

IMAGE GUIDED SURGERY

INTRODUCTION

Sinusitis is one of the most common diseases in the United States. It affects tens of millions of people. Surgery may be recommended if medications are unsuccessful. During sinus surgery, the sinuses are opened wider (See Endoscopic Sinus Surgery). This allows the sinuses to drain and ventilate. It also allows medications to better reach the sinuses. Thin pieces of bone and tissue are removed from around the small natural sinus openings to widen them. Telescopes and cameras provide light, visualization and magnification of the nose and sinuses. Sinus surgery is a common and safe surgery. However, there is a very small risk of harm to the surrounding structures during sinus surgery. The sinuses are surrounded by the tear ducts, the eyes, the optic nerves (the nerves of vision), the brain, and the carotid arteries (which carry the main blood supply to the brain). Sinus surgeons rely on an in-depth knowledge of anatomy, years of training, and unique skills to keep these important surrounding structures safe during surgery. A technology called image-guided surgery can now be used to potentially make sinus surgery even safer when deemed necessary by the surgeon.



Figure 1. An image-guidance system

IMAGE GUIDED SURGERY

During image-guided sinus surgery, a computer helps the surgeon know the precise location of his or her instruments within the sinuses in real-time. The patient's CT scan or MRI is used by the computer to create a 3D map of the patient's sinuses. Much like a GPS system, the precise location of the tip of each instrument is constantly tracked by the computer as it is moved within the nose and sinuses. The location is displayed in real-time on the map of the sinuses.

Unlike the GPS system in your car, image-guidance systems don't tell surgeons where they can go and how to get there. They give them a very precise knowledge of where their instruments are at all times. This is most helpful when surgeons are operating very close to the important structures surrounding the sinuses mentioned above.

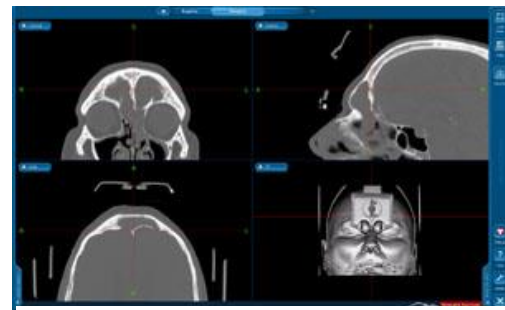


Figure 2. A three-dimensional rendering during image-guided surgery

IMAGE-GUIDANCE IN ACTION

Image-guidance systems are used during several different types of surgeries. The following is a list of some of these types of surgeries that might benefit from image-guidance.

- Primary sinus surgery
- Revision sinus surgery
- Sinus surgery when polyps are present
- Sinus tumor surgery
- CSF (brain fluid) leaks
- Orbital or optic nerve decompression
- Surgery on the pituitary gland
- Surgery within the orbit
- Surgery on other tumors or infections at the skull base

ADVANTAGES & DISADVANTAGES

The advantages of image-guidance systems are obvious: they can help sinus surgeons know the precise location of their instruments in real time. They allow surgeons to locate important structures within and around the sinuses (even if the patient's normal anatomy has been altered). The disadvantages of these systems include the need for specialized pre-operative imaging studies. Most commonly this is a CT scan (which can mean exposure to an extra dose of radiation), or less commonly an MRI (which can be problematic for some patients with fear of confined spaces). Furthermore, like any other technology we use, these computer systems can be subject to human error.



Figure 3. CT scan machine

SUMMARY

Image-guided surgery has been a tremendous advancement in the field of endoscopic sinus and skull base surgery. There is overwhelming agreement among experts in the field that image-guidance can make some surgical procedures safer and more complete. However, not all endoscopic procedures require this technology. For more information on image-guided surgery and whether you may benefit from it, please contact your treating physician.

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