

## BODY

# Best Face Forward

BY LACEY MEYER

*Survivors of head and neck cancers are benefiting from more specialized approaches to facial restoration.*

When 16th-century astronomer Tycho Brahe lost part of his nose in a duel, his options for a prosthesis were limited — he donned a folded metal plate in the shape of a nose to cover his missing anatomy.

Today, patients with head and neck cancer, who may lose bone, skin, teeth or cartilage as a result of cancer surgery, find that the focus is not only on cancer control, but also on facial restoration with specialists who see the process as not only functional but also aesthetic. For past patients, the evolved approach to treatment with a multidisciplinary team of specialists, each concentrating on a certain area within the full scope of maxillofacial prosthetic rehabilitation, can be life-changing.

Joseph Huryn, DDS, says he has patients who were recluses for years, unaware of facial prostheses as a possibility. “It changes their life incredibly,” says Huryn, chief of dental service at Memorial Sloan-Kettering Cancer Center in New York City.

Depending on head and neck cancer location, size and treatment, maxillofacial prostheses can be intra-oral (within the mouth) or extra-oral (outside of the mouth). Maxillofacial prosthodontists can fabricate prostheses ranging from a resection appliance — used to replace part of the lower jaw — to an auricular (ear) prosthesis or an orbital prosthesis replacing the eye and surrounding tissues including the eyelid, socket and sometimes part of the cheek and nose. Professionals in anaplastology — the art and science of creating artificial anatomy — specialize in the fabrication of extra-oral prostheses such as eyes, ears, noses and limbs.

“People who are immersing themselves in facial prosthetics are focused on all those little problems that seem minor, and they can offer something even better the next time a patient comes back,” says Greg Gion, clinical anaplastologist and founder of Medical Art Prosthetics in Dallas.

## The Team Approach

A multidisciplinary team works with the patient and surgeon from the beginning, expanding the cancer treatment focus to include rehabilitation and quality of life,

according to Betsy Davis, DMD, MS.

“The team approach is critically important because it incorporates a comprehensive treatment with rehabilitation so patients have a better outcome,” says Davis, director of the division of maxillofacial prosthetics at the Medical University of South Carolina.

The Head and Neck Tumor Program at the Medical University of South Carolina involves 30 specialties and 72 practitioners, including head and neck surgeons, radiation oncologists and medical oncologists who determine treatment plans using the latest maxillofacial techniques. “The reconstructive surgeon, the dental/maxillofacial prosthodontist, the oral surgeon, and the speech and swallowing pathologist work as a team on the rehabilitation of the patient,” Davis says.

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—Greg Gion

### Building the Prosthesis

Prosthetic rehabilitation, now part of the cancer patient’s surgery and treatment plan, begins with a meeting among the surgeons who remove the tumor and perform the reconstruction, and the maxillofacial prosthodontist. They begin discussing the unique challenges of each patient depending on cancer treatment, surgery, and where and how much tissue is removed. The surgeon removing the tumor and the maxillofacial prosthodontist or the anaplastologist creating the prosthesis determine the best approach before the surgery, deciding whether the prosthesis will be attached with adhesive, anchored to osseointegrated implants (screws placed in the bone beneath the skin) or held in place by virtue of design.

If the meeting indicates that a patient is a candidate for osseointegrated implants, the surgeon can place them at the time of tumor removal. Then after three to four months of healing time to allow the bone to grow around the implanted screws, the abutments (bar and clip or magnets above the skin to which the prosthesis is attached) can be connected to the implants.

Used in maxillofacial prosthetics for more than a decade, osseointegrated implants offer more secure retention and are easier for patients to use, Huryn says.

“Somebody who’s missing one eye doesn’t have the depth perception and doesn’t have the stereovision very often to apply their orbital prosthesis,” he says. “With magnets on the implants, they basically just have to get in the vicinity of the magnets and they’ll just pull the thing into the proper orientation, so it’s really wonderful.”

However, because of insurance companies’ reluctance to pay for more expensive

osseointegrated implants, adhesives remain the most commonly used retention method.

Dallas resident Reva Lee, 74, wears an orbital prosthesis retained with adhesive. “It’s like a walking cane,” she says. “I don’t think I could do without it.”

Lee says that right after she lost her eye, surgeons told her just to put on a black patch. “I was going to stay at home,” she says. But Gion crafted her orbital prosthesis and told her which glasses to wear and how to hold her head so the prosthesis was indiscernible. “I thought I would have a miserable life, and he just turned that around.”



Reva Lee, 74, on her eye prosthesis: "I've never been a picture-taker, but I can because of this." Photo by David Gresham.

### Custom Concerns

For patients who may have difficulty managing adhesives, Gion says he tries to offer other ways of attaching the prosthesis. The prosthetics specialist can create what is called an anatomically/self-retained prosthesis, which stays in place only because of its design and fit. In the case of an orbital prosthesis, the practitioner can design a hollow, balloon-like prosthesis to fit in the eye cavity without needing adhesives or implants if the surgeon has prepared the defect area with well-healed tissues and undercuts in the skin lining the cavity, says Gion.

Customizing a facial prosthesis to match the surrounding skin and tissues presents its own set of issues. The two most challenging aesthetic components of the prosthesis, color and contour, are created using both the newest technology and the oldest, the human hand.

While creating the perfect texture and color depends on artistic ability and experience, advances in the use of computer-aided design and manufacturing (CAD/CAM) technology have led to a less time-consuming fabrication process and more accurate results.

“The coloring is really one thing that remains very low-tech,” Gion says. “All coloring of facial prostheses requires somebody who’s trained or has natural ability with color-matching. The method of coming up with a new color formation differs from provider to provider.” Some people have made up their own system of quantifying color and keep color references for each patient, he says.

The color is mixed into silicone to match the patient’s basic skin tone, then the outside of the prosthesis is hand-painted to perfect pigments and nuances such as freckles and hairs. To ensure aesthetic perfection, Davis says she gives patients two prostheses for the price of one, “because the first time you can get it close, but the second time the color is always better.”



Otis Willingham, 101, on his prosthetic nose: "I like it better than not having anything." Photo by David Gresham.

## Evolving Technique

Silicone materials used to make external prostheses have remained much the same since the 1960s, Gion says, but methods of mixing the silicone to create softer or firmer textures customized for each patient have been developed. These methods take into account the characteristics of specific tissues and the need for durability.

Meanwhile, the old method of taking an impression of the patient's head and then carving a wax replica from the mold has been replaced by a three-dimensional scan that collects exact measurements reflecting the anatomy shape and contour. "We have the ability to scan and mill a lot of the form we need using 3D technology, particularly in ear prostheses," Gion says. "We can take a model of a patient's left ear, scan and then reverse the data and mill the exact opposite. It saves us a lot of time sculpting, and it gives the patient a much more accurate result." In addition, most patients have a CT scan made before surgery which can also be used by the computer program (known as Mimics) to create the wax pattern, says Davis.

The CAD/CAM technique uses a process known as rapid prototyping that stores the measurements layer by layer in an electronic file to then mill the intermediate wax pattern. The pattern is retained along with the negative mold to use for fabricating replacement prostheses in the future.



Richard O'Neal, 77, on his ear prosthesis: "It keeps the kids from hollering, 'Hey, he's got no ear!' "

## Looking Forward

Davis and Huryn say that tissue engineering and 3D medical imaging with CAD/CAM technology will propel future developments.

"Instead of doing a bone graft from the fibula to reconstruct a jaw," Huryn says, "it might be possible in the future to encourage the patient's own bone to grow in this matrix that can be generated on a computer and have the exact shape of preoperative situations. It is amazing. It boggles even me."

One challenge not yet overcome, Gion says, is how to reattach the prosthesis every day with adhesive and not affect the longevity of the silicone. Because they don't undergo the wear and deterioration of applying and removing adhesive, implant-anchored prostheses last longer, Gion says, adding that the widespread use of osseointegrated implants to attach facial prostheses will lead to the development of softer, more flesh-like silicone materials.

"I think the implant method, just that technique, has sparked a more professional approach to getting patients really good results," Gion says. "That technology has fed an interest and kind of heightened practitioners' desire to come up with even better prostheses to go along with the technique that is much more

sophisticated.”

A main purpose of the implants, he says, is so patients don't have to rely on adhesives and live with the fear of their prosthesis getting loose and falling off. Davis agrees that the secure retention of implants, as well as the overall aesthetics, gives patients additional confidence in their prosthesis.

Davis says that when the prosthesis fits well and the patient can camouflage its existence, it really makes a difference. “I think that it helps patients' psychological well-being tremendously, because now they can go out in society with confidence.”



Kim Thaler, 50, on her eighth prosthetic nose: "It makes me as normal as I can be with the amount of surgeries I've had. It makes life a little less challenging." Photo by David Gresham.

*Lacey Meyer is an editorial intern for Heal.*