

## **ACOUSTIC NEUROMAS**

Being invited to Florence, Italy to address an international medical meeting about our work for head and neck tumors was a great honor. The symposium – organized under the auspices of the President of Italy was held in a once-ancient hospital that is now a museum in the historic city of Tuscany.

Our work for tumors of the head and neck area has garnered great notice. I am very proud that other patients who have previously been treated by our physicians now refer many patients. In many countries, “Lederman Clubs” have arisen that bring together patients that have been treated here in New York. What started out more than a decade ago for treatment of acoustic neuromas was a simple idea, that is, to use a lower dose than available elsewhere and to divide up the dose into a series of treatments. Acoustic neuromas are benign tumors that affect the nerve off the brain responsible for hearing.

By fractionating the dose of radiosurgery, the normal tissues would be allowed to repair effects of treatment. The benefits of fractionation have been known for many, many decades. It was only the inability of other systems to utilize a non-invasive relocatable head frame that made fractionation impossible.

Many, many studies using radiosurgery over more than 30 years show a high degree of success. The question is how to lower the dose, decrease or minimize the adverse effects, try to maintain hearing which avoiding treatment failure and facial and trigeminal nerve dysfunction. Of course, everyone wants to try to maintain hearing or even improve hearing. Thus, our program that started so many years ago was discussed in Florence, Italy this past weekend.

This program is now the largest program worldwide for treatment of acoustic neuromas.

Acoustic neuromas are most often benign tumors affecting the 8<sup>th</sup> cranial nerve. The brainstem – the most delicate part of the brain – has 12 nerves coming off each side. The 8<sup>th</sup> cranial nerve is called the acoustic nerve and is responsible for balance and hearing. Tumors of the 8<sup>th</sup> cranial nerve are probably most common although we see tumors of most cranial nerves.

For more than a century, surgery has been used to treat these tumors. Unfortunately for patients, surgery usually results in deafness to the patient and often facial paralysis as well as other possible adverse effects. It is easy to see why patients would prefer other than this invasive treatment.

Gamma knife was a step forward but because of its high dose in a single fraction, it tended to cause side effects that seem to be avoided today with fractionated stereotactic radiosurgery in our low-dose form. We have currently treated about 500 patients for acoustic neuromas and these patients were reported on the international meeting in Italy. Most patients have tumors initially recognized by symptoms such as hearing loss, abnormal noises or sounds in the ears, imbalance and sometimes other symptoms affecting the facial or trigeminal nerve. The facial nerve is responsible for movement of the face, while the trigeminal nerve is responsible for sensation of the face.

One of the unique features of our program is that all the patients over the years have received the same total dose. In the early years, patients with small tumors received 500 rad times 4 on alternate or more days while patients with tumors larger than 3cm received 400 rad times 5 on five alternate or more days. The total dose has always been the same. Before the program started, we thought we might need to escalate the dose, but because of the paucity of treatment

failure, this dose has remained the same. It is remarkable that we have been successfully able to maintain this low biologic dose, yet have such a high control rate.

Described at the meeting were patients whose ages ranged from 11 to 88 years, with a mean of 53 years. Forty-one percent were female and 59% were male. Forty-seven percent of patients had right-sided tumors and 53% had left-sided tumors. The tumor size in diameter ranged from 0.3cm to 5.8cm, with a mean of 2cm. The volume ranged from 0.1cc to 34.7cc, with a mean of 4.2cc.

For follow-up evaluation, all patients are asked to get hearing tests and contrast-enhanced MRI's of the internal auditory canals every six months for two years and then annually. We have a group of experts to evaluate patients before and after treatment. Currently, 99% of patients are in remission free of any further treatment to the tumor.

How is success defined in the field of radiosurgery? It is defined as cessation of growth, shrinkage or disappearance of the tumor in the treated area. This means that 99% of patients have needed no further treatment for their acoustic neuromas.

More than 90% of our patients still have hearing after 5-plus years. What about table or improved hearing? We know that the dose and fractionation does make a difference. With patients treated at 400 rad times 5 on alternate or more days, 78% have stable or improved hearing. When consecutive day treatments are given, hearing rates fall to the 50% range. That is why we divide up the dose and deliver treatment on alternate days – to improve quality of life –hearing!

Statistical analysis shows this is truly significant and we, therefore, recommend that treatment be given on alternate days in 400 rad fractions times 5. The rationale is explained and people are very understanding. Again, our treatment is non-invasive so there is no hospital stay, no pins or screws into the skull, no anesthesia or medication needed for head frame placement or treatment. Many tell us that the treatment is a treat.

The likelihood of stable or improved facial nerve function is Over 99%. Similarly, trigeminal nerve function is in the same range. The facial nerve controls movement of the face while the trigeminal nerve is responsible for sensation. The vast majority of patients – over 90% - tell us their balance is stable or better after treatment, which we believe is also attributable to the dose.

Results for neurofibromatosis patients were also reported at the Italian meetings. Patients with neurofibromatosis II (NF2) tend to have bilateral acoustic neuromas – that is on both hearing nerves. Again, we have one of the largest experiences worldwide treating acoustic neuromas in the NF2 patients. The ages ranged from 11 to 60 years, with a mean of 31 years. Thirty-eight percent of patients were female and 62% were male. The tumor size of acoustic neuromas in NF2 patients was 0.5 to 5.0cm, with a mean of 2.4cm. Follow-up ranged to 93 months.

Three patients who presented with facial nerve damage from the tumor compressing that delicate nerve actually had improvement. We were one of the first groups to report actual improvement of hearing and improvement of facial nerve function. We have also had an acoustic neuroma patient with NF2 who had numbness of the face before they came to us which improved with treatment. Of the NF2 patients, 7% had improved hearing while 57% had stable hearing and 36% had worse hearing. Personally, I believe that worse hearing is due to the years of the tumor eroding what would be the otherwise healthy 8<sup>th</sup> nerve.

Overall about 500 patients have been treated and the vast majority – 99% - needs no further treatment for the tumor. This is reassuring especially since our patients have generally avoided the adverse effects of deafness, facial and trigeminal nerve damage seen more commonly with other methods of treatment.

Our intent is to continue following our patients and to offer this treatment to prospective patients. We believe this is the treatment of the future – it is well-tolerated, generally painless and highly successful. We have seen these results in all age groups. There is no obvious advantage to limiting fractionated stereotactic radiosurgery to any particular group.

Our purpose of presenting this data at international and national medical meetings is to inform physicians and researchers in the field about new developments in the treatment of this benign condition. We are hopeful patients learn about all treatment options before proceeding with any therapy. I tell people rushing to get treated is not necessary. The decision process, however, is important. Already one of the Italian organizers is contemplating a journey to New York for fractionated stereotactic radiosurgery. Such is the nature of our work.