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4 Hot Trends in Sinus Surgery

Top docs reveal how and where procedures will be performed in the not-too-distant future.

Daniel Cook, Executive Editor



SINUS SURGERY OUTCOMES From 3D

modeling to drug-eluting implants, there's a lot going on in the treatment of sinus disease.

Image-guidance and improved instrumentation already let surgeons perform endoscopic sinus surgery with unprecedented levels of accuracy and safety. Could the procedures get any easier? Can outcomes get any better? Will cases shift to the office? Absolutely, say several forward-thinking surgeons who have their fingers on the pulse of 4 hot trends that promise to revolutionize the treatment of sinus disease.

1 Pre-op planning with 3D modeling

Doctors could one day use 3D technology to design customized models that map out individual surgeries before surgeons step into the OR. Otolaryngologists at the Ohio State University Wexner Medical Center in Columbus are exploring whether a computer program based on fluid dynamics — used for years in the aerodynamic industry — could simulate a patient's airflow so doctors could better understand the physiology underlying nasal function and, in turn, nasal symptoms.

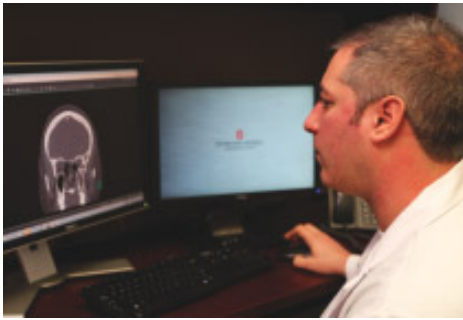
"Using the 3D model would reveal the anatomical variations found in individual patients in order to maximize surgical outcomes," says Alex Farag, MD. "You'd be able to assess which treatments or surgical approaches would work best, and you might even be able to predict outcomes."

When people complain of sinus-related symptoms, there's a lot of overlap between several disease processes, points

out Dr. Farag. "A headache could be caused by really bad septum deviation, sinus issues or a migraine disorder," he says. "If you're better able to define the disease, you're better able to find out exactly what's going on and treat it."

The 3D modeling technology is a more individualized CT scan for refining treatment plans, says Dr. Farag, who adds there's no worse feeling than performing surgery on a patient that should have worked, but didn't.

"Nasal obstruction is currently categorized as one thing, but I'll bet you the problem is much more diverse," says Dr. Farag. "How do you identify those differences, and which intervention would make a difference for which patients? We want to find out."



MODEL APPROACH Ohio State University otolaryngologist Alex Farag, MD, helped develop 3D fluid dynamics software that lets surgeons run delicate sinus surgeries and see results before they go into the OR.

Patients do best when surgery complements physiology. "Surgical intervention isn't just about making a hole or opening a sinus, it's about how and where you open the sinus," explains Dr. Farag. "If you open the sinus in the wrong area, you could make the patient worse. We currently do an excellent job in terms of sinus surgery outcomes, but there's always room for improvement in treating disease processes. When you understand how the body works, and how patients perceive their disease process and what drives it, you can better address their specific issues."

2Robotics add safety and precision

No question image-guidance has dramatically improved endoscopic sinus surgery, but is it precise enough? "[Image-guidance] has been incredibly important and revolutionary, but the drawback is that it's not precise enough to operate directly with the navigation system, and it doesn't provide an absolute safety envelope," says Masaru Ishii, MD, PhD, associate professor of otolaryngology: head and neck surgery at Johns Hopkins Medicine in Baltimore, Md. Image-guidance lets you recall the 3D image of a patient's anatomy in order to reorient yourself in space, to understand your location with respect to patient anatomy so you can proceed safely with surgery, says Dr. Ishii. "But if you don't interpret the information correctly, you can still violate the confines of the nose and run into trouble," he says. "There's no physical construct that prevents you from violating the 'safe fly zone.'"

Researchers are looking at ways to make navigation systems incredibly precise by using machine-vision techniques, says Dr. Ishii. He says computer programs that could analyze surgical video, understand where surgeons are in space and provide real-time feedback would make navigation systems more accurate and useful.

Robotics takes that potential advancement a step further. "The technology is interesting, because if you can build a robot that's rigid enough and understands where it is in space, it could follow along while surgeons operate and

provide complete constraint," says Dr. Ishii. "In other words, if the robot realizes that you're about to go into the eye, it could freeze the instruments and prevent you from doing so."

If the navigation is made precise enough, you'd be able to tell the robot the areas you want to operate in and where you want to avoid, and it would provide that safety envelope, says Dr. Ishii.

Dr. Ishii is also very interested in how robots can be used as advanced training modules by recording and calculating what the expert tool paths are supposed to be for specific procedures, and showing them to novice surgeons. Improving the skill sets of all surgeons would deliver a higher quality of care to a larger number of patients. "The question is how much of a quality benefit is needed to justify the increased cost of the technology," says Dr. Ishii.

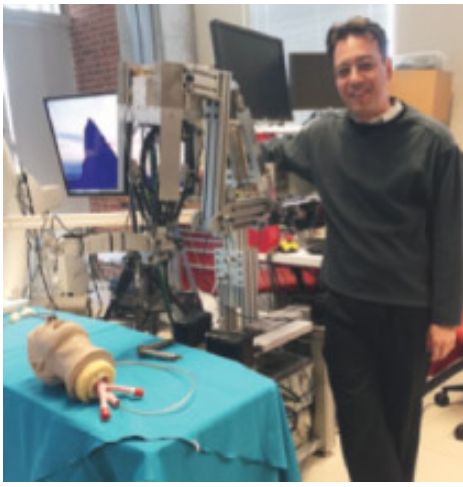
Robotic technology geared for sinus or skull-based surgery is in development, especially overseas, but Dr. Ishii says it probably won't launch in American ORs for at least another 5 years.

3The shift to office-based settings

Performing basic sinus surgery in an office-based procedure room? Why not, asks Nora Perkins, MD, FACS, FAAOA, an ENT-otolaryngologist at Albany (N.Y.) ENT and Allergy Services. Dr. Perkins noticed 2 things: Patients who underwent basic cases in the OR recover quickly and fairly easily, and putting them under general anesthesia sometimes took longer than the procedures themselves. She first moved healthier patients scheduled to undergo straightforward procedures to the office, but she then tackled more advanced cases as her confidence and comfort level grew. She now dedicates a single afternoon each week in her office to perform 3 or 4 sinus procedures, including submucous reduction inferior turbinates, balloon dilation, maxillary antrostomy, anterior ethmoidectomy and nasal polypectomy.

Smaller instrumentation, 3-mm endoscopes and advances in local anesthetic techniques have made tailoring the procedures to the office setting possible. Patients take an oral anxiolytic as soon as they arrive. Dr. Perkins then starts slowly advancing pledgets containing topical numbing medicine inside the nose. After waiting about 20 minutes for the numbing to take effect, she injects a local anesthetic and begins the procedure. Importantly, patients begin applying a topical decongestant every 30 to 60 minutes on the morning of surgery. That eases the application of the topical numbing medication. Using local anesthesia instead of inhalational agents helps keep bleeding to a minimum, which limits the need to pack the nasal cavity after surgery and promotes the faster recoveries needed in the office setting.

Patients love showing up for their procedures only 30 minutes before they're scheduled. "We actually ask them to eat lunch beforehand, so they don't get nauseous," says Dr. Perkins. "They're ready to head home 15 to 20 minutes after surgery and are back to normal life activity the next day."



HELPING HAND Robotics could dramatically improve how surgeons train and

perform.

4Drug-eluting implants improve recoveries

The only FDA-approved drug-eluted implant for sinus surgery contains the topical steroid mometasone. The implants are placed at the time of surgery or during the early follow-up period in the frontal and ethmoid sinuses. "The idea is to help with the healing of the cavity. They stay in place for a month — they're bioabsorbable, but remnants are removed at that time," says David Kennedy, MD, a rhinology professor at in the department of otorhinolaryngology: head and neck surgery at the University of Pennsylvania's Perelman School of Medicine in Philadelphia, Pa.

The implants offer mechanical support, because when the ethmoid sinus is opened, the middle turbinate can lateralize and close off the area, says Dr. Kennedy. The implants also place mometasone right where it's needed most. "It keeps the swelling under control," says Dr. Kennedy. "These patients experience a great deal of post-op inflammation, and if you don't manage that properly, scar tissue and adhesions will form."

Drug-eluting implants have been proven to reduce polypoid tissue following surgery, reduce the number of post-op debridements and improve patients' symptoms scores. "The hope is that they'll also reduce disease recurrence, but that hasn't yet been proven," says Dr. Kennedy.

The FDA is currently reviewing a 90-day implant intended for use as an alternative to revision surgery for patients who suffer a recurrence of polyps, says Dr. Kennedy. He believes the real excitement about the future use of drug-eluting implants lies in what agents could be added to them — such as a monoclonal antibody for immunization of mucosal surfaces or a local anesthetic to help manage pain following tonsillectomy — to prevent recurrence of symptoms and treat patients healing from surgery. **OSM**