

European Questions About Vestibular Schwannomas

By: Dr. Gil Lederman

In many countries now there are groups of patients who were treated by the physicians of Radiosurgery New York for acoustic neuromas or vestibular schwannomas who are forming social groups. Several recently asked a series of questions from a group in the United Kingdom about treatment options and results.

An acoustic neuroma is a benign tumor of the 8th cranial nerve. This is a delicate nerve from the brainstem responsible for hearing and balance. The tumor seems to be increasing in its frequency of diagnosis.

Yet, it is still an uncommon disease with an estimated 2000 Americans diagnosed each year. In some countries, there are very few patients diagnosed while in others the frequency seems great. This is likely due to access of patient care and the availability of contrast-enhanced MRI's.

The most common early symptoms of acoustic neuromas or vestibular schwannomas are hearing loss, which is often unilateral. Often patients have ringing sounds or tinnitus in the ear. This is most often unilateral. Other symptoms include a full feeling in the ear and sometimes imbalance, dizziness or years of awkwardness.

Many people aren't diagnosed for years after the development of symptoms. At the time of actual diagnosis, a great proportion recall having symptoms that have been a decade or two long.

For many patients the typical route is to be seen by an ear specialist who subsequently orders an MRI or nuclear magnetic tests with contrast enhancement. Often a small lesion is seen in the intracranial area, which leads to the internal portion of the ear. Another location that is common for acoustic neuromas is what is called the CP angle, or cerebellar pontine angle. This is a site near the brain stem where the delicate nerve leaves the brain to travel to the inner ear.

Since approximately 1895, surgery had been a mainstay for this disease. From 1969, stereotactic radiation has been used. The success rate even in patients treated decades ago with stereotactic radiation remains high. In early years, this treatment remained a rarity. Recently, I was in Israel giving a lecture to a group of acoustic neuroma patients and their families and met a man who was treated with radiosurgery in the early 1970's. He has had good control of his tumor but because of the limited technology available then as well as a paucity of dose data, he had some damage to the facial nerve. In our hands, this is essentially never seen.

What is so special about our approach is that we perform fractionated radiosurgery, which means the dose is divided and also we use biologically the lowest dose worldwide.

The questions brought forth from English patients and potential patients are interesting in their scope of knowledge about the disease and the treatment. Different treatment methods asked about include gamma knife (single fraction treatment), fractionated radiosurgery, single shot radiosurgery using Linear accelerator and proton beam. Of course there are surgical options and watchful waiting.

Some people choose to have no treatment and this was especially true when surgery was the only option. Now as fractionated radiosurgery is gaining hold and the data is compelling, with in general a minimum of side effects and great benefits, many patients are selecting this method.

There are other differences in that single fraction uses a screw on head frame. This is usually considered quite uncomfortable and most often patients get medicated with anesthetics or sedatives and sometimes even Decadron. Usually the patient stays overnight in the hospital.

Single fraction therapy doesn't allow for the benefits of fractionation - which are considerable.

This is in marked distinction to fractionated radiosurgery where there is a non-invasive re-locatable head frame. Where patients come in, get treatment and go about their business. Many patients come here and say that our treatment is a "treat" and not a "treatment."

Yet the success rate is very, very high with the vast majority never needing any further treatment and also maintaining hearing at the same level that they came in with or better. Currently, the overall control rate is 99% - meaning no further treatment is used.

There are different approaches in different facilities. Each doctor may prescribe dose differently, at a different point and at a different isocenter and therefore what may seem to be similar doses may be markedly different doses. For example, gamma knife people often prescribe their dose at the fifty percent line which means the inside dose is very hot, double the dose in fact in the interior. With our program, there is a much more homogeneous dose. We believe that a homogeneous dose is more likely to lead to better results since the degree of hot spot is markedly less and therefore it is much less likely to harm the delicate eighth nerve which is so crucial for balance and hearing and as well as for other nerves such as the fifth and seventh which are responsible for facial sensation and function. Their approach has been to lower the prescribed dose from what it was in the past.

Also there are differences in head frame systems with invasive and non-invasive frames. There are a variety of non-invasive frames including those that use dental and occipital fixation and those that do not. Also there are systems that don't confirm the positioning of the re-locatable frame.

We confirm in nearly two-dozen positions each time we use the frame. This allows us to be highly confident of the accuracy while maintaining the flexibility and the benefits of fractionation, which have been known for nearly eight decades. I am well aware of systems in many other facilities that don't perform daily measurement of the patient in treatment position.

There are differences in fractionation programs.

Our data shows if larger fraction size (500 rad fractions) is given the likelihood of hearing falls. There is statistical analysis confirming this fact. Furthermore, if we fractionate on alternate days versus consecutive days we have better hearing. For other centers that give higher doses on consecutive days with a higher total dose, the likelihood of hearing preservation will falter and the likelihood of harm to the surrounding nerves will increase. We are opposed to higher doses based on our high success rates - utilizing low dose treatment.

With our high success rate we see no reason to give higher doses, in fact we see many reasons not to give higher doses which may lead to serious adverse effects to the patient.

In the treatment of tumors giving the correct dose leads to good outcome. Giving higher dose gives the patient risks without obvious benefits.

Gamma knife system in general is markedly different because size of collimator is limited by the technology, whereas we have a vast array of collimator or beam sizes. In general the gamma knife people may use multiple overlapping fields, whereas we are very reluctant to use overlapping fields. Overlapping fields tend to create even higher hot spots than I discussed previously about isodose lines.

If single fraction people cut the dose too closely it means there are cold spots and cold spots allow for tumor recurrence. If they treat too great an area, there is a likely increased risk to surrounding healthy tissues. Also in exchange for this great precision is the pain of the head frame, often medication and hospitalization associated with the head frame.

We believe that we can properly and precisely treat the tumor, avoid harm to healthy tissues while giving the lowest actual dose to patients with acoustic neuromas and we have proof of hundreds of patients in this regard. Furthermore we have the flexibility of treating small as well as large tumors. Our group has the largest experience of treating larger acoustic neuromas - again with this fractionated approach.

About radiation causing second malignancies - the only second malignancies that have been reported in the literature after radiosurgery that was single fraction.

It is likely that the higher biological dose of radiation, the higher likelihood of malignant induction. We know that there is radiation repair with fractionation. The likelihood of repair falters precipitously with single fraction therapy. Fractionation likely helps avoid malignancies. Another possible factor that helps avoid malignancies is giving a lower dose. By giving the lowest dose feasible, fractionating and using radiosurgery techniques I believe that the likelihood of second malignancy will be kept to the lowest possible number.

About gamma knife treatment in its present form - it is in fact not true that its dose has been around for a longer period of time. Gamma knife recently was treating patients at the 1800 and 2000 rad range - each center and physician is unique, of course. They have reduced the dose due to untoward side effects and because our low dose fractionation program has shown that we can give a lower dose, break up the dose, avoid the pain of the head frame and have a high degree of success and a higher degree of hearing preservation. If you look at hearing at any level with single fraction it is approximately fifty percent yet with our fractionated program hearing at the same or better level is approximately ninety percent.

Thus the hearing appears better with our low dose fractionated program than with gamma knife. Also because we have continued to deliver the same dose for nearly ten years we have more data at the same dose for a longer period of time than most other centers.

Furthermore, if one evaluates facial or trigeminal nerve damage, the likelihood of that occurring with single fraction technology is greater than with fractionated stereotactic radiosurgery in our hands. Again the reason is the low dose and the fractionation.

If one simply looks at a major American clinic with single fraction experience from the early 90's, they had sixty percent facial nerve damage and sixty percent trigeminal nerve damage with overall eighty percent of their patients being treated for acoustic neuromas having facial and/or trigeminal nerve damage.

This gives tremendous reassurance for patients undergoing fractionated stereotactic radiosurgery with our physicians. We have the largest experience worldwide for fractionated radiosurgery of acoustic tumors. We have more patients treated over a longer period of time than anyone else using fractionated technique.

In conclusion, do I believe that there is a best method of treatment? Yes. Personally I believe that radiosurgery technique is very important. I believe that fractionation is important to maintain the best outcome for the facial, trigeminal and auditory nerve as well as the associated brain stem. I believe that the benefit is great both in terms of local comfort at the time of treatment and down the road hearing preservation.

I, in fact, have doctors who perform single fraction therapy sending me their difficult patients or patients with only one hearing ear to have the highest likelihood of maintaining hearing. These doctors know that when hearing depends on one nerve the patient is much better served by fractionation. I extrapolate this argument to state that all patients should have as much hearing, whether one or two eared, as possible to maintain quality of life and avoid undesired adverse effects.

