc.

Dr. Kornhauser: And the results of therapy?

Dr. Lederman: There were no local failures. Successful control in the radiosurgery world means cessation of growth, shrinkage of the tumor or disappearance. Obviously if a tumor is unsuccessfully treated, it will continue to expand and grow. If a cancer stops growing, shrinks or disappears, it suggests that the radiosurgery has been successful.

In the data of primary liver tumors, there were no local failures. Tumors ceased growing, decreased in size or even totally resolved.

Dr. Kornhauser: What about metastases to the liver?

Dr. Lederman: Metastases were treated as well with great success. Metastatic cancers to the liver were from the colon, anus, bladder, ovary, carcinoid and elsewhere. The success rate was 94.7% A good share of tumors totally disappeared.

Dr. Kornhauser: Is the data similar for lung metastases?

Dr. Lederman: Yes, pulmonary or lung metastases ranged in size 3cc to 198cc and were of various primary sites including the colon, germ cell, thyroid, kidney and elsewhere. The control rate was 94.1%. There was one local failure which was a large tumor. That metastasis was retreated using body radiosurgery 25 months after the original radiosurgery and had a successful outcome.

Abdominal cancers included colon, germ cell, melanoma, ovary, thyroid, pancreas and others. The size ranged from 7cc to 732cc. The vast majority of cancers, as we discussed above, were controlled with radiosurgery - with one-third of tumors disappearing by follow-up scanning after fractionated body radiosurgery.

Dr. Kornhauser: How do you verify that the patient is accurately placed within the stereotactic body frame?

Dr. Lederman: We have developed new techniques that, we believe, are superior in placing the patient accurately in the body frame. A custom-made mold of the patient in treatment position allows not only a high degree of precision and is quite comfortable. Repeat CT scans verify the accuracy of position showing the patient and the tumor in relationship to the stereotactic body frame and are compared to the first stereotactic CT. No patient is treated without quality assurance steps to confirm accuracy of re-positioning.

Other techniques are used to produce a high degree of patient re-positioning accuracy in the stereotactic body frame. These include small tattoos placed on the skin over the sternum and shin which further enhance the accuracy and confidence in this technique.

Dr. Kornhauser: How do you minimize patient motion during fractionated body radiosurgery?

Dr. Lederman: Not only is the frame set-up quite important but as well a diaphragm control plate (which was developed by Lax and Blomgren at Karolinska Institute) minimizes the depth of inspiration and therefore patient movement. This is very important in allowing us to proceed with fractionated stereotactic radiosurgery.

Dr. Kornhauser: How long is a typical treatment of body radiosurgery?

Dr. Lederman: Treatment lasts approximately 30 minutes depending on the complexity. We have used up to ten customized radiation fields all directed from different angles to attack an individual tumor to minimize dose to the normal, healthy surrounding tissue. Each beam is custom made for the patient's tumor with unique shape and direction developed to exclude healthy tissue beyond the tumor.

Dr. Kornhauser: How many treatments are most commonly administered using body radiosurgery?

Dr. Lederman: We typically use five treatments. There are, however, situations where more than one tumor is treated and in certain instances, we vary the treatment number. One important aspect of body radiosurgery is that it is much quicker overall than standard external beam radiation, chemotherapy or the surgical and recovery process.

Dr. Kornhauser: How does this compare to open surgery and chemotherapy?

Dr. Lederman: Usually for primary tumors, patients who receive chemotherapy do so for a finite period of time, i.e. six months, and for metastatic tumors until the cancer progresses. Body radiosurgery is very different in that in general five treatments (in as few as five consecutive days) are administered and the beneficial effect can be maintained for a long period of time thereafter. Thus, this technique is much less invasive and much less toxic and of course consumes much less time. The same is true compared to external beam radiation therapy.

Compared to surgery, there is the avoidance of anesthesia and the risks on the operating table as well as convalescence process. Our patients having body radiosurgery are able to immediately return to their activities. This is all outpatient therapy.

Dr. Kornhauser: Fractionated body radiosurgery certainly sounds appealing. What are the steps for patients considering the process?

Dr. Lederman: All patients who contact us are given or sent a packet of information. We have regular seminars describing the technique in more detail for those who wish to attend. There is no charge or obligation to any who sends films for review. We review pathology, CT scans and clinical history. Patients thought to be candidates are notified of our findings.

We have a panel of multiple experts in the field to evaluate all aspects of body radiosurgery. Patients considered candidates for body radiosurgery are invited in for consultation which includes history, physical examination, further review of newer films (if they exist), pathology and other records.

If patients are appropriate candidates and wish to proceed, the Informed Consent process is continued, explaining the risks, benefits and alternatives. Once we have accepted the patient and the patient has accepted us, the stereotactic body frame is custom fitted. This frame includes coordinates and indicators to determine the exact body position within the frame. Small tattoos are placed on strategic locations to confirm the accuracy of set-up. High resolution CT scans with the patient in the fiducial-marked box is performed with repeated quality assurance processes to confirm the accuracy and reliability of stereotactic radiosurgery treatment plan. Fiducials allow for accurate identification of the position within the frame. The treatment plan is coordinated by the radiation oncology physicians, radiation physicists and dosimetrists.

Following that, there is a double-check of each step for quality assurance, with the patient placed again in the stereotactic body frame to confirm the accuracy of set-up using CT-guidance. Once proven, stereotactic radiosurgery is performed.

Stereotactic radiosurgery is delivered with the patient on a linear accelerator couch in the custom-fitted frame. The treatment takes about 30 to 60 minutes, depending on the size and complexity of the tumor. After treatment, the patient returns to usual activities.

Dr. Kornhauser: How do you follow patients' progress?

Dr. Lederman: We ask for follow-up CT scans on a routine basis - approximately every three months after the procedure for the first year and less frequently in subsequent years. Patients who come here have a complete history and physical examination as well.

Dr. Kornhauser: If other sites are identified to have cancer, can they be treated after the first course of stereotactic radiosurgery?

Dr. Lederman: Yes, if appropriate.

Dr. Kornhauser: Is the patient obliged to return for routine follow up?

Dr. Lederman: No. We have patients here from around the world sending us films for review and follow-up. Any need for retreatment is discussed with the patient and family.

Dr. Kornhauser: How selective are you in the review process?

Dr. Lederman: We are quite selective. If we believe other methods of treatment are superior, the patient and family certainly are notified of that. If there are equivalent options or in fact other options, the family and patient are fully informed as to those options.

Dr. Kornhauser: I know you are a Board-certified internist, medical oncologist as well as radiation oncologist. That must help you greatly in identifying the best patients for body radiosurgery.

Dr. Lederman: I believe it is important to have extensive training in fields of oncology. That allows me and my patients to have the confidence that the best treatment options are fully and adequately being discussed.

Dr. Kornhauser: What has been the reception from other specialists in the field?

Dr. Lederman: In general, surgeons, medical oncologists and others are excited about having an effective treatment option available for their patients. There have been many situations where no effective therapy could be administered or the presently-available therapy was good but not adequate. Physicians obviously want to have the best possible outcome for their patients.

Dr. Kornhauser: What are the most common uses of body radiosurgery in your experience?

Dr. Lederman: There are several categories. One category of body radiosurgery is to use it to boost the dose of radiation for those who have already been treated with surgery, radiation or chemotherapy. By administering higher doses safely, better outcome should be had. Examples of this are those patients with lung cancer who have had radiation or chemotherapy and have had a good response but not a complete response. Radiosurgery may well be able to extend their lives and increase the control rate. Similarly, radiosurgery may be administered after standard treatment for other tumors including of the mediastinum, pancreas and elsewhere as well as head and neck cancers.

Some cancers have returned after standard therapy. Body radiosurgery offers a second chance for those patients - especially when there are limited sites of disease.

Additionally, some tumors are poorly treated by conventional means and body radiosurgery is a new option. This includes those with metastases to various sites such as lung, abdomen, liver and elsewhere. Primary liver cancers as well as pancreatic cancers are suitable for body radiosurgery consideration.

Dr. Kornhauser: Has body radiosurgery opened up new options for those who previously had little chance?

Dr. Lederman: Certainly. The ability to treat metastases to the lung and liver as well as other sites is very exciting. We recently had a patient who underwent four years of chemotherapy for a solitary liver metastasis that was felt to be unresectable. He was sent home to die but yet when his brother found out about body radiosurgery and notified the patient, the patient was ecstatic. He went from being a condemned man to having a chance to live because of this technique.

Dr. Kornhauser: What are your statistics for body radiosurgery?

Dr. Lederman: Thus far, all tumors treated have been successfully controlled - meaning cessation of growth, shrinkage or disappearance. While our experience is early, especially being the first site in this continent to perform body radiosurgery, we have had a variety of dramatic examples.

Dr. Kornhauser: Can you describe some of the cases treated?

Dr. Lederman: Yes. Lung cancer patients have come to us after chemotherapy or standard radiation has been performed and then had radiosurgery with dramatic shrinkage. Liver metastases elsewhere thought to be untreatable have all been, thus far, controlled. Abdominal tumors similarly have had a positive outcome. One of the most dramatic examples was a gentleman with recurrent esophageal cancer who came to us after chemotherapy/radiation with intractable pain and inability to swallow. He was treated with five fractions of body radiosurgery over five days. His follow-up CT scans show a complete disappearance of the tumor. His pain is gone and he is able to eat once again.

Dr. Kornhauser: Can you treat tumors of the extremity?

Dr. Lederman: Thanks to the innovation of our group, we have been the first in the world to treat extremity tumors with body radiosurgery. We recently treated a woman who had extensive sarcoma of the leg extending near to the knee.

Dr. Kornhauser: Any other special considerations?

Dr. Lederman: We have met with a variety of patients who are Jehovah Witnesses who declined to have blood transfusions. Obviously with body radiosurgery there is no invasion, no cutting and no risk of bleeding. It certainly offers great appeal for this large segment of society seeking a bloodless non-invasive approach to their disease.

Dr. Kornhauser: Who should be evaluated for body radiosurgery?

Dr. Lederman: Many patients with cancers that cannot be treated successfully in standard fashion or those with cancers that have returned despite prior therapy may wish to at least inquire about the technique. We now have the ability to treat everything from brain tumors to those throughout the body and extremities with precision radiation.

The best chance for a patient is to call us. We have set up an 800-phone line so that the access is certainly extensive. Review of patients' CT scans and clinical histories will be undertaken by our multi-specialty panel. We believe we have established a mechanism to offer a great deal of information to people on a very timely basis.

Dr. Kornhauser: This is certainly intriguing work. It should change the lives of many people around the world.

Dr. Lederman: Thank you.