Collaboration Creates Composite to Fill Surgical Cavities

When a patient has a tumor removed, surgeons may fill the cavity using silicone implants, soft tissue from another part of the patient’s body—or use no filler at all. Each option has drawbacks, such as scar formation, the need for replacement, additional surgical procedures or concerns about appearance.

But now, Johns Hopkins plastic surgeons and biomedical engineers have invented a composite material that supports a surgical cavity while encouraging new tissue growth within it. The composite has performed well in small-animal tests.

Two years ago, plastic and reconstructive surgeon Justin Sacks and surgical resident Sashank Reddy approached materials engineer Hai-Quan Mao in the Translational Tissue Engineering Center with a new idea. They wanted to reconstruct new soft tissue for patients after breast cancer removal using a soft material that surgeons could custom fit to fill a cavity. Mao suggested trying hydrogels because they are jellylike and have elastic properties that mimic the feel of soft tissue. Some hydrogels are already in use to fill small-volume defects for cosmetic reconstruction. However, it can be difficult to achieve both material strength that matches soft tissues and sufficient pore structure that encourages new tissue growth.

In the end, the team developed a new material that combined hydrogel and nanofibers made with the same polymer materials used in degradable sutures. “We bonded the nanofibers with the hydrogel and made a stronger composite that can hold its shape until new tissue grows in the pores of the composite,” says Mao.

Gordon and his team are perfecting the system through swine trials, and they’re talking with several major technology companies about integrating the platform with operating room computers. They also have taken out nine patents and received several national grant awards, and they expect to release the system within four to six years.

Johns Hopkins Technology Improves Facial Transplant Results

In 2008, when craniofacial plastic surgeon Chad Gordon participated in the world’s first facial transplant surgery involving an upper jaw and teeth, he was frustrated to see that functionality could not be a primary goal.

“All that mattered initially was whether the face, bones and teeth would survive and not reject, but that didn’t mean our patient would chew without a problem,” says Gordon, co-director of the Multidisciplinary Adult Craniofacial Center.

To ensure optimal chewing function, surgeons end up revising most face-jaw-teeth transplants, but Gordon aims to improve the situation with his Computer-Assisted Planning and Execution system. Developed with a team from Walter Reed National Military Medical Center, its biomechanical simulation function will allow surgeons “to calculate—before and during surgery—where patients’ jaws and teeth should be for them to chew as well as function their best,” Gordon says.

In Gordon’s system, a surgery team uploads CT scans of patient and donor facial skeletons to a software platform to digitally visualize the surgery’s results ahead of time. During two simultaneous operations—one extracting the transplant, and the other affixing it to the patient—antennae attached to patient and donor heads transmit the faces’ locations to the software platform so the system can direct surgeons where to cut and affix.

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Eye-Tracking Device Helps Accurately Identify Stroke

Studies show that $1 billion is wasted each year on unnecessary tests and hospital admissions for people with dizziness who are suspected of having a stroke but who actually have benign inner ear problems. On the other hand, about 40,000 to 70,000 patients have strokes each year that are initially missed when they come to the emergency room presenting dizziness.

To differentiate stroke from other conditions that cause dizziness, neurologist David Newman-Toker devised a technique that looks for minute differences in eye movements. A 2009 study showed that the test can outperform more standard clinical tests for stroke, including an MRI or CT scan, but they come with a drawback. “Learning to administer these tests correctly requires months to years of mentorship and can be extremely difficult, even for specialists,” he says.

The technology resembles a pair of swim goggles and uses a video camera connected to a computer to examine eye movements. In patients with severe dizziness, if the goggles and the eyes stay stable when the head is rotated, eye jerking changes direction or either eye is higher, the patient has a stroke; otherwise, it is a benign postural ear condition known as vestibular neuritis.

Newman-Toker is working to demonstrate the device’s accuracy and utility in emergency room clinical practice and says the technology could be in use in about five years.

The term “social media command center” might conjure visions of NASA’s Mission Control Center, with its large monitors and streaming social content. It’s actually a dedicated space within the Marketing and Communications Department that enables social media team members to see all social data that impact the brand.

“The command center allows the team to act quickly and efficiently, mitigate risk around crisis situations, and take advantage of opportunities to resolve patient complaints and provide expert commentary on trending topics,” says Therese Lockemy, director of Internet marketing and social engagement.

Each team member has three monitors showing five different data streams of social media activity. The team works closely with subject matter experts to respond quickly.

• Trending topics: The team quickly responds to the top trending topics in healthcare, science and medicine, providing opportunities for Johns Hopkins experts to comment.

WEB EXTRA: See examples of the above data streams at hopkinsmedicine.org/insight.