



**S•P•O•H•N•C**

A PROGRAM OF SUPPORT  
FOR  
PEOPLE WITH ORAL  
AND  
HEAD AND NECK CANCER

## TARGETED THERAPY IN CANCER TREATMENT

DEBRA WUJCIK, RN, MSN, AOCN

Treatment for head and neck cancer includes the modalities of surgery, radiation, chemotherapy and biotherapy. For tumors that can be removed surgically, cure is a goal. Radiation is used as a single modality for early stage head and neck cancer. Cure is a goal here, as well, with organ preservation as an added benefit. Chemotherapy is primarily aimed at providing nonselective killing of rapidly dividing cells. Biotherapy is the use of drugs or agents that work using the body's immune system rather than directly attacking cancer cells. Targeted therapies are an emerging class of drugs that sometimes cross the modalities of chemotherapy and biotherapy. However, targeted therapies can be selectively toxic in ways similar to a chemotherapeutic agent.

### Background of Cancer Treatment

Although chemotherapy, radiation, and biotherapy are very effective treatments in many cancers, each of these modalities works by mechanisms that affect both cancer and normal cells. When normal cells are damaged or destroyed, side effects occur. These side effects range from bothersome hair loss and nausea to severe vomiting or life threatening infection. Cancer researchers continue to strive to find more effective treatments with fewer side effects. Targeted therapy may provide some of these treatments.

Chemotherapy and targeted therapies have different characteristics. Chemotherapy drugs work by killing cells in the cell cycle. However, some drugs are much less cell cycle specific than others. Because the drugs do not differentiate between normal and cancer cells, there are multiple side effects. Chemotherapy drugs work throughout the body; therefore, side effects are systemic. Chemotherapy is administered in the highest doses that can be safely

given (maximum tolerated dose). The effects of chemotherapy are measured as tumor response and survival.

In contrast, targeted therapies have tumor selective killing. They work by targeting a specific receptor on the tumor cells. Since these receptors are not found on normal cells or they are found in low numbers, there are fewer normal cells destroyed and fewer side effects, and it is hoped, subsequent lower toxicity level. The mechanisms of action of chemotherapy and targeted therapies are different so targeted therapies are dosed at biologically active levels rather than maximum tolerated doses. Response to targeted therapy is measured by tumor response, survival, and other clinical benefits such as improved symptoms or enhanced quality of life. Currently targeted therapies are being administered in addition to standard therapies.

The ideal target for anti cancer therapy has several characteristics. First it is the target which drives growth for a specific tumor. Second, activation of the target turns on key mechanisms of cancer progression. Next, this target activation should be reversible by inhibition. Finally, in order to identify the patients who will benefit from the targeted therapy, the ideal target is measurable in tumor tissue.

### Epidermal Growth Factor Receptors

There is a family of receptors found on the surface of normal and cancer cells called Human Epidermal Growth Factor Receptors (EGFR). There are at least four members of this family and they are called HER1, HER2, HER3, and HER4. Two members of this family, HER1 and HER2, have been studied extensively in patients with cancer. In normal cells, the HER1 or HER 2 receptors combine with proteins called growth factors to send growth signals from outside the cell to the center of the cell (nucleus). If the growth signal is strong enough, the nucleus tells the cell to divide and grow. This signaling pathway allows for the normal functions of cells to divide, grow, and die according to the body needs.

In certain tumors, researchers have found there is EGFR over expression, that is, too many HER1 or HER2 receptors on the cell surface. Since there are too many receptors, there is increase in normal cell functions of growth and proliferation. In addition, there is increased cell movement (motility), invasion, and development of blood supply. These characteristics are necessary for the growth and survival of tumor cells. Targeted therapies interfere with the growth factor that starts the signal pathway on the cell surface or the continued movement of the signal within the cell.

One method of interfering with the binding of proteins to the surface receptors is using the body's immune system. The immune system works by an antigen and antibody interaction. The function

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#### COMING IN MARCH 2006

“Reconstruction of the Tongue” by Eric Genden, M.D., F.A.C.S.  
More information about SPOHNC’s 15th Anniversary

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of an antibody is to recognize an antigen, and then interact with other blood proteins to trigger normal immune responses. The binding (joining) of antibody to antigen is highly selective, rather like a lock-and-key fit. When an antibody selectively binds to a specific antigen, the antibody/antigen complex acts as a flag or target, drawing other immune cells to the bound cell in order to destroy it. Or when an anti EGFR monoclonal antibody is introduced to the body, the monoclonal antibody attaches to the receptor and the normal signaling pathway to the nucleus of the cell is blocked.

Antigens are normal cell surface proteins that can serve as targets for binding special man made antibodies, called monoclonal antibodies, for the treatment of cancer. After the monoclonal antibody specifically binds to the target antigen on the cancer cell, it induces inactivation or destruction of the cancer cell through direct interference with normal biological activities of the antigen, such as signal transduction of cell growth messages.

#### Anti EGFR Monoclonal Antibodies

As stated previously, many tumors have over expression of EGFR receptors on the cell surface. Having too many HER2 receptors causes the growth signal to be sent continuously, making the cancer grow faster.

**Trastuzumab (Herceptin™)** was the first targeted therapy approved by the FDA. It is a monoclonal antibody used for the treatment of HER2 positive metastatic breast cancer. Trastuzumab works by only targeting tumor cells that have too many HER2 receptors (HER2 over expression). When the cell signal is stopped, the cancer cells’ ability to continue to grow and divide is also stopped. This process is unique because only cells with HER2 overexpression are targeted by the herceptin. Standard chemotherapy kills cells that are dividing which means both breast cancer and normal cells are destroyed. This causes many of the side effects associated with chemotherapy such as hair loss, nausea and vomiting, and risk of infection and bleeding. Since herceptin interferes with the cell signaling in the cancer cells, there are few side effects. Herceptin is given intravenously on a weekly basis. It is not yet known how long the drug should be given and research with this drug is ongoing.

Another new monoclonal antibody is **cetuximab (Erbix™)** which also works by stopping cell signals. This monoclonal antibody targets another member of the EGFR family, HER1, which is also called EGFR. Cetuximab binds (joins) with the HER1 receptor and stops the cell signal pathway. Many patients with colon cancer have EGFR over expression or too many receptors on the cell surface. When this monoclonal antibody binds with the receptor, the epidermal growth factor cannot cause the tumor cells to continue to grow and divide. Cetuximab is approved by the FDA for patients with metastatic colon cancer and can be used alone or with another drug. It is given weekly intravenously.

Both of these monoclonal antibodies can be given safely. However, infusion reactions can occur, especially during the first treatment. The symptoms of fever, chills, nausea, headache, and fatigue can be lessened by medications given before the treatment begins and treated with other medications if a severe reaction occurs.

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#### Anti-Angiogenesis Agents

Angiogenesis is a biologic function that controls the forming of new blood vessels and the maintenance of existing blood vessels. Anti-angiogenesis agents have the potential to stop or slow the growth of tumor blood vessels by attaching to the growth factors that attach to the receptors or by attaching to the receptors themselves, thus blocking the action of the growth factor.

The walls of blood vessels are formed by endothelial cells. These cells are the source of new blood vessel formation and have a remarkable ability to divide and migrate (move to new areas). New blood vessels nourish cancer cells with oxygen and nutrients, allowing the cells to grow, move into nearby tissue, and spread to other parts of the body (metastasize).

Vascular Endothelial Growth Factor (VEGF) is a protein or growth factor involved in the process of angiogenesis. VEGF stimulates angiogenesis, or new blood cell formation, by binding to specific receptors on nearby blood vessels to grow extensions to existing blood vessels. VEGF is produced naturally by the body but can also be produced in abnormal amounts by certain tumor cells such as colorectal cancer cells. An increased amount of VEGF in the bloodstream has been linked with a poor outcome (prognosis) in some cancers such as colorectal cancer.

**Bevacizumab (Avastin™)** is approved by the FDA for use in combination with chemotherapy (5-fluorouracil) in the first-line treatment of metastatic colorectal cancer. Bevacizumab binds with the protein VEGF. When the VEGF is joined with the monoclonal antibody, it can no longer bind with the receptor site. The action of VEGF binding to the receptor is stopped so new blood vessels do not grow. Since tumor cells cannot grow without a blood supply, the result is shrinking and death of the tumor.

Bevacizumab is given by IV every two weeks and continues until there is no sign of disease. There are fewer infusion reactions with this monoclonal antibody than the others already mentioned. Therefore no medications are needed before the infusion. Since bevacizumab interferes with new blood cell production, it is not given to patients who are having surgery as it will interfere with normal healing

processes. High blood pressure may occur, but it can be managed with drugs that lower blood pressure. A small number of patients develop blood clots while receiving bevacizumab. There can be other side effects as well, Patients should report any pain, swelling, skin warmth, or change in skin color to their doctor.

#### Small Molecules or Tyrosine Kinase Inhibitors

Another targeted therapy in development is the class of small molecules or tyrosine kinase inhibitors (TKIs). These drugs target a specific area called the tyrosine kinase (TK) area found within the EGFR to interfere with cell signaling and to stop the cell from growing and dividing. The HER1 or EGFR protein has several parts. The outer portion on the surface of the cell receives the growth factor and the receptor is activated or set in motion. A signal then crosses the surface membrane and goes inside the cell to the TK area. Here, chemical actions occur and the signal is sent along one or more pathways to the nucleus (center) of the cell.

Tyrosine kinase inhibitors are drugs that enter the cell, attach to the TK area, and stop the signal. The drugs are made of "small molecules" that allow them to easily enter the cell and attach to the TK area. These drugs are pills that are taken daily. The first drug in this class to be approved by the FDA for use was **gefitinib (Iressa™)**. Gefitinib was initially approved for the treatment of locally advanced and metastatic non-small cell lung cancer after there is no response from standard therapy using platinum or docetaxel chemotherapy. Due to a lack of response efficacy in a confirmatory trial, a recent change by the FDA limits the use of this drug to patients with a history of response. Gefitinib is a pill that is given daily.

The most common side effects of gefitinib are diarrhea and skin rash. The diarrhea is easily controlled with medication. The skin rash which resembles acne can be mild to severe. It develops within several weeks of starting treatment and continues until the treatment ends. In most cases, the rash is easily managed with skin lotions, but in some severe cases, the drug must be stopped.

Another drug in this class was approved by the FDA in late 2004. **Erlotinib HCl (Tarceva™)** is given for the treatment of patients with non-small cell lung cancer after failure of at least one prior chemotherapy regimen. This drug also interferes with the cell signal by attaching to the TK portion of the EGFR. It is a pill that is given daily. The reported side effects for this TKI are also mild to moderate skin rash and diarrhea. Interstitial lung disease (ILD) is a rare but life-threatening side effect of anti-EGFR therapy. Severe cases occurred in <0.5% of patients (3 of 633) with advanced colorectal cancer receiving cetuximab. One of these was fatal. The incidence of ILD was 0.6% with erlotinib and 1% with gefitinib in clinical trials. In the event of acute onset or worsening of pulmonary symptoms, therapy with EGFR inhibitors should be interrupted. If ILD is confirmed, therapy should be discontinued and patient should be treated appropriately

Patients with head and neck cancer are known to have EGFR over expression. The targeted therapies, mentioned in this article, along with several others in development, are being studied in patients with head and neck cancer. Results of clinical trials indicate that there will soon be targeted therapies available for head and neck cancer patients

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#### UPDATE:

On Oct. 31, 2005--ImClone Systems Incorporated and Bristol-Myers Squibb Company announced that the U.S. Food and Drug Administration (FDA) has accepted for filing ImClone's supplemental Biologics License Application for ERBITUX(R) (Cetuximab), an IgG1 monoclonal antibody, in the treatment of Squamous Cell Carcinoma of the Head and Neck (SCCHN). The application seeks approval for use of ERBITUX in combination with radiation for locally or regionally advanced head and neck cancer, and as monotherapy in patients with recurrent and/or metastatic disease where prior platinum-based chemotherapy has failed or where platinum-based therapy would not be appropriate.

# A TIME FOR SHARING

A Squamous Nose That Had to Go!

Every Cancer patient has a date on the calendar they will never forget. The date that changed my life was May 28, 2004. I just happened to be standing by my desk at work when I got the call.

"This is your ENT doctor from Kaiser, your tests came back showing cancer," he said. I felt my knees get weak. I sat down. "I have been trying to get in touch with you for over a week..." The rest of his words went into an abyss. I was in shock. I hung up the phone and walked outside in a daze.

Cancer? What the heck was he talking about? I was having nosebleeds for the last two years, and all I was told was that I had a "deviated septum." I even had a CT scan one year earlier and there was no sign of a serious problem.

A biopsy surgery was quickly scheduled and I was truly confident this was an early stage of the cancer. My father had died at the age of fifty-one of a late diagnosis of prostate cancer and I was adamant about going to the ENT doctor for these annoying nosebleeds. I was forty-four and in good health, or so I thought.

I was recovering at home from the biopsy surgery when my wife Alice closed the door and sat down next to me. "The cancer was more extensive than we thought." She said with sadness in her voice. "You are going to have to fight like you have never fought before." I was in utter shock. I was sure this was just a minor thing and maybe a radiation session would cure it, no sweat right? This was just a blip on the radar.

My first consultation after the biopsy surgery with my ENT specialist was a shocking episode. I was not prepared for what came next.

"Most patients who have this diagnosis have their nose removed." Said the doctor. My wife Alice and I looked at each other in disbelief.

"You don't want your nose removed do you?" asked Alice. The tone in her voice was filled with fright and shock. "NO" I shouted. I could not believe what I was hearing. This doctor must be wrong. "I need to get another opinion" I said to myself. This is crazy. The

ENT doctor was very sullen. "This is beyond my scope, he said. "I can refer you to

our Head & Neck Oncology Department in Los Angeles" he offered. And then I was sent out on my own with very little additional information or mention of a head and neck cancer support group. All of a sudden I was on a quest to find out what in the world I was in for.

I could not get an appointment with Head & Neck Oncology for 3-4 weeks so I found out through the R.A. Bloch Cancer website that Loma Linda University was one of the recommended hospitals for second opinions. I received a quick appointment and brought my biopsy results with me after paying \$695.00 for the consultation. I was nervous and had terrible anxiety; I almost forgot that this appointment was on my 45<sup>th</sup> birthday. Oh well. The first procedure was to send a mini-camera called an endoscope up my nasal cavity and down my throat. On the T.V. monitor there was a view of a black mass and obvious irritation in my left nasal cavity. "That's the cancer," said the oncologist. All of a sudden I noticed that there were two to three different doctors stopping in to look at the screen. Boy, this must be out of the ordinary! "Would you be interested in coming to our tumor board meeting next week? We will have a team of specialists to consult with you." said the oncologist. I was given a snapshot of the cancer and awaited the tumor board and its diagnosis.

The tumor board consultation was bizarre, yet almost entertaining. There seemed to be about eight to ten doctors who were intrigued by my case. They asked me questions like: "Were you a carpenter?" "Did you work around sawdust?" "No!" I kept saying. The only informative thing I could recall was that I worked at a lock factory for about eight months back in 1980. I might have gotten a whiff of some chemicals. "Hmm, It would take twenty to thirty years of exposure for that to happen." said the senior oncologist. He then asked "Does your nose or teeth hurt?" Well, come to think of it, just recently my nose would feel like someone had punched me smack in the face and sometimes my front teeth would tingle. But it would come and go and I had been told by my ENT doctor it was just a reaction to the medication I was taking for allergies.

The final diagnosis was that I had nasal septum cancer, stage three. Head and neck

cancer is only 5% of all cancers and this kind of cancer was .03% of that. This was a rare cancer. The problem was that the cancer had invaded my dental bone, the floor of my nose, my hard palate and would next invade my eye if I did not have the surgery. The tumor board at Loma Linda highly recommended I have my four front teeth removed to get good margins. Since I had "bony invasion," chemotherapy and other forms of radiation would not work. I needed to have this cancer removed pronto!

I went to the medical library at Loma Linda and the more I read, the more anxiety and fear I felt. I soon discovered the words that could possibly save my life: Rhinectomy-Total nose removal. Palectomy-Hard palate removal. Maxillofacial-Prosthesis, Intra-Nasal passageway. I was formerly a staff writer for a real estate magazine and had a decent vocabulary, but these words were new and scary. The bottom line was I was going to be disfigured and my life would change. The survival rate I kept reading was between 40-60% with a high reoccurrence rate, too. Would I still be able to play guitar. Would I look like a freak? Was I going to die and leave my dear wife Alice after all of the life events we had gone thru together? I was in despair.

Alice suggested that I find some kind of cancer support group, but I did not want just a general cancer group. I did a search on the internet for a support group and found there was only one place for people with head and neck cancer. SPOHNC. I made a desperate call for help and was guided to a support group fifty miles away at UCI in Orange. I went to the group not knowing what to expect and when it came time for me to speak I almost broke down in tears. I recalled the motto of the organization, "WE HAVE WALKED IN YOUR SHOES" and listened to the other courageous stories of survival. I received enormous support from the group. No one had the same cancer that I did, but the motto stuck in my head. A gentleman named "Delton" reached out to me and I felt great relief. Finally, I felt a little less anxiety and could go on with my next cancer consultation..

The Kaiser Metro-Los Angeles Head and Neck Oncology department was prepared for my case and I had to go thru the same routine

again. Another endoscopy, another stage III diagnosis. I kept hoping that Loma Linda University had made a mistake, but no such luck, and with that I was resolved to get this enemy out of my body.

The surgeon who was to perform the rhinectomy was experienced in this kind of rare surgery. He seemed to be about the same age as me and looked very concerned about my fears.

“We want to think about your quality of life after the surgery and I think we can be successful without removing your teeth.” he said. “You will be referred to UCLA for the prosthetic nose. They are really good at this type of thing.” And with that I was asked if I was available on July 29. “I can pencil you in for that Thursday.” Said the surgical scheduler. I felt dead calm and looked at my wife, Alice, who was in tears. It was done. The ride home was in utter silence and dread. I was going to have my nose removed. How do you tell your family and friends news like this?

I began a desperate search for clinical trials across the country on the internet. There were lots of clinical trials for prostate cancer and breast cancer but very little for head and neck cancer, much less Stage III nasal septum cancer. I found one in Toronto and one in Singapore. It turned out all the clinical trials were early phases of research for chemotherapy and radiation. Since the cancer had invaded my dental bone I was not a candidate.

I went to UCLA Maxillofacial School of Dentistry for a consultation the following Friday. It was a ninety mile ride and by the time I got there in I was a nervous wreck. I was escorted to a dental chair and a gentleman introduced himself as the doctor. “I went to the University of Minnesota and I teach Dentistry.” He said in not so perfect English. “What can I do for you today?” I looked at him in disbelief. What? “You mean you didn’t read my chart?” I said in an angry tone. “No” he said. When I told him why I was there he had a puzzled look on his face. “Wait a minute, how many prosthetic noses have you made?” I asked. “None,” he admitted.”

That was it. I Lost it. I demanded to know who was in charge of this madhouse and felt a rage boiling inside of me. Great! I have a student who was going to make a fake nose for me. This was beyond belief. After a short wait, an older, scholarly gentleman came to put my fears to rest. “He was the doctor who founded this School of Prosthetic Dentistry

and wrote a textbook which he handed me. It was full of photographs of people before and after surgeries. He assured me everything would be under his guidance and authority. However the photos were horrific to me. People with holes in their nasal cavities, ears missing, eyes surgically removed. But the after photos were remarkable. You could not tell they were missing a piece of their face! I began to feel a tiny bit of relief. But the photos were very disturbing. What would I look like? How would it feel to have no nose?

I began having nightmares about having no nose and just how in the heck I would get in the car and travel sixty miles to have my surgery. What would that day be like? Lucky for me I had my wife Alice and Jennifer, my 20 year old step-daughter escort me to the hospital. As we parked in the parking garage my bloody nose came back and this time it was from both sides of my nasal cavity, not just the left side. Jennifer being eight months pregnant had morning sickness and was throwing up. We must have been quite a sight in that parking lot. When I arrived in the hospital lobby I had three of my lifelong buddies, my brother and sister-in-law and mother and step-father all in attendance to support me. I even had a friend travel cross-country to see me in the hospital and help out at home.

I will never forget waking up after the surgery and hearing my wife Alice say: **“Blayne, you are cancer free. The doctor saved your teeth!** The next thing I realized was that I was in Intensive Care because the tumor was a bleeder and I lost a couple of liters of blood. An hour felt like a whole day had gone by. I woke up and at my bedside were some long time friends that I had not seen in years. Also there was “Delton” who had come on behalf of the SPOHNC support group. He gave me the Lance Armstrong book. I was touched that he had come to support me.

I spent five days in the Kaiser Metro Los Angeles Hospital and was quite nervous about going home. It still felt like I had a nose, but my throat felt like a concrete block. I could not tell what was going on with my mouth as my surgical area was stuffed with bandages. It was very difficult to walk as I had skin grafts taken from my thigh. The pain felt like there was a big vise on my face and the only way to stop it was to get a shot of morphine.

When I had my bandages removed the pain I felt was horrific. It felt I yelled out and

discovered that my ability to form words was gone. I was almost mute. There was a huge whole where my palate had been. The communicated by writing on a pad of paper. I did not sleep at all that night and neither did Alice. I had difficulty breathing. It felt like a wind tunnel was in my face and I could not get air into my lungs. I could only eat and drink thru a syringe; it was too painful to eat solid food and I lost about 17 pounds. This was more than I bargained for! The doctors at Loma Linda and Kaiser never told me about this.

After going back to UCLA I was relieved that they had manufactured my new partner for life. An obturator that would enable me to speak clearly and eat solid food again. Now I had to view my surgical area. I would peek under the bandage and see a big hole where the bridge of my nose used to be. It was terrifying to even think about viewing my face. I had phantom nose feelings. I could still feel the tip and bridge of my nose. Cleaning my surgical area was painful and bizarre, but it had to be done in order to prevent infection.

Very slowly, week by week, I got my strength and weight back. I rode my mountain bike to get back in shape. My prognosis was good and with the successful surgery, radiation was ruled out. I am now a year and a half cancer free! I am also a new grandpa!

I have found out that there is life after radical cancer surgery. And so my wife Alice and I threw a celebration of life party. Finding the SPOHNC website was a moment that greatly helped me through my ordeal. With time I hope to support and help anyone who is facing a similar situation.

Without my family, good friends and the SPOHNC support group I would have been lost in despair. Recently, I was approved for a nasal implant prosthesis. I realize that I still face a long road of prosthetic procedures, but I will meet those challenges, too. For now, I go out in public with a bandage on my face, People may stare and gawk, but I could care less for I am not hiding out at home. There are minor limits as to what I can physically do, but I can still do a moderate workout at the gym, ride my bike and play guitar. If I can still do all of that, I am truly a lucky man who is grateful for a second chance at life. I just want to say thank you, SPOHNC.

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## **TOMOTHERAPY: TECHNOLOGICAL ADVANCES IN THE TREATMENT OF HEAD & NECK CANCER**

PEGGY WIEDERHOLT, R.N. AND PAUL HARARI, M.D

Over 40,000 Americans are diagnosed annually with head and neck (H&N) cancer, and over 500,000 cases are diagnosed worldwide. H&N cancer can be extremely debilitating due to severe pain, cosmetic disfigurement, and difficulty with speech and swallowing.

Radiotherapy is commonly a primary treatment for cancer of the head and neck. When used in the treatment of early stage H&N cancers, cure rates may be as high as 80-90% with radiotherapy alone. In more advanced disease, radiotherapy may be used alone, in combination with chemotherapy, or following surgery to treat residual microscopic disease around the surgical bed and in nearby lymph nodes where cancer may still be hiding.

Although radiotherapy is a highly effective treatment for H&N cancer, standard treatments deliver high radiation to normal tissues and produce side effects that can have a significant impact on health related quality of life. Several of the normal structures that may be in the H&N treatment fields are quite sensitive to radiation injury. These include the salivary glands that produce saliva to keep the mouth moist, and the auditory (hearing) apparatus. Radiation injury to these structures commonly results in dry mouth, ear inflammation, or hearing loss. In addition, high dose radiation can produce significant adverse effects on taste, voice, and swallow function. This can lead to a decrease in appetite, weight loss, dehydration, malnutrition, fatigue, depression and social withdrawal.

The desire to spare salivary glands and other normal structures from high radiation doses during H&N radiation has contributed to the development of new strategies and technologies in the delivery of radiation treatments. Several technological advances have evolved over recent years using applications called three-

dimensional (3-D) conformal radiotherapy, intensity modulated radiotherapy (IMRT) and helical tomotherapy.

Three-dimensional conformal radiotherapy involves using a computer-based treatment planning method that allows visualization of the tumor and normal tissues in three dimensions. IMRT techniques employ high precision radiation beams from multiple different angles to shape radiation dose distributions that fully encompass the tumor but diminish dose to adjacent normal healthy tissue structures. Helical tomotherapy is a further technological advance in the delivery of IMRT. The original concept was developed by Professor Thomas Rockwell Mackie at the University of Wisconsin.

Helical tomotherapy combines treatment planning, patient positioning and treatment delivery into a single system. This allows doctors to perform a special CT scan just before each treatment, and then adjust the patient's position if necessary to ensure that the radiation is delivered in a highly precise fashion to the tumor without exposing healthy tissue to unnecessary radiation. Tomotherapy delivers radiation using a helical 360 degree loop pattern, traveling in multiple circles around the



patient who lies on a movable treatment couch that guides the patient into the treatment unit.

The ability to accurately verify the treatment plan with CT imaging prior to each daily treatment, and to then deliver the IMRT with such precision, makes tomotherapy a promising new treatment option for some patients with H&N cancer.

### **Delivering Tomotherapy Treatments**

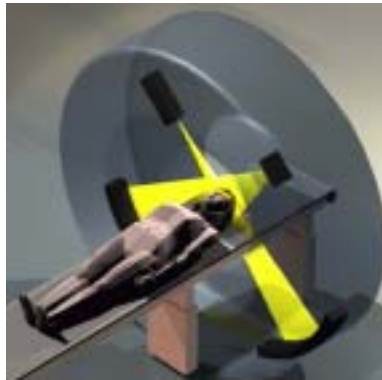
Before beginning tomotherapy treatment, the radiation oncologist works closely with a physicist to create an IMRT treatment plan. Using 3-D images from a planning CT scan, and special computer software, the radiation oncologist develops precise contours which outline the tumor, and identifies surrounding normal structures for which high dose radiation is to be avoided (figure 2). The radiation oncologist knows how much radiation the tumor should receive and what would be acceptable radiation doses for normal nearby structures. The radiation physicist then uses special computer software to calculate the appropriate pattern, position and intensity of the radiation beam that will be delivered to the patient as prescribed by the radiation oncologist.

This highly conformal plan spares radiation to one of the major salivary glands. The parotid gland lies just outside the full radiation dose profile.

Once the tomotherapy plan is completed, radiation treatments can begin. Prior to each treatment, a special CT scan is performed with the patient lying on the treatment couch in the tomotherapy machine. This allows the doctor to verify the position of the tumor before every treatment. If necessary, the patient's position can then be adjusted to make sure the radiation is delivered selectively to destroy cancerous tumors while avoiding normal structures.

The machine that produces the radiation beam is called a linear accelerator (or linac). Traditional radiation therapy is delivered by the linac with beams projecting into the tumor from only a few directions. Tomotherapy, on the other hand, rotates the beam around the patient continuously in circles delivering radiation from many points on a helix, or spiral, instead of just a few points. This allows the radiation to enter the patient from many different angles in succession. The radiation dose can often be better shaped to the tumor when there are a greater number of beam directions, thereby sparing normal cells from radiation exposure. The intensity of the beam is controlled by a system called a multileaf collimator (MCL). The leaves of the MCL move in and out very quickly to constantly adjust the radiation beam by blocking some beams and allowing others to pass through the leaves of the accelerator. At the same time, the couch moves and guides the patient slowly through the tomotherapy machine, so that each time the linac circles the patient, it directs the beam at a slightly different projection. The end result is a highly sophisticated form of IMRT capable of delivering precise radiation treatment

doses while diminishing the risk of exposing healthy tissue to high dose radiation.



Helical tomotherapy circling the patient to deliver radiation from several different angles.

**Clinical Evaluation of Normal Tissue Toxicities with IMRT**

The University of Wisconsin was awarded a grant from the National Institute of Health (NIH) to study helical tomotherapy with the goal of improving outcomes in cancer patients treated with radiation. The H&N Tomotherapy Project research team, as part of this grant, is conducting a study to examine the capacity of IMRT and helical

tomotherapy to minimize toxic effects on salivary, auditory, swallow, and voice function, as well as overall quality of life in patients receiving high dose radiation for advanced H&N cancer. Patients enrolled in the study undergo audiology, salivary, swallow and voice function tests, along with quality of life surveys. These tests are performed prior to radiation treatment and again at one, six and twelve months following the last radiation treatment session. The purpose of the study is to help us better understand the potential benefit to patient quality of life when normal tissues are spared from radiation exposure.

*Editor's Note: Peggy Wiederholt, RN is the multidisciplinary H&N Oncology Nurse Coordinator at the University of Wisconsin Hospital & Clinics where she provides case management and coordinated care for H&N cancer patients in Radiation Oncology, Medical Oncology and Otolaryngology*

*Dr. Paul M. Harari holds the Jack Fowler Professorship of Human Oncology at the University of Wisconsin-Madison where he serves as Director of H&N Oncology Programs. His clinical and laboratory research involves advances in the treatment of head and neck cancer with particular focus on the interaction of molecular targeted growth inhibitors with radiation.*

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**SUPPORT FOR PEOPLE WITH ORAL AND HEAD AND NECK  
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15TH ANNIVERSARY CONFERENCE AND CELEBRATION OF LIFE  
PRELIMINARY PROGRAM: MARRIOTT LAGUARDIA HOTEL, NY  
August 18-20, 2006**

Friday, August 18, 2006

4:00--7:00 PM SPOHNC Registration/Information

3:25-4:10

**Research in Head & Neck Cancer**

Mora Gillison, MD Hopkins

**Medically Necessary Dental Care**4:15-5:00 PM Sally Hart, Esq, Center for Medicare  
Advocacy,Saturday, August 19, 20067:30-8:50 AM **Continental Breakfast**

6:30-8:00 PM

**SPOHNC Grand Reception**

9:00-9:15 AM

**Opening Ceremonies**Nancy E. Leupold, President and  
Founder of Support for People with  
Oral and Head and Neck Cancer  
(SPOHNC)Sunday, August 20, 2006

9:20-10:05 AM

**Swallowing Therapies (Panel)  
Dilation of Esophagus**

8:00-8:15 AM

**Opening Remarks**Nancy Leupold, President & Founder  
SPOHNC**Vital Stim**

8:15-9:15 AM

**Buffet Breakfast**

10:10-10:55AM

**Acupuncture for Saliva Stimulation**Richard Neimtzow, MD, Walter Reed  
Hospital, Bethesda MD

9:15-9:30 AM

**Where Have We Come**James J. Sciubba, DMD. PhD  
Vice President of SPOHNC

11:00-11:20AM

**Break with Exhibitors**

11:25-12:10AM

**Mind/Body Medicine**Ann Webster, MD, Deaconess Hospital and  
Harvard

9:30-10:15AM

**Concerns for the Future: Survivor Panel:**Bette Denlinger, AZ  
Dan Stack, TX  
Micky Naimoli, NJ  
Leonard Lanyo, NY  
Rene Rodrigus, MD  
Jerry Reynolds, CA

12:15-1:15PM

**Buffet Lunch**

1:20-2:05PM

**Advances in Treatments for Head and  
Neck Cancer (Panel)**

Rosenthal

Pfister

Urken

10:15-11:15 AM

**Norm Crosby,**

Entertainer and Survivor

2:10-2:55PM

**Keynote Speaker—Eva Grazel,**  
Survivor and world known storyteller

11:45-12:00

**Final Remarks**

Nancy E. Leupold, Survivor

3:00—3:20

**Break with Exhibitors**

# 15<sup>th</sup> Anniversary Conference and Celebration

August 19-20, 2006

Marriott LaGuardia Hotel, Elmhurst, NY

Name Last First

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City State Zip

Home Phone Work Phone

Fax Number E-mail

## REGISTRATION FEES for Conference and Celebration (All meals and Grand Reception included)

- |   |         |
|---|---------|
| <input type="checkbox"/> Survivor           | No Fee  |
| <input type="checkbox"/> Guests of Survivor | \$75.00 |
| <input type="checkbox"/> Physician          | \$75.00 |
| <input type="checkbox"/> Dentist            | \$75.00 |
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- |                                   |         |
|-----------------------------------|---------|
| <input type="checkbox"/> Survivor | No Fee  |
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## HOTEL INFORMATION

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102-05 Ditmars Blvd., east Elmhurst, NY 11369

The New York LaGuardia Airport Marriott is conveniently located directly across from the LaGuardia Airport and minutes away from Midtown Manhattan.

Discounted room rates of \$119.00 single or double have been secured for SPOHNC attendees. To make a reservation call 718-565-8900 or 800-882-1043 and mention that you are attending the SPOHNC 15th Anniversary. Please note that you should make your hotel reservations early to assure accommodations. SPOHNC has blocked an appropriate number of rooms, but it does not guarantee that rooms will be available after June 15, 2006.

Reservations made after this date will be accepted on a space available basis and may not be at the group rate. All reservations must be guaranteed by a credit card or check for the first night's deposit.

GUESTS (Please print clearly)

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United Airlines including united Express, TED by United or United code share flights operated by US Airways, US Airways Express and Air Canada is the official airline of SPOHNC's Anniversary Conference and Celebration. United will offer discounted fares for this special event. Reservations may be obtained by calling the Meeting Plus Reservation Center at 1-800-521-4041 (US and Canada) and refer to Meeting Code 539TF. Reservations booked 30 days or more prior to departure will be discounted at 7% off the lowest fares; less than 30 days, the discount will be 2%.

For Special car rental discounts in conjunction with United Airlines, call Avis at 1-877-289-2611 and refer to Meeting discount #K019303. For Budget, call 1-800-214-609 and refer to Meeting discount #914201

Parking is available at the hotel at a cost of \$10.00 per day for overnight guests and \$6.00 per car per day.

Shuttle Service by Marriott is available from LaGuardia Airport to the hotel. Estimated taxi fare: \$4 USD (one way)

Questions? Call: (800)377-0928



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