MedicalXpress

Virtual surgery shows promise in personalized treatment of nasal obstruction

April 18 2011

A preliminary report suggests that virtual nasal surgery has the potential to be a productive tool that may enable surgeons to perform personalized nasal surgery using computer simulation techniques, according to a report posted online today that will appear in the September print issue of *Archives of Facial Plastic Surgery*, one of the JAMA/Archives journals.

Nasal obstruction is usually caused by a deviated septum (a condition in which the partition between the two sides of the nose is off-center or crooked, making breathing difficult), or by enlarged tissues (turbinates) within the nose. Two surgical procedures commonly performed by otolaryngologists are septoplasty (an operation to correct the deformity in the septum) and turbinate surgery.

"With the availability of powerful bioengineering computer-aided design software, anatomically accurate three-dimensional (3D) computational models can now be generated from computed tomography (CT) or magnetic resonance imaging (MRI) data," the authors write as background information in the article. "Computational fluid dynamics (CFD) software can be used to analyze these models and calculate various anatomic and physiologic measures including nasal airflow, resistance, air conditioning, and wall shear stress."

John S. Rhee, M.D., M.P.H., of the Medical College of Wisconsin, Milwaukee, and colleagues evaluated whether virtual surgery performed on three-dimensional nasal airway models can predict post-surgical

biophysical parameters obtained by computational fluid dynamics. The researchers used pre- and post-surgery CT scans of a patient undergoing septoplasty and right inferior turbinate reduction (ITR) to generate 3D models of the nasal airway.

"Overall, the virtual surgery results are promising and demonstrate the potential of CFD techniques to predict post-surgical outcomes," the authors report. "The CFD calculations of overall nasal resistance for the combined virtual septoplasty with ITR model correlated well with the actual post-surgery calculations."

"As we look to the future, the hope is that this technology can be more routinely used day to day in the armamentarium [the medicines, equipment, and techniques available to a medical practitioner] of otolaryngologists and facial plastic surgeons," the authors conclude. "At this time, CFD technology is truly translational in nature and will require further research and development to reach its full potential for future applications."

More information: *Arch Facial Plastic Surg*. Published online April 18, 2011. doi:10.1001/archfacial.2011.18