Robotic microlaryngeal surgery – Where we are and where we're going

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Abstract

This presentation will review limitations of current robotic approaches to microlaryngoscopy, and will introduce the audience to a new robotic technology with the potential to change how microlaryngeal surgeries are performed. The evolution of laryngeal surgical techniques has been driven by the promise of increased operative precision. Coincident with advances in microlaryngeal surgery have been similar, though more rapid, advances in robot-assisted surgery within Otolaryngology. From well-established use of the da Vinci surgical robot for ablative procedures of the pharynx to newer applications for robot-assisted procedures such as thyroid surgery and skull base surgery, robotic-assisted surgery is growing. Despite these advances, robot-assisted surgery is not yet routinely incorporated into microlaryngeal surgery. Current limitations for existing commercial systems include size of available instrumentation; difficulty manipulating robotic effector arms within narrow working space afforded by standard retractors, and reduced haptic feedback that comes from working remotely rather than handling tissues directly. Even as smaller instruments and new retractors are being developed, existing robots have been largely limited to laryngeal procedures such as vocal cord stripping, cordectomy, and partial epiglottectomy – procedures in which preservation of normal vocal fold anatomy and function are not prioritized. To address these issues and create a role for robotic assistance in microlaryngoscopy, a novel robotic ENT microsurgery system (REMS) has been developed. This system emphasizes cooperative control, rather than remote control, of a microsurgical instrument; traditional microlaryngoscopy instruments are utilized with both the robot arm and surgeon controlling the same instrument. The ability of this REMS system to improve precise performance of simulated microlaryngoscopy tasks has been demonstrated in a variety of research studies. These preliminary studies, their methods, and their results will be reviewed; surgical videos will demonstrate the robot 'in action'. The REMS platform may represent the next step in the evolution of robotic microlaryngeal surgery.

Biography

Lee M Akst is head of the Johns Hopkins Voice Center and is Director of the Division of Laryngology at the Johns Hopkins University Department of Otolaryngology-Head and Neck Surgery. The focus of his clinical practice is on management of voice disorders, with focus on office-based treatments and operative management of epithelial diseases such as vocal cord leukoplakia, papilloma, and early glottis cancer. He has lectured extensively on phonosurgical techniques, treatment of laryngeal leukoplakia, laryngopharyngeal reflux, and globus pharyngeus. He has been working with engineers at Johns Hopkins on novel robotic platforms to bringing robotic surgery into the endolarynx to aid microlaryngeal operative precision. He received his undergraduate and medical degrees from Yale University, did his Otolaryngology residency at the Cleveland Clinic, and completed his laryngology fellowship at Massachusetts General Hospital.

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