JOHNS HOPKINS MEDICINE

HeadLines

NEWS FROM JOHNS HOPKINS OTOLARYNGOLOGY–HEAD AND NECK SURGERY

SPRING 2018

Restoring a Writer's Voice

When journalist Alfred Friendly Jr. was diagnosed with cancer of the larynx, his journey to care—and to support Johns Hopkins research—led to the Department of Otolaryngology–Head and Neck Surgery's **Christine Gourin**.

Under the care of Christine Gourin, patient Alfred Friendly Jr. is cancer-free.

During a long career in journalism, Alfred Friendly Jr. traveled the world, working for *Newsweek* in Rome and Moscow and for the *New York Times* in Indonesia, West Africa, Italy and the Balkans. He also wrote speeches for members of Congress and a former president of the World Bank in Washington.

In the fall of 2011 the retired Friendly was diagnosed with stage 1 cancer of the larynx. Commonly called a voice box, the hollow organ is involved in breathing, producing sound and protecting the windpipe from food and drink. Doctors in Washington used radiation to treat the cancer, but by the following spring Friendly was experiencing throat and ear pain and sought a second opinion at Johns Hopkins, where he was introduced to head and neck surgeon **Christine Gourin**.

Gourin found the cancer had recurred and was now stage II. "Unfortunately, when radiation hasn't worked, you can't get a meaningful dose of more radiation, so the only curative option is then surgery," she says. Gourin was able to perform a partial laryngectomy, a procedure to remove all of the larynx except for the vocal cords, sparing Friendly's voice. He then worked with speech language pathologist Donna Tippett to relearn how to swallow.

While Friendly initially did well, a few months later he developed exercise intolerance and shortness of breath. When Gourin examined him, she noticed his vocal cords had started to scar. "While he still had a good voice, he couldn't open up the vocal cords as widely when taking deep breaths of air," she says.

Gourin then recommended a tracheal cannula. It allowed her to create an opening in Friendly's airway that is covered by just a small, soft plastic tube in his neck. Since that December 2012 procedure, Friendly has remained cancer-free. He maintains an active lifestyle playing tennis, traveling and walking his dog, Millie, and recently celebrated his 80th birthday.

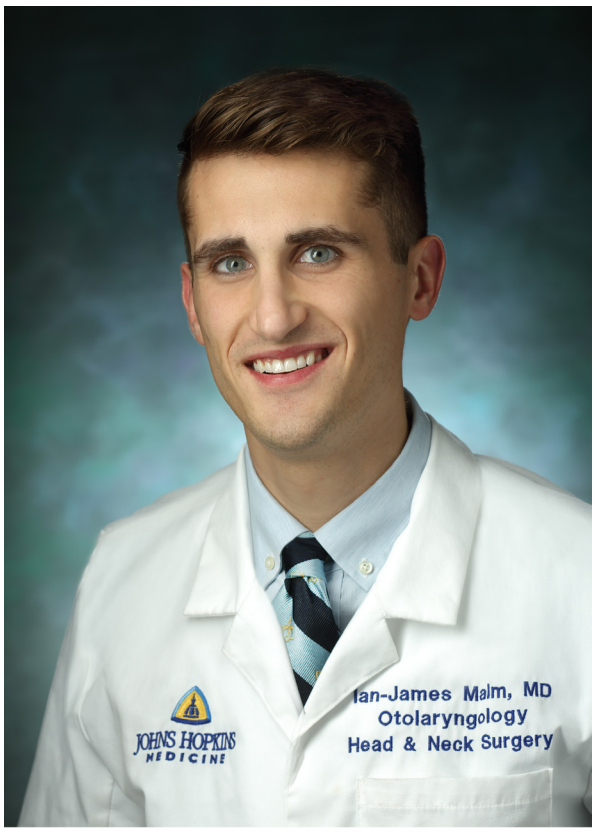
"[Dr. Gourin] has been educating me and others on the value of trying to assess quality of care as a measure of successful medical practice, and I thought that made a lot of sense."

—ALFRED FRIENDLY JR.

In gratitude, Friendly and his wife have made donations to the Department of Otolaryngology–Head and Neck Surgery in support of Gourin's research, which seeks to improve quality of health care for patients with head and neck cancers.

"She has been educating me and others on the value of trying to assess quality of care as a measure of successful medical practice, and I thought that made a lot of sense," says Friendly, whose father died in 1983 after unsuccessful treatment for throat cancer. "It seemed like a very interesting field that probably didn't get enough attention."

The gifts have been critical at a time when there are fewer research dollars available, says Gourin. She recently watched a YouTube video of Friendly addressing a group of journalism fellows at American University: "It nearly brought me to tears because for him, retaining his voice was so important. I'm just so thrilled that this worked out for him." ■



Resident Spotlight: Ian-James Malm

Seeking why some nonsmokers develop laryngeal cancer

Even in high school, fourth-year resident Ian-James Malm says he was interested in a career involving biology and pathology.

"In college, I realized what I was most interested in was human biology and the application to medicine," he says. His natural drive toward research lies in "trying to figure out why things happen, and how we can prevent them and treat certain diseases."

In fact, the opportunities to conduct research is what attracted Malm to Johns Hopkins for medical school. As a student, he worked with head and neck surgeon **Young Kim** studying tumor immunology. He then decided to stay on for residency, where he has worked with head and neck surgeon **Carole Fakhry** evaluating proposed staging systems for head and neck cancers. During his time here, Malm has coauthored several peer-reviewed journal articles on different topics and presented some of his findings at national meetings. In 2017, he received the American Laryngological Society's Resident Research Award.

"My interest is mostly in the basic science," Malm says. "I like the bench work, figuring out how we can go from the basic science research to clinical translational research."

In one ongoing project, Malm has been working with laryngologist **Simon Best** to try to determine why some nonsmokers develop laryngeal cancer, which is classically strongly associated with smoking. Comparing tumors of smokers and nonsmokers diagnosed with laryngeal cancers under the microscope, Best, Malm and colleagues found the biomarkers look very similar. Now, Malm says, "we want to get more samples from other parts of the country and the world and try to figure out if the same thing or something else is going on elsewhere" to further tease this out.

"We're hoping to really figure out why these nonsmokers develop laryngeal cancer," he says. "Hopefully in the future we can better educate patients on why they develop the cancer and find risk factors for nonsmokers who develop laryngeal cancer. One thought is that it was due to human papilloma virus (HPV), which causes oropharyngeal cancer in the tissues of the throat. But we're not finding any higher rate of HPV in the nonsmokers, so we don't think it's due to the virus." The causes could be anything from gastric reflux to genetic factors to plain old bad luck, Malm says.

Malm has done some of the most comprehensive work ever conducted in this patient group, says Best: "He has really spearheaded a number of novel techniques for looking at this population and taken the initiative in a whole line of investigation that people have not looked at in detail before. That's a big endeavor and a big accomplishment for a resident."

Upon finishing his residency in June 2019, Malm says he'll look for work in comprehensive otolaryngology, so he can keep his fingers on the pulse of different areas.

He should be successful, Best notes: "He's a creative researcher who has tremendous skills in terms of thinking of new ideas." ■

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>
> —IAN-JAMES MALM

To Smile Again

After Facial Paralysis

By revising a procedure that once achieved less-than-optimal results, facial plastic surgeon Kofi Boahene and colleagues help give back patients' ability to smile.

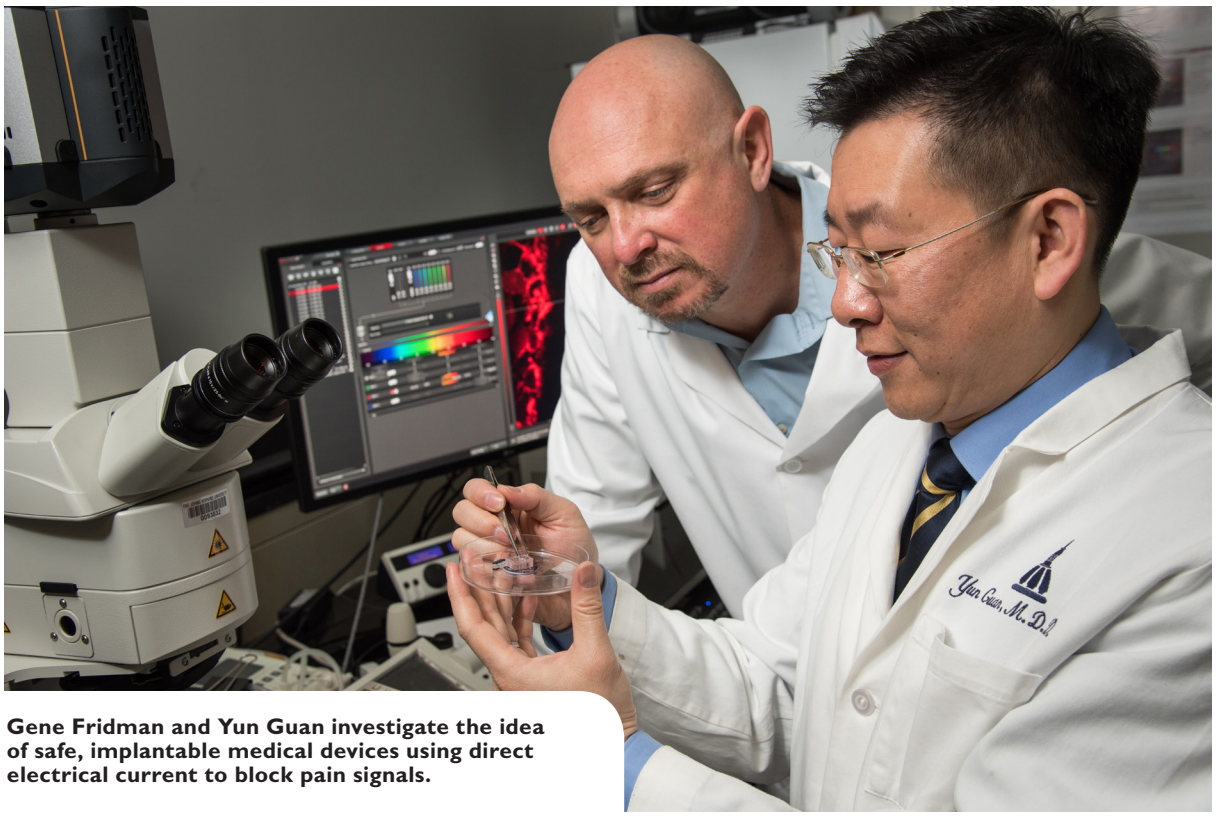
Kofi Boahene says he's the kind of guy who smiles a lot. Now he's doing so even more—as are his patients.

Boahene, a professor in the Department of Otolaryngology–Head and Neck Surgery, and colleagues improved an existing operation to restore a more natural-looking, even smile to patients paralyzed on one side of the face following a stroke, brain surgery or other conditions. Normally, surgeons transfer a piece of muscle tissue from the thigh to the paralyzed side of the face, to help pull up the mouth to form a smile. But a smirk is the best this approach achieves, where just the corner of the mouth turns up, Boahene says: "A really nice smile where the lips open up, the corners move, you see teeth and a sparkle in the person's eye ... that's not what we were achieving," mainly because they were replacing just one of many muscles involved in animating the face.

The goal of the revised procedure, called a multivector gracilis muscle flap, is to try to replace as many muscles as possible to recreate normalcy. First, Boahene and colleagues study a patient's face, noting the angle of the smile on the nonparalyzed side, including how many teeth show when smiling. Then,


Kofi Boahene

A New Concept for Neural Implants



Gene Fridman and Yun Guan investigate the idea of safe, implantable medical devices using direct electrical current to block pain signals.

Johns Hopkins researchers say that recent experiments advance the search for implantable devices able to treat chronic pain from peripheral nerve injury or disease.

"We have developed a potential new concept for neural implants that works differently than conventional electrical stimulators," says **Gene Fridman**, assistant professor of otolaryngology–head and neck surgery and biomedical engineering at the Johns Hopkins University School of Medicine. "We believe we are the first to investigate the idea of using this concept for implantable medical devices that use direct electrical current, long thought to be unsafe."

Using computer models and laboratory rats, the team has demonstrated that "direct electrical current" can be delivered to nerves preferentially, blocking pain signals while leaving other sensations undisturbed.

In a report on the new findings, published online April 11 in *Science Advances*, the researchers say direct electrical current devices would allow for more precise, preferential targeting of the appropriate pain-transmitting nerve cells, making them more effective for pain suppression and reducing the side effects of conventional devices.

Traditionally, direct current—or single-direction streaming electrical signaling—has been considered unsafe for medical devices that deliver electrical stimulation in the body. The continual flow of electrical current results in chemical reactions at the site of the electrodes delivering the signal, causing gas bubbles, corrosion and toxic byproducts to form.

All modern implantable electrical stimulation devices use alternating current pulses instead, in which the electrical current switches back and forth very quickly in a circuit between positive and negative voltage. Such rapid pulses allow the devices to interact with the nervous system but don't create the toxic chemical reactions.

In 2013, Fridman and his team reported on successful efforts to develop an ionic direct current system, which converts the "safe" pulses like those delivered in the conventional stimulator into direct ionic current that may potentially be applied to the body safely.

To find out if the modified system of direct ionic current could be safely used to preferentially target and silence pain-transmitting neurons, Fridman teamed up with pain researcher **Yun Guan**, an associate professor of anesthesiology and critical care medicine and neurological surgery at the Johns Hopkins University School of Medicine.

Fridman and Guan's team first devised a computer model to try to predict what happens when researchers use direct current to block the pain signals or inhibit other sensory neurons. In the model they sent negatively charged direct current to the nerves to weaken their activity. The model showed that the sodium channels 1.6 in the feeling sensory neurons were blocked with 670 microamperes, but the pain neuron's sodium channels 1.7 were blocked at only 290 microamperes. For comparison, holding a 9-volt battery to the tongue delivers approximately 2,000 microamperes, causing a small shock. This suggested to the researchers that it was theoretically possible to preferentially target one type of neuron over another,

(continued on back page)

during the four- to six-hour procedure, they take a small piece of muscle from a patient's inner thigh, tease it apart into two to three smaller strips, and place it in two to three directions at the corner of the mouth or the upper lip to the cheek and eyelid. Then, they connect it to arteries, veins and rerouted nerves, and adjust the muscle tension to make the person's new smile symmetrical. They hide the incisions in the hairline or the crease next to the ear. A description of the operation was published recently in the journal *JAMA Facial Plastic Surgery*.

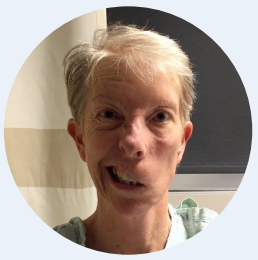
Most patients stay in the hospital for three days following surgery while doctors make sure the blood vessels are working well. About two to six months after surgery, patients notice a twitch in the transplanted muscles—a sign the nerves are working. Next, patients learn physical therapy exercises to practice their new smiles while looking in a mirror.

"Over the next year, the brain starts rewiring this new muscle to try to make it part of the face, so you see the movement continue to get more sophisticated," Boahene says. "Some people tell me, 'I've been paralyzed all my life, and I was told there's nothing that can be done.' That's not correct. I've seen patients paralyzed from one year to 50 years. Some people are actually born without the right muscles so they've never known how to smile. They are still candidates."

More than 50 patients have undergone the procedure at Johns Hopkins, says Boahene, and their renewed smiles are so contagious that one can't help but smile back: "Never let anyone tell you there's nothing that can be done, because in almost every situation there's an improvement we can achieve." ■

Watch a video about patient Kathy, who after losing all movement on the left side of her face, consulted with facial plastic surgeon Kofi Boahene. Boahene ultimately recommended a multiple vector gracilis free flap surgical approach for facial reanimation. Within months of her surgery, Kathy began to get her smile back.

bit.ly/SMILE_AGAIN



Kathy before

Kathy after

IDEAS AT WORK

A New Concept for Neural Implants *(continued from page 3)*

since the channels could be blocked at different levels of current.

Next, working with anesthetized rats, they sent direct ionic current into the sciatic nerve in the legs and, using neural recording electrodes, recorded whether this current inhibited the activity of individual or groups of neurons at the spinal cord.

"Using direct current, we can inhibit the pain-transmitting neurons at much lower amplitudes than the feeling sensory neurons, allowing us to be preferential in how we target the nerve," says Guan. "We also found that because the pain neurons take longer to come back on line, we may be able to conserve energy and not have to deliver this electrical current constantly to keep them blocked."

Being able to deliver this current periodically rather than constantly would mean longer use of the neural implant before needing to recharge the battery, says Guan. ■

For information, call 443-287-2124.

HeadLines

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This newsletter is published for the Department of Otolaryngology–Head and Neck Surgery by Johns Hopkins Medicine Marketing and Communications.

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