The most common primary body cancers which metastasize to the brain are listed in the accompanying table. Researchers commonly report that these primary carcinomas metastasize to the brain at the rate of 20-40%.

At a low estimate this means that about 185,840 people who are diagnosed with one of these primary body cancers can expect to have it metastasize to the brain. If these predictions are correct then up to 40% or 371,680 people in the United States can expect to have their primary body cancers metastasize to the brain.

In stark contrast, we expect the number of new primary brain tumors each year to be about 34,000 (Source: Central Brain Tumor Registry of the United States, 1998). That is somewhere between 9-18% of the amount of metastatic brain tumors that can be expected in the same period. Consider the number of tumors on a world-wide basis and the incidence of brain metastases is staggering.

Intracranial metastases are tumors that result from other primary body tumors. Active cancer cells travel hematogenously (through the blood supply) in the arterial circulation. Areas of the body which circulate high amounts of blood such as the brain, lungs, liver and spinal cord are more susceptible to metastatic tumors.

The brain circulates approximately 25% of the blood in a human’s body, making it the perfect host for metastases from primary body cancers. Metastatic brain tumors can appear anywhere in the brain and are proportional to the blood supply to specific areas.

Commonly, more than one metastatic brain tumor appears with the first symptoms. The fewer tumors the patient has, the better the prognosis. However, it is not uncommon to find and treat multiple brain metastases with radiosurgery and with conventional whole brain radiation therapy.

In the past, patients with metastatic brain tumors were often given palliative care only (keep them comfortable with minimally aggressive treatment).

### BODY CANCERS THAT COMMONLY METASTASIZE TO THE BRAIN

<table>
<thead>
<tr>
<th>Primary Cancer Site</th>
<th>Estimated New Cancer Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digestive System (colon/rectum/other)</td>
<td>226,300</td>
</tr>
<tr>
<td>Respiratory System (lung/bronchus/other)</td>
<td>187,000</td>
</tr>
<tr>
<td>Prostate</td>
<td>179,300</td>
</tr>
<tr>
<td>Breast</td>
<td>176,300</td>
</tr>
<tr>
<td>Urinary System (kidney &amp; bladder)</td>
<td>86,500</td>
</tr>
<tr>
<td>Skin (melanoma/other)</td>
<td>54,000</td>
</tr>
<tr>
<td>Endocrine (thyroid)</td>
<td>19,300</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>929,200</strong></td>
</tr>
</tbody>
</table>

(Source: Table I-1, SEER Data 1973-1996, published September 1999, National Cancer Institute, for United States population only.)

On the whole, metastatic brain tumors receive very little emphasis in patient support literature. It is time the medical community and the support community developed better mechanisms for gathering statistics on metastases and developed educational programs to aid those with body cancer in ways to detect metastases at an early point in their development. Earlier detection would result in longer survival times, and more options for treatment.

Patients with metastatic brain tumors have a very high mortality rate. This has driven the goal of treatment for those with active primary cancer upon diagnosis of a brain metastasis to first and foremost prolong the life of the patient to afford the chance of treating the primary cancer, and secondly, to increase the quality of life and the survival period as much as possible.

*Continued on page 7*
Stereotactic radiosurgery is not surgery. The skull is never opened. Radiosurgery involves the use of precisely directed single fractions of radiation to create lesions within the brain or to treat tumors or vascular malformations with minimal damage to surrounding structures or tissues.

This works by delivering a relatively high dose of radiation in one session to the target with scalpel-like precision. The dose is designed to injure or kill the cells or their supporting blood vessels, while minimizing its effect on surrounding healthy tissue. The radiation distorts the cells’ DNA, causing them to lose the ability to replicate themselves. The safety and clinical effectiveness of this technique has been established since 1968 in over 150,000 treated individuals.

The benefits include: No risks of infection or anesthesia reactions; virtually no pain; reduced costs; and an immediate return to normal activities.

Radiosurgery may or may not be appropriate for your condition. It may be used as the primary treatment or recommended in addition to other treatments you may need. Only a treating neurosurgeon can make the evaluation as to whether you can be treated. Some of the most common indications for treatment today are:

- Arteriovenous/vascular malformations
- Meningiomas
- Acoustic neuromas
- Pituitary and pineal tumors
- Metastatic tumors
- Glial and astrocytoma tumors
- All other malignant & benign tumors
- Trigeminal neuralgia
- Parkinson’s tremors/rigidity
- Functional disorders

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Editor’s note: This story was written by Nancy, Clyde’s wife.

Our lives changed forever three years ago when Clyde was diagnosed with adenocarcinoma of the right lung, with a single lesion to the brain. One doctor said this was the “good” kind of cancer! Clyde was 71 years old, and had stopped smoking 25 years earlier.

We have two daughters, Jo Anne and Kerry (married to Ray). The girls spent many years researching every treatment option, calling doctors, and making appointments for consultations. Kerry found an article detailing results of a study done years before which offered hope in cases such as her father’s.

If operable, lung surgery sometimes worked. This was not an easy decision. Local doctors recommended radiation of the lung, but they did not encourage “aggressive” treatment.

Radiation to the lung was begun. It helped to shrink the tumor, but had to be stopped at a certain point so that lung surgery would be possible. Fortunately, Kerry contacted Dr. Melvyn Goldberg, Chief of Thoracic Surgical Oncology at Fox Chase Cancer Center in Philadelphia. After several consultations and many medical tests, he agreed to remove Clyde’s right lung if the brain lesion was treated first. So many decisions to make!

Finally a local doctor mentioned Gamma Knife radiosurgery. We talked long and hard with the support association. Dr. Lawrence Chin, with the University of Maryland Gamma Knife Center, treated the brain lesion one month before the lung operation. This was in April, 1997, and involved an overnight hospital stay and then a return to normal activities.

A year later Dr. Chin treated a second tiny brain lesion, again with Gamma Knife. Two years have passed and each of these lesions is “just a small amount of scar tissue.” We just had our three year check-up. Clyde has been having MRI’s every three months until the last, which was a six month period. We are grateful that we never did need whole brain radiation, because of its side effects. The Gamma Knife treatments have worked wonderfully! We have been most fortunate to have searched out and found the best treatments for Clyde. I hope more physicians tell their patients about Gamma Knife.

Clyde works out twice a week at a local health facility, and we walk two miles each morning. We enjoy reading, the computer, and traveling. Recently, we took a family trip to Alaska. Clyde and I celebrated our 40th anniversary in June.

Words of wisdom: Do the research. Don’t be discouraged. There are options out there. Think long and hard and make those decisions that have to be made. Friends and family make a great support group! We consider ourselves to be so VERY fortunate at this time.
Metastatic Brain Tumors

Editor's note: Numbers in parenthesis correspond to published research articles.

Brain metastases are the most common type of brain tumors, with the total number diagnosed annually outnumbering all other intracranial tumors combined (22, 30). With the increasing survival of patients with systemic (extracranial) disease, the incidence of the most common cancers (lung, breast, melanoma, renal and colon) is thought to be rising. Autopsy data show that the frequency of brain metastases in patients dying from cancer varies from 20 to 50%, and may be higher if dural, leptomeningeal, or spinal metastases are taken into account. As the incidence of brain metastases rises due to improved cancer therapy for systemic disease (18), it is imperative that improved intracranial therapy be developed as well.

The most common source of brain metastases in males is lung cancer and in females is breast cancer (29), but with increasing frequency of lung cancer in females, it is expected that for females this too will be the primary cause of metastatic brain tumors (22).

How Do Tumors Metastasize?
The mechanisms by which primary tumors produce brain metastases is thought to be hematogenous spread from primary or secondary sites in the lung. Since the brain has no lymphatic system, all tumors metastasizing to the brain do so by spreading through the bloodstream. Arterial blood passes through the lungs before entering the brain, and collects tumor cells filtered out in capillaries, which subsequently embolize to the brain. This is correlated with sites of localization: the cerebrum is involved in 80 to 85% of all brain metastases, the cerebellum in 10 to 15% and the brainstem in 3 to 5% (6, 10, 29). The overall distribution corresponds roughly to the relative size of blood flow regions in the brain.

Different types of primary tumors have different relative frequencies of single versus multiple metastases. Melanoma has the highest tendency to produce multiple lesions, followed by lung and breast cancers (19, 22). Though many studies have indicated that 37 to 50% of patients present with a single metastasis (6, 29), recent studies have shown that patients with one lesion detected by CT may demonstrate multiple lesions detected by MRI (4, 28). These findings clearly agree with our data in which the majority of patients presented with multiple lesions upon contrast dye with MRI (1).

Common Symptoms
Metastatic brain tumors present with the usual signs and symptoms of any expanding intracranial mass lesion. These include increased intracranial pressure and focal neurological deficits with focal irritations. Such symptoms include headaches, focal weakness, mental status changes, seizures, ataxia [inability to coordinate voluntary muscular movements] and sensory and visual changes. Though most of these symptoms are of gradual onset, acute episodes may occur due to hemorrhages into a metastasis (15). When such an event occurs, either choroid carcinoma or melanoma must be considered, because these have the greatest tendency to hemorrhage (15). Because of the greater incidence of bronchogenic metastasis, these lesions represent the most common source of a hemorrhagic lesion (15, 21).

Whole Brain Radiation Therapy (WBRT)
Brain metastases carry an ominous prognosis regardless of primary status or treatment given. The median survival of untreated patients, or those treated with corticosteroids alone to reduce brain edema, is about one month (32). Whole brain radiation therapy (WBRT) is the most widely used method of treating brain metastasis, despite the fact that patients treated this way have an expected survival of only three to four months. Death from recurrent or persistent tumors occurs in about 50% of the patients (12, 29).

The radiosensitivity of the tumor itself is not taken into account when these patients are being treated. Most tumors that metastasize to the brain, such as non-small cell lung, renal, colon, and melanoma are radioresistant [resistant to radiation therapy]. Worse yet, many treating facilities continue to use prophylactic cranial radiation despite the fact that only one study has ever demonstrated a statistically significant increase in life span (20). (Prophylactic radiation therapy is treatment given before lesions have appeared within the brain.)

Significant neurotoxicity has been reported with the use of WBRT. Acute effects include hair loss (alopecia), nausea, vomiting, lethargy, otitis media and severe cerebral edema. Though some of these effects can be transient, dermatitis, alopecia, and otitis media can persist for months after irradiation (23). Chronic effects are even more serious, and these include atrophy, leukoencephalopathy, radiation necrosis, neurological deterioration and dementia (5). Reports of development of severe radiation induced dementia have varied between 11% in one-year survivors (23, 24, 27) to 50% in those surviving two years (7, 23). The time involved in this therapeutic intervention frequently is over two weeks, in itself a burden to many patients (5, 8).

Surgery and WBRT
Surgical removal of solitary and occasionally multiple lesions has been reported to enhance survival (2, 6, 7, 10, 16, 26), with several reports indicating improvement of neurological function. Recently, the concept of multiple craniotomies for multiple lesions has been promoted (2), though only in those patients with “accessible locations” and “good clinical condition.” The risks of postoperative morbidity in “eloquent” areas must also be considered when contemplating surgical intervention. The complications of the surgery itself include hemorraghes and wound infection.

Pseudomeningoceles form in 8 to 9% of patients, and an estimated 10% of patients develop clinically evident thromboembolic complications such as deep vein thrombosis or pulmonary embolisms (3, 9). Recent reports have also indicated an operative mortality of approximately 3%. Though adjunct WBRT

Continued on page 4
has been prescribed in the past, and Patchell et al (16) showed that a subset of patients with favorable prognosis and a single brain metastasis that had surgery followed by adjunct WBRT had a median survival of 10 months, other subsequent randomized trials failed to show a benefit to surgical resection (14).

Radiosurgery
Radiosurgery is a technique which allows the delivery of a single high dose of radiation in a highly accurate manner (24, 25). The Gamma Knife (a dedicated neuro-surgical instrument) allows numerous beams of radiation to converge on a target site, resulting in a high dose of radiation delivered to the target site with a sharp dose gradient at the target edge. A recent report by Somaza et al (25) revealed that even in patients with radioreistant tumors (such as melanoma), local tumor control was achieved in 97% of patients and neurological improvement occurred in 53% of affected patients.

Median survival with radiosurgery alone improved from two to three months to nine months in patients with single or multiple metastatic melanoma lesions to the brain (25). Despite such results, radiosurgery has not been considered a primary therapy. In the recent past most treatment centers treat only unresectable tumors or recurrent tumors with this modality (17, 31, 32).

Multiple Metastases
The issue of multiple metastases has become important, as has the issue of lesion size. From our perspective, neither number of lesions nor the size of the lesions has been shown scientifically to be a limiting factor in single session Gamma Knife treatment. Multiple metastases may be more of an issue in terms of the equipment itself not allowing multiple lesions to be treated in a single sitting. At the Miami Neuroscience Center, at HealthSouth Doctors’ Hospital in Coral Gables, Florida, we have treated 460 patients (261 females and 199 males) with a mean of four lesions per treatment. The patients had the following types of cancers: 111 males and 111 females had lung cancer, 32 males and 16 females had melanoma, 7 males and 20 females had colon cancer, and 8 males and 16 females had renal cancer.

When we looked specifically at the outcome of metastatic breast carcinoma (1), we found the following results: 68 women were treated, ranging in age from 25 to 83 years, and the median age was 52. Thirty-eight patients had previously received conventional modalities, including WBRT. A total of 110 treatments were given to the 68 women with an average of eight tumor sites per patient. Twenty-seven (40%) of 68 survived one year, seven (10%) survived two years, and two (3%) survived more than three years. Twenty-six patients with one to three lesions were treated, 18 with four to seven lesions, and 24 with more than eight lesions. Their overall local control rate was 94%, with 39 (91%) of the 43 patients expiring, dying of causes unrelated to their brain metastases. There was no significant difference in survival and local control based on the number of lesions treated. Survival was clearly found to be independent of the number of lesions treated.

Similarly, when we looked at our renal cell carcinoma patients, we found similar results. Twenty-two patients were treated: 8 females and 14 males. The range of lesions was between 1 and 21, with a median of 3.4 per patient.
Twelve of 22 (55%) had WBRT. Age ranged from 38 to 80, with a median age of 60. The median survival was 8.7 months (3 to 55 months), with local control in 20 of 22 patients (91%). Eight patients (36%) required re-treatment for new lesions. Survival at one year was 24% in patients older than 60, but 54% in those younger than 60. Once again, the number of sites or prior WBRT did not have statistically significant effects on survival.

In our study, Gamma Knife radiosurgery shifted the question of survival to that of systemic control. Previous whole brain radiation therapy results have yielded no survival advantage to the treatment. The overall complication rate with one-session Gamma Knife has been 1.2%, in which patients having biopsy proven radiation necrosis required treatment with stereotactic aspiration and corticosteroids. This is a very low rate of complications.

Conclusion

In conclusion, we believe that one-session Gamma Knife radiosurgery for brain metastases is a superior mode of treatment for either single or multiple metastases. Survival rates match or exceed those previously reported for surgery with whole brain radiation or whole brain radiation alone. Radiosurgery yields added advantages: outpatient treatment, lower morbidity, greater flexibility in terms of local and general pressure and the frequently occurring local swelling surrounding the tumor.

It is important to define the indication for each one of the techniques alone and in combination so that optimal treatment can be selected for every patient. There is a long track record for WBRT, surgery and now also for radiosurgery alone. However, the role of these methods in combination is not as clear. As an example, survival is longer after radiosurgery alone than after WBRT alone. Does that mean that a combination of both is even better? Possibly, but not necessarily: available results point in both directions.

And what is the role of resection of one (or more) metastatic lesion(s) versus stereotactic radiosurgery? A single large metastasis with mass effect (local symptomatic compression of the brain) and signs of increased intracranial pressure is a clear indication for open surgery, to achieve prompt relief of the local and general pressure and the frequently occurring local swelling surrounding the tumor.

What if there are two lesions or more? If one is large and the others small, resection of the large lesion followed by radiosurgery of the small lesions might be the optimal strategy. Also, there is a 5-40% risk of local recurrence following resection. Radiosurgery to the tumor is a sensible way to reduce that risk if the patient is in good general condition.

Is there an upper limit for how many cerebral metastatic lesions can be treated with radiosurgery? In the past, this limit was somewhat arbitrarily set to three or four. Several recent studies, including those presented by Dr. Wolf, show that the number of lesions treated with stereotactic radiosurgery does not affect the outcome in terms of survival in the majority of patients. The survival is 80% dependent on how well the primary tumor and systemic disease is controlled.

Stereotactic radiosurgery is a very efficacious addition to the armamentarium for treatment of cerebral metastastic disease. Over time, the impact and importance of radiosurgery will increase, as it is being more widely implemented in clinical practice.
Researchers at the Karolinska Hospital in Stockholm, Sweden, should justifiably be proud of their accomplishments. The development of the Gamma Knife along with formal and rigorous radiosurgery treatment principles is no doubt one of the most significant medical accomplishments of the 20th century. With the advent of computerized imaging, the true potential surrounding the precision and elegant simplicity of the Gamma Knife has been realized in treating a wide variety of intracranial problems.

Physicians are seeking out the benefits of the Gamma Knife more and more for treating their patients’ intracranial problems because such treatments are fast, efficient, effective, and typically carry lower risks of serious side-effects than conventional treatments.

The recognized success of the Gamma Knife, especially for tumors, leads to an obvious question: If it works so well for the brain, why not use it to treat tumors elsewhere in the body?

Of course we should use Gamma Knife methods and treatment concepts to treat tumors elsewhere in the body. The reason that such treatments have not been introduced earlier is multi-factorial. But stereotactic body radiotherapy is finally here and again researchers at the Karolinska Hospital deserve the most credit for its development.

Dr. Henric Blomgren, an oncologist, was frustrated with the poor ability of systemic therapy such as chemotherapy to ultimately control gross metastatic deposits of tumor in the chest and abdomen. This frustration is particularly apparent in patients with a limited number of identifiable tumors where a better local therapy might make an impact. A physicist colleague, Dr. Ingmar Lax, a veteran of Gamma Knife physics and development, joined forces with Dr. Blomgren to devise a method to perform radiosurgery in the body.

The most obvious obstacles to such an approach are related to motion and fixation. In brain radiosurgery, one can assume that with rigid immobilization of the skull via the Leksell frame halo that there is no motion of the brain or any targets within the brain. In terms of rigid immobilization, the skull is relatively easy to firmly attach to the fiducial markers for stereotactic targeting.

In the body, organ motion is the rule. It is indeed important that our patients should breathe, that their hearts should beat, and that their bowels should churn. All of these physiologically important functions result in constant and significant motion. In addition, no rigid bony structure counterpart to the skull exists in the body that we might immobilize the body with.

Indeed, even bones in the body are relatively easily moved with relation to joints, tendons, ligaments, and soft tissues.

This movement of tumor targets within the body has been well recognized by radiation oncologists for many years. Using conventionally fractionated (low daily dose) radiation, radiation oncologists give a “margin” of radiation to the normal tissue around tumor targets to account for daily variations in the position of the target without “missing” portions on any given day.

These “margins” range from 2 to 5 centimeters (two inches) depending on the location of the target and will radiate normal tissue and organs that are in the way.

In trying to treat with the new method of high dose single fraction radiosurgery, a treatment biologically very different from conventionally fractionated radiation, a margin of 2 to 5 cm would result in unacceptable damage to surrounding normal tissue. Because of this problem, Drs. Lax and Blomgren had to devise a new method to target and immobilize within the body. The new method must be different from conventional radiotherapy methods, that would allow for a higher dose of radiation without the significant overlap that is found in traditional radiation therapy.

Their invention was the first stereotactic body frame. The frame includes a fiducial system that allows any point within the frame to be assigned a 3-D coordinate. The trunk and pelvis of the patient is immobilized by the “hugging” action of a vacuum pillow that encircles the patient over the majority of his or her circumference. Curves and crevices of the body fall into this pillow in a reliable and reproducible fashion while the extensive surface area of contact ensures immobilization within the frame.

The biggest cause of organ motion, diaphragmatic breathing, is reduced by employing an abdominal “clamping” pressure. The pressure forces patients to perform relatively more chest wall...
breathing as opposed to diaphragmatic breathing. Altogether, these maneuvers decrease organ and target motion within the body. This reduction of movement allows a higher dose of radiation to be targeted to the cancer area without the effects that would accompany conventional radiation therapy.

With the stereotactic body frame, the necessary “margin” of normal tissue around the target to avoid “missing” the target is around 5 millimeters (or 1/2 of a centimeter) in the transverse plane and 10 millimeters (1 centimeter or less than 1/2 of an inch) in the longitudinal plane. This is a significant improvement over conventional radiation targeting.

While much more accurate than conventional radiation, the body frame is about ten times less accurate than the Gamma Knife. However, the Gamma Knife can only be used for head and neck indications. The tissues of the central nervous system demand the precision of the Gamma Knife to prevent damage to healthy brain tissue.

Fortunately, normal tissues outside of the central nervous system are considerably more tolerant of radiation than the brain or spinal cord. Nonetheless, in order to deliver a greater dose without toxicity, stereotactic treatments in the body are fractionated — not the 20 to 35 treatments over four to seven weeks typical of conventional radiation, but rather a total of two to three treatments with large doses per treatment. Additionally, the outcomes should be the same or better with the stereotactic body frame.

The experience with stereotactic body radiotherapy as published by Drs. Blomgren and Lax started in 1992. The majority of treatments have been given to patients with a limited number (e.g., one to four) of metastases to the liver, lung, or retroperitoneum from cancer that started elsewhere (e.g., colon, lung, breast, kidney, melanoma, etc).

Some experience also exists for treating primary tumors of the liver (hepatoma), pancreas, and lung. The preliminary results are encouraging with control rates greater than 90%. Tumor “control” is not the same as “cure” and, unfortunately, in the majority of patients with metastatic disease the disease will ultimately progress elsewhere. Nonetheless, stereotactic body radiotherapy is clearly a promising emerging technology.

Our group at Indiana University treated our first patient in the U.S. with this system in early 1997. Since then, we have treated a number of patients with metastases, particularly those with metastases to the liver and lung. We have learned that the treatment is most effective if patients are carefully selected. For metastatic disease, we find this technology most benefits patients capable of self-care with three or fewer gross tumor deposits and controlled or absent primary body tumors.

The treatment may be associated with toxicity, particularly in heavily pretreated or frail patients. Targets must be separate from the spinal cord by 1 to 2 cm to avoid cord injury. Although uncommon, as with conventional radiation, treating targets near the esophagus or bowels may result in stricture or even perforation. We have seen symptomatic pneumonitis in several patients treated for larger lung metastases as well as a few cases of pericarditis. Most problems are self-limiting after conservative management and, overall, the treatment has a very favorable toxicity profile.

At Indiana University, we are accruing patients to a rather novel trial for people with medically inoperable early stage lung cancer. Eligible patients must have pre-existing medical problems that preclude them from a potentially curative surgical resection. This patient population has a need for better therapy because the cure rate drops from 50 - 70% with surgery to 15 - 40% with conventional fractionated radiation.

Conventional fractionated radiation exposes rather large volumes of healthy lung tissue to radiation doses comparable to the tumor dose. As such toxicity is significant. With stereotactic body radiotherapy, we hope tolerance of treatment and tumor control will improve. The study is a formal evaluation of escalating doses of radiation (phase I toxicity study) and will be followed by a confirmatory efficacy study (phase II). This is the first formal trial conducted for this technology that we are aware of, as all previous reports have been uncontrolled and retrospective.

While stereotactic body radiotherapy will not be the answer to all patients with cancer, it represents an evolving and potentially important therapeutic option. It constitutes a logical extension from experience obtained treating brain disorders with the Gamma Knife. Lessons learned in treating patients with the Gamma Knife will be useful within the new realm of the body.

More importantly, with controlled trials and thoughtful patient selection, the place for this therapy will be more appropriately defined in time.

Dr. Robert Timmerman is an Assistant Professor of Radiation Oncology at Indiana University School of Medicine and Co-Director of the Indiana Lions Gamma Knife Center. He may be reached by phone at: +317-274-1190 or by email at: rtimmerm@iupui.edu.

Metastatic Brain Tumors

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Radiosurgery accomplishes both of these goals while allowing for a quick return to the treatment of the primary body cancer. With radiosurgery, we are seeing patients have multiple treatments for their central nervous system metastases, and we are seeing dramatically increased survival times.

In the recent past, clear and convincing research has shown the benefits of radiosurgery for brain metastases. It may be utilized after, before or without whole brain radiation therapy. It can be repeated if new metastases appear. Radiosurgery has been shown to have the same tumor control and survival time as whole brain radiation in certain conditions. It is simply another ‘tool in the tool box’ which physicians have available: a tool that is quick, easy for the patient, and lets the treatment for the primary cancer continue without interruption. Where appropriate, radiosurgery is a win-win situation for everyone.
Fast Facts About Cancer

PROSTATE CANCER:
- Second most common cancer in men (after lung)
- Median age at diagnosis is 72
- Highest reported mortality in the world is among American blacks
- Lowest rates are found in Asia and Africa
- Regular use of aspirin may be associated with lower risk
- 20-40% chance of developing brain metastases

BREAST CANCER:
- 1 in 8 lifetime chance of developing breast cancer
- About 180,000 women are diagnosed each year
- White, Hawaiian, and black women have the highest risk
- At age 60, a white person has a 2.8% chance
- San Francisco Bay area women have the highest rate reported in the USA
- Family history plays a strong part in risk
- 7 in 8 lifetime chance of not developing breast cancer
- 20-40% chance of developing brain metastases

KIDNEY CANCER:
- Rates are highest in USA, Europe and Scandinavia
- Highest risks among white and black men
- Wilms’ tumor of the kidney (nephromblastoma) is found only in children
- Cigarette smoking is significantly linked to these tumors
- Abuse of analgesics (pain relievers) is causally linked
- High weight or obesity is a significant risk factor especially among women
- 20-40% chance of developing brain metastases

MELANOMA OF THE SKIN:
- Related to intense intermittent exposure to UV radiation in early life
- Fair skin, light eyes and hair, and freckles are associated with increased risk
- Apparent increase in risk of melanoma after breast or brain cancer
- Rate of skin cancer in southern USA exceeds that of all other cancers combined
- Represents only 5% of all types of skin cancers, but 75% of all skin cancer deaths in USA
- Australia has one of the highest rates in the world
- Melanomas can occur on any body part, the top of the head or the ear are the most common
- In dark-skinned people, often occurs on the palms of the hands and soles of the feet
- 20-40% chance of developing brain metastases

COLON & RECTAL CANCER:
- Second leading cause of cancer deaths in men in the USA
- Rank third among women in cancer deaths
- Risk increases with age, with 70 as the median age at diagnosis for men
- Any age can be susceptible to colon cancer
- Highest rates are found in industrialized countries, such as the USA
- Lowest rates are found in Asia and Africa
- Dietary fat and low fiber diets may increase risk
- Regular use of aspirin may be associated with lower risk
- 20-40% chance of developing brain metastases

LUNG AND BRONCHUS CANCER:
- Two types of lung cancer: non-small cell and small cell
- Non-small cell grows and spreads more slowly
- Small cell lung cancer is also known as ‘oat cell’ cancer
- Small cell cancer is aggressive and spreads quickly
- Accounts for about 15% of all types of cancers
- Accounts for 29% of all cancer deaths
- Maoris of New Zealand have the highest rate of lung cancer
- Black males have the highest incidence rate in the USA
- Most common cancer in men, second most common in women
- 20-40% chance of developing brain metastases

“Every struggle has a spirit.”
– Unknown
Malignant Melanoma and the Pathway to Hope

“What color was your hair until the age of six?”

That’s the first question on the patient questionnaire at the John Wayne Cancer Institute in Santa Monica, California.

Six years old...

When I was six years old in 1958, my father, mother, six of my nine siblings and I moved from New Jersey to São Paulo, Brasil, where my father was director of a dental and surgical products manufacturing operation. Forty-three years later we are still here and now I am married to Ivete, a beautiful Lebanese Brazilian. We have three young adult children: Andrea, 23, Robbie, 21 and Phillip, 19. I now own the family business, and we continue to sell high-tech surgical equipment.

Being one of those people blessed with perfect health, I never went for a check-up until I was 42 years old, and even then I went for no specific reason – just a check-up. At the end of a long day of medical testing I saw a doctor who would read me my results and take my questions. I asked him about two large lumps I had in my right armpit. He said, “Ah...that he did. Two weeks later when I went in to have the stitches removed, he repeated his advice: “you wanted to hear it straight, here it is: you have metastatic malignant melanoma.”

I felt my body slowly freeze, from head to toe – I knew what this meant, having worked my entire life in the medical field, and my first thoughts were, “this isn’t happening to me.”

Two days later I was in surgery at the Memorial Sloan-Kettering Hospital in New York, where the diagnosis was confirmed. From there I went to post-operative care back in São Paulo, where the surgeon told me about the John Wayne Cancer Institute. I was accepted there as part of an FDA controlled experiment, in which a vaccine used melanoma cells to “jump start” my immune system, with treatments once a month. This meant moving my family to southern California, to be near the treatment center and to enjoy what was supposed to be the last year of my life.

Those were hard times - riding the roller coaster of my emotions, up one day, down the next. Three months into treatment, with high expectations I had a recurrence with a metastatic lymph node in my neck, which required more surgery.

Life progressed relentlessly, and slowly the roller coaster became flat, and the ride became less harrowing. At three years into treatment I was about to graduate to the next level, which meant treatments would occur only every six months. The “graduation ceremony” entailed head to foot body scans - if these were clean I could move ahead.

The results came in from the January 1997 MRI of my brain, showing a metastatic lesion in the front of my brain, and a (benign) meningioma on one side.

I had read all along that as long as I was a stage three melanoma patient I was OK, but that stage four was the end – when cancer spread to the vital organs, which usually were brain, lungs and liver. This was the end...

“Not so,” said Kathleen, the saint who is my nurse at the John Wayne Cancer Institute. “Now there is something called ‘Gamma Knife’ where they zap the tumor in your brain without surgery.”

Kathleen sent me to a nearby university hospital where the treatment cost was $30,000!! I couldn’t afford that so I returned to Brasil to consider my fate and look for alternatives.

The alternatives came through the Internet where I learned of an institution which offered a special package rate for patients who were from out of the country and who did not have insurance coverage. The package rate was a much more realistic $18,000, which my family and friends all chipped in and paid for.

As we left the San Diego Gamma Knife center at 11 a.m. one bright California morning, my brother who had flown in from New Jersey to keep me company commented, “We’ve been robbed.” When I asked him why he said, “Well look at you, two hours ago you had a malignant brain tumor, now you have none and there is no difference from looking at you!” And it was true – the treatment was as benign as drinking a glass of cool water.

The good news is that this episode was the end of my metastasis anywhere, and two years later, I have been released from treatment as cured. Not a trace of melanoma anywhere in my system!

What did I learn?

I learned that God, whom I already knew personally, is good – no matter what life hands you.
Jack of Miami Shores, Florida, says he’s “a little tired at 82 years of age.” Getting treatments and going to doctors’ appointments have been a routine part of his life for the past decade. Nine years ago in 1991, at the age of 73, Jack was diagnosed with prostate cancer. This was “only a minor setback,” he states. After initial treatment for his prostate cancer, Jack continued on with life. His love for gardening and flowers and socializing with people continued. Five years later in 1996, he began having problems.

He was diagnosed with a metastatic tumor in the brain. Jack underwent an open skull surgery called a craniotomy to remove the mass from his brain. It was found that his brain tumor had seeded from lung cancer that he did not know he had. Jack states that he had smoked all his life and that “my 20 years as a bartender probably did not help.” A bartender until his late 60’s, Jack says “I like bartending; I’m a people person. I enjoyed it, and was kept busy talking all the time.”

After his surgery, Jack says he did some crazy things such as “putting the washcloths in the refrigerator.” He would simply forget things, and he had headaches and some problems keeping his balance for a while. Jack’s positive attitude and his love of people and going places kept him going.

In early 1997, he found that he once again had another metastatic tumor to his brain from his lung cancer. “That’s when I was sent to HealthSouth Doctors’ Hospital and Dr. Aizik Wolf. He showed me this machine that could treat my brain tumor in just a couple of hours and I could go home. No surgery! I was really excited.”

Jack was treated on the Gamma Knife, a neuro-surgical instrument that performs radiosurgery in a one-session treatment. His neurosurgeon, Dr. Aizik Wolf uses the highly technical dedicated neurological instrument to treat brain tumors and other brain problems like pain and movement disorders. Dr. Wolf’s facility was the first treatment facility in Florida to purchase a Gamma Knife and provide this non-invasive treatment to patients with brain tumors.

“My treatment was easy,” Jack recalls. He arrived in the morning and had a frame placed on his head. He had a MRI brain scan, and then was treated on the machine. Jack went home in the afternoon and was back to his routine immediately.

“It was great! So great in fact that I have had eight treatments for brain tumors with the Gamma Knife and Dr. Wolf. That’s right! I just kept getting more small tumors from my lung cancer and Dr. Wolf quickly took care of me.” Jack was treated three times in 1998, once in 1999, and in January and April 2000. “It sure beats the surgery they did on me in 1996,” he recalls.

During 1999, Jack also received 33 chemotherapy treatments, and 12 special radiation treatments to his lung. The special radiation treatments to his lung required that a tube be placed down his throat and to his lung each time he had a treatment. “The tumor shrunk, but it came back,” Jack says. He is currently undergoing daily radiation treatments for the tumor in his lung.

Jack will have a checkup soon to see if another brain tumor has developed. “If one shows up then I’ll take the Gammie,” he says.

Jack says he spends a lot of time driving to doctors’ appointments and taking his 80-year-old sister to do the shopping. “After all, I have great energy. I used to be a professional dancer when I was eighteen,” he says. “I did ballroom specialties with my sister and another girl. My sister got married and quit, so I teamed up with the other girl. But then she got married too so I just gave up and went into bar service,” he recalls.

Jack has many responsibilities to his sister and to maintaining the household. Therefore he did not want radiation therapy because of the effects it would have on his memory and the mild dementia that it might bring. Jack said that having the one-session Gamma Knife treatments for his brain metastases allowed him to continue his treatments for his lung cancer without taking more than one day at a time to treat his brain metastases. He knows that it is important to get the lung cancer under control.

Jack and his sister live with five cats, which sleep indoors at night. “They all came as kittens,” Jack recalls. “We raised two kittens with eyedroppers. They were so young that they didn’t have their eyes open yet.”

Since the chemotherapy and radiation treatments to his lungs, Jack sleeps a lot, and is very tired. He knows that this is a side effect of his treatments and that in time he will feel better. He misses working with his garden but is too tired to do the work right now. However, Jack has not lost his great sense of humor, and can recall exact dates and treatments, with very few memory problems. Jack’s positive attitude and enthusiasm for life have made undergoing treatments for brain tumors and body cancers for almost a decade seem like a routine part of life.

Lung Cancer and Golf

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after 16 or 17 holes. My handicap is posted at 15.”

“I would recommend Gamma Knife very highly,” Jim says. “Considering chemo, and radiation therapy, Gamma Knife is worth everything to me.”
BRAIN TUMOR PROGRESSION BY TYPE OF RADIOSURGERY INSTRUMENT.....

The final report of RTOG 90-05 (Radiation Therapy Oncology Group) multi-institutional study, found a significant variable that was not predicted - the type of treatment unit. The study concluded that “those treated on a linear accelerator (versus the Gamma Knife) had a 2.84 greater risk of local [brain tumor] progression.”


RADIOSURGERY FOR UP TO FOUR BRAIN METASTASES WITHOUT WHOLE BRAIN RADIOTHERAPY.....

Survival time and local control were the same for radiosurgery alone versus radiosurgery and whole brain radiation therapy. The study concluded that “the omission of whole brain radiation therapy in the initial management of patients treated with radiosurgery for up to four brain metastases does not appear to compromise survival or intracranial control....” Whole brain radiation therapy would still be available as a salvage therapy where indicated.

Jims’ experience with cancer began in August of 1998, when he thought he was having a heart attack. “There was a tightening in my chest. The next day, it came back,” he recalls. Jim called a friend who was a physician’s assistant. She said, “Jim, it doesn’t sound like you’re having a heart attack. But if it were me, I’d go to the emergency room.” Jim went to the emergency room, where X-rays were taken of his chest. “Nothing was wrong with my heart; my circulation was fine. But they noticed a shadow on my lung,” Jim recalls. “It was small cell lung cancer.”

Jim, 62, lives with his wife Marsha in Wyomissing, Pennsylvania. Originally from Texas, Jim moved to Wyomissing in the 1980’s. There he met Marsha, and they have been married nearly 12 years. He has two sons, ages 36 and 42. Both sons live in Texas.

“I’ve been a smoker since I was 15,” Jim says. “I still smoke. I told Marsha I would quit once all the treatments were over. I’m going to try acupuncture, to help me quit.” “The doctors told me, ‘You’re going through enough right now. Don’t try to quit [smoking] right now. It’s like getting the horse out of the barn after the fire’s started. You already have the disease.’” The docs also said, “You have the same cancer as people that have never smoked,”” Jim recalls.

Jim had chemotherapy for about six months after he was first diagnosed. “The chemo was effective, and I didn’t get sick,” he says. “I was very fortunate. I didn’t have nausea. But I went through a lot of mood swings because of the steroids they put me on.” He also had five weeks of radiation treatments to his chest.

“After the radiation and the chemo, I was all clear - no lung cancer. I felt cocky,” he recalls. “But then I started to feel off balance. I told my radiologist, ‘I think maybe its my glasses.’ The doc’s eyes got real big,” Jim says. An MRI showed five tumors in Jim’s brain. His lung cancer had metastasized to his brain and was causing his balance problems.

To treat the brain tumors, Jim had chemotherapy and five weeks of whole brain radiation. Again, he experienced mood swings caused by the steroids. “I’m a low-key person,” he says. “The second day I was on chemo I was in a business meeting. I snapped at an engineer and almost jumped over the table to get to him.” Jim told his doctor, “When I get off these little green pills, half the city of Reading will come in and shake your hand.”

After the whole brain radiation, “five pieces of trash [tumors] were still left in my head,” Jim states. “Then my doc suggested Gamma Knife. I had never heard of Gamma Knife,” he recalls. In January of 2000, Jim had Gamma Knife radiosurgery at Lancaster General Hospital with Dr. Edward Garrido. Two tumors on the right side of his brain were treated with Gamma Knife. “I had no after-effects from Gamma Knife. I only had a small headache during the treatment.”

A subsequent CT and MRI showed that the tumors on the right were shrinking. “I was all clear, except for the other three pieces of trash on the left side of my head,” Jim states. In late April the tumors on the left side of Jim’s brain were treated with Gamma Knife. “The docs at Lancaster General Hospital seem to care, they explain everything,” Jim says. “The main thing I want to do is give credit to my nurse, Cris Burfete. She made it [radiosurgery] a whole lot easier. She goes out of her way to keep you comfortable and answer questions.”

Jim still travels for business “quite a bit,” and in February traveled to the Caribbean hardware show in San Juan. Before he found out he had cancer, he was a sales manager for different corporations. Now he works out of his home, and is a sales consultant for hardware, housewares and automotive manufacturers.

Jim says he is “doing just great” now. “I lost strength with the chemo. Now I work out twice a week at the gym with a doctor,” he reports. “Golf is my passion,” Jim states. “I golf as much as I can. I play once a week, but I give out

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