Oral Cancer and Reconstructive Surgery:
Dental School and School of Medicine experts restore health and normality through a team approach

BY REGINA LAVETTE DAVIS

Jaws of Life

Walter Russell used to take for granted simple acts such as speaking, chewing, and swallowing—but that was before he was diagnosed with oral cancer.

Many survivors of head and neck cancer lose the ability to properly communicate or eat, requiring extensive surgery and rehabilitation to resume these normal activities. Fortunately, though, health care professionals in the Dental School and the School of Medicine have the skill and technology to help patients restore those basic functions.

The combined talents of physicians from both schools are often used to treat patients who have oral cancer and require reconstructive surgery. The team includes Robert A. Ord, MD, DDS, Dental School professor, chair of the Department of Oral-Maxillofacial Surgery, and Greenebaum Cancer Center surgeon; Alexander E. Pazoki, MD, DDS, assistant professor in the Dental School's Oral-Maxillofacial Surgery Department and director of the postgraduate residency program; and surgeons from the School of Medicine's Division of Otolaryngology-Head and Neck Surgery.

A majority of oral cancer is caused by a combination of smoking and alcohol, which can increase the chances of getting oral cancer by 8-fold. Left unchecked, cancer can spread to the lymph nodes in the neck, liver, and lungs.

In Russell's case, smoking was the likely culprit. The 54-year-old began the habit early. "I smoked ever since I was a young boy—starting around the seventh grade," he says.

The effects of his dangerous habit finally caught up to him in the fall of 2002, after he experienced mouth sores. Russell ignored the sores, attributing the problem to a possible mouth infection from a pulled tooth.

"My mouth hurt for a few months. I thought it would go away," says Russell.

But it didn't. When he noticed white patches inside of his mouth, he returned to his local dentist in Martinsburg, W.Va., who referred Russell to a specialist in Hagerstown, Md. A mouth sample sent to the University of Maryland Medical Center (UMMC) tested positive for cancer.

"I never thought it would happen to me," he says of the diagnosis. "But that's what happens when you smoke."

The day before Thanksgiving 2002, Russell left Martinsburg and came to UMMC to begin his treatment.

"I just put my trust in the good Lord and the doctors," he says.

Russell's treatment required surgical intervention, led by Ord, to remove the cancer from his mouth, including the lip and jaw. The right side of his jaw was removed and replaced with bone from his lower right leg, along with a blood vessel from his leg. A mandibular bar—to fashion a new jawline—was placed in his mouth during the final reconstruction.

Not all oral cancers, however, require drastic measures, as in Russell's case. If cancer is detected early (stages 1 and 2) and the tumor is less than 2 cm, then no major reconstructive surgery is necessary. For more advanced

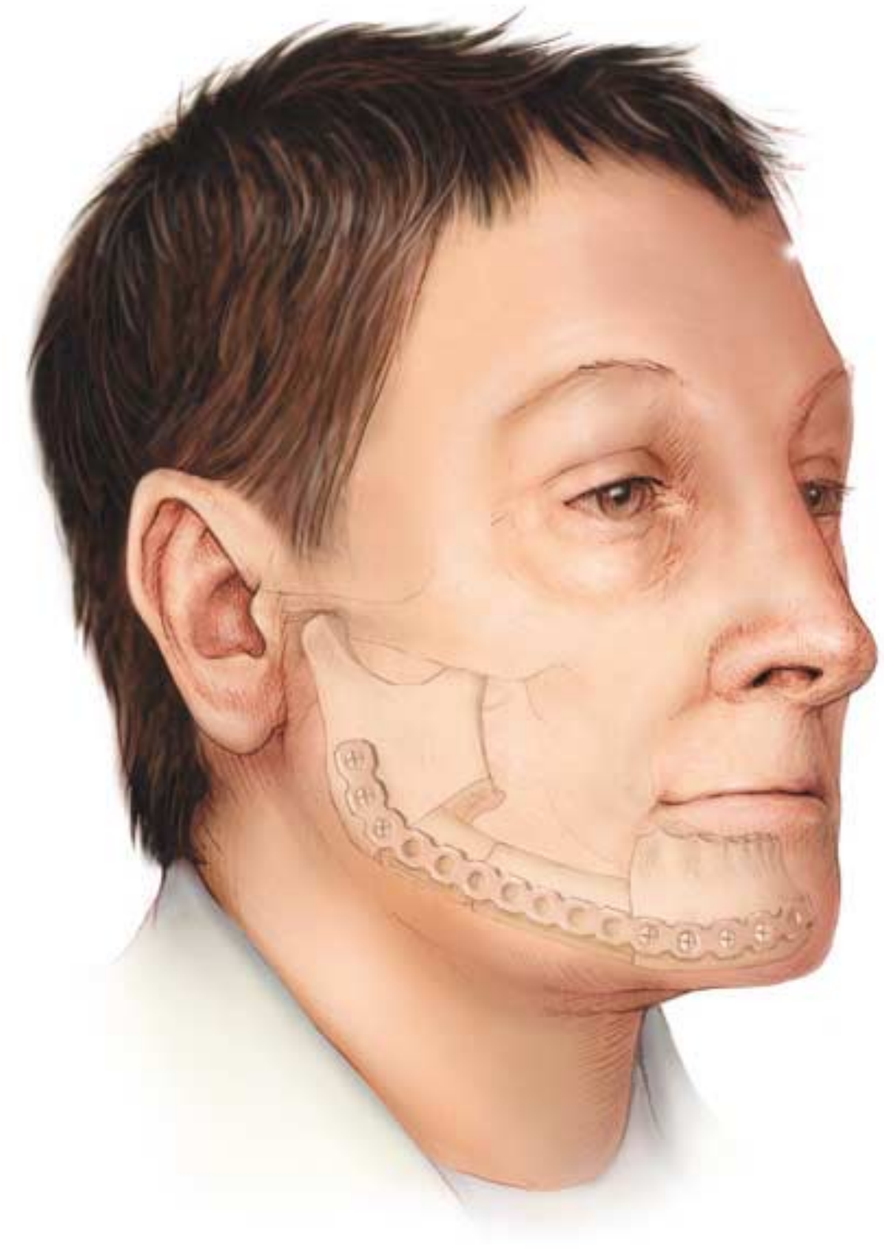

ILLUSTRATION BY JENNIFER GENTRY

Exterior view of affected area (shaded).

1 Shaded area indicates extent of cancer in the jaw.

2 Cancerous portion of the jaw resected and reconstruction bar placed along the jawline.

3 Bone flap used in the resection.

4 Bone flap from the leg adapted to the reconstruction bar.

tumors (stages 3 and 4), reconstruction may be required, in addition to radiation treatment and possible chemotherapy.

When the patient requires surgery, a skilled team of physicians combine their talents to achieve the best treatment possible. Ord performs the ablative (tissue removal) part of the surgery, Pazoki reconstructs the affected areas using various flaps, including microvascular procedures, and a School of Medicine specialist treats cancers that have extended to the cranial base.

"With head and neck cancer, there are obvious problems with speech and swallowing—then there is the aesthetic component," says Ord. There is emotional devastation as well. To remove three-quarters of the tongue or jaw is "a very traumatic experience for the patient," he adds.

A variety of methods are used for the reconstruction procedures, depending on the type of oral cancer being treated. For example, tissue can be harvested from the arm, leg, or abdomen to be used in the head and neck area for reconstruction. Fortunately, as in Russell's case, this type of harvested tissue comes with its own blood supply. When reconstructing the jaw area, titanium bars are commonly used as placeholders that adhere to the remaining facial bone to help maintain the shape of a jawline. Bone grafts and dental implants are used in the final rehabilitation.

Russell, who is currently limited to a diet of liquids and soft foods, is looking forward to the next stage of his treatment, when he hopes to have dentures or dental implants to help him chew and swallow solid food.

Oral cancer reconstruction is not limited to the mouth. Using a variety of craniofacial implants, often combined with magnets, Dental School surgeons can reconstruct noses, eyes, and ears. The implants are placed on the residual bone surrounding the affected area (e.g., leftover bone surrounding the eye) and a prosthetic part (e.g., eye or ear) is attached to the implant.

"The challenge in the reconstructive procedures is balancing the need to remove the tumor and preserve the functions of speech and swallowing," says William Gray, MD, associate professor of surgery, Division of Otolaryngology-Head and Neck Surgery, in the School of Medicine.

Along with that challenge, says Ord, is getting all of the cancer while leaving at least 1 cm of "good tissue."

Ord adds that the University is uniquely positioned to provide both the surgical tumor removal and the reconstruction that follows because of the scope of services it offers.

In the future, genetic engineering may be adopted to construct body parts for reconstructive surgery. Genetic engineering will also be applied to soft tissue surgery to decrease morbidity to areas where tissue is harvested.

According to Gray, other research includes a focus on developing new gene and molecular therapies in combination with chemotherapy and radiation. In the future, treatment may be less invasive.

The collaborative treatment efforts also extend to the School of Pharmacy, where novel drug therapies for cancer treatment are being explored. The efforts of the three schools effectively bring together new ideas and strengths not common among all institutions.

Ord says the most satisfying aspect of the surgeries is helping patients return to a normal lifestyle. "We have the technology and skills to restore normal functions and provide a better quality of life."

Russell, a former Marine who survived Vietnam with two purple hearts and three gunshots, is grateful to the health care team that helped make him a survivor again.

"They did what doctors and nurses are supposed to do—take care of the patient."

ILLUSTRATIONS BY JENNIFER GENTRY

New Technology Improves Cancer Treatment

Three University researchers have developed a method to deliver radiation treatment more effectively. The direct aperture optimization methodology was invented by Mathew Earl, PhD, assistant professor; David M. Shepard, PhD, assistant professor; and Cedric Yu, ScD, associate professor, all from the Department of Radiation Oncology in the School of Medicine. Given the market potential of this technology, UMB recently entered into an exclusive license arrangement with Prowess Inc., of Chico, Calif., to incorporate the new method into its radiation treatment planning system.

The method operates conventional radiation therapy equipment using proprietary software that optimizes the shapes of radiation fields administered as the radiation beam is aimed from a number of different directions at the tumor in the patient. The technology optimizes the radiation dose to the tumor and minimizes unnecessary exposure to healthy tissues.

According to Yu, direct aperture optimization has several benefits, including reduced side effects from radiation sickness. Moreover, conventional methods require patients to remain still for 20-40 minutes to receive the dose, whereas the new technology delivers treatment in 5-10 minutes, which lessens the effect of patient motion and the associated risk of exposing healthy tissue to radiation.

Direct aperture optimization is also a viable solution to difficult forms of cancer. "Head and neck cancer have always been the most challenging for radiation oncologists," says Yu, because of "air cavities that attenuate less radiation, bones that attenuate more radiation in dose calculation, and the need to spare salivary glands, the brain stem, and optic nerves."

The goal is to be able to spare those critical organs and still deliver optimal treatment. Direct aperture's computerized technology takes minutes to compare thousands of treatment plans to devise the best plan for the patient. Conventional methods take hours or days to manually determine the most effective radiation targeting.

Prowess, Inc., an international provider of products and services for radiation therapy, will incorporate the new technology into its radiation treatment planning system. In addition to royalties, Prowess will provide UMB with four treatment planning systems valued at approximately $1 million. The Office of Research and Development, Technology Commercialization Group worked closely with Prowess to develop favorable terms for the license.

University president David J. Ramsay, DM, DPhil, says this technology will provide benefits to many patients. "By licensing this innovative technology to Prowess, we are converting investments in the University's research activities directly into public health benefits, both in Maryland and around the world."