Evaluating Endoscopic Sinus Surgery Skills in Otolaryngology Residents

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ABSTRACT

Background: The goal of residency training is to create experts. Restrictions on work hours and limitations in resources have created increased interest in how to most effectively train residents. This has led to the development of new paradigms of surgical education.

Objective: Evaluate if hand motion analysis can be used as an objective measurement of technical skill of otolaryngology residents while performing specific sinus endoscopy tasks on a surgical simulator.

Methods: Residents and faculty in the University of Tennessee Otolaryngology residency program were asked to cannulate the frontal, sphenoid, and maxillary sinus ostia on a head model from The Chamberlin Group using the Entellus Express™ balloon sinuplasty system. Each subject was given two attempts. Each attempt was video recorded and hand motion was analyzed using the Polhemus Patriot™ wired tracker system.

Videos were reviewed and scored using an Endoscopic Sinus Surgery Global Assessment (ESSGA) tool. ESSGA scores and hand motion data between first and second attempt were compared for each subject. Scores and data were then stratified by year of training, and number endoscopic sinus cases.

Results: ESSGA scores improved with each year of training. The number of hand motions was inversely related to the resident’s year of training and the number of sinus cases performed.

Conclusion: ESSGA and hand motion analysis are effective tools for evaluating the development of endoscopic surgery skills in otolaryngology residents.

INTRODUCTION

Training surgical experts is a primary goal of otolaryngology residency programs. There is some controversy on how expertise is gained and how to best train residents. With increasing restrictions on work hours, limited resources, and concerns about patient safety; it has become increasingly important to provide effective training. To this end, new surgical education paradigms are being developed. The objective measurement and understanding of acquisition of surgical skill is thus, not surprisingly, at the forefront of surgical education programs.

Training programs have focused on competency based educational objectives. Assessment tools that provide useful and reliable evidence that residents achieve these objectives have become increasingly important. Use of the simulation-based equipment for teaching and assessment purposes has advantages in terms of reproducibility and the ability to perform and assess any and all steps of a procedure (1).

Hand motion analysis (HMA) has proven to be a useful tool for evaluating technical skill in several areas (2,3). The purpose of this study is to evaluate if HMA can be used as an objective measurement of technical skill of otolaryngology residents while performing specific sinus endoscopy tasks on a surgical simulator.

METHODS AND MATERIALS

Residents in the University of Tennessee Otolaryngology residency program were asked to cannulate the frontal, sphenoid, and maxillary sinus ostia on a head model from The Chamberlin Group using the Entellus Express™ balloon sinuplasty system. Each subject was given two attempts. Each attempt was video recorded and hand motion was analyzed using the Polhemus Patriot™ wired tracker system.

Videos were reviewed and scored using an Endoscopic Sinus Surgery Global Assessment (ESSGA) tool (4) with the following categories:

1. Use of Endoscope
2. Knowledge of Instruments
3. Instrument handling
4. Respect for tissue
5. Time and Motion
6. Knowledge of specific procedure
7. Flow of Operation
8. Overall performance

ESSGA scores and hand motion data between first and second attempt were compared for each subject. Scores and data were then stratified by year of training, and number of endoscopic sinus cases.

RESULTS

Ten residents were tested. The average ESSGA scores between residents in their 2nd and 3rd year of training were the same. Scores increased for each subsequent year of training. Average scores increased across all levels of training between the initial and second attempt (Fig 2). Areas that showed greatest improvement in scores between the initial and second attempt include: instrument handling, time and motion, and flow of operation.

Hand motion frame rate correlates inversely with time to complete the task and number of hand motions. Decrease in frame rate was found with increasing year of training as well as number of logged endoscopic sinus cases on the second pass only (Fig 3,4). A significant decrease in frame rate was noted between the initial and second attempt across all levels of training.

DISCUSSION

The results of this pilot study show that HMA is a useful tool for providing an objective measurement of the endoscopic skills of otolaryngology residents. HMA correlates well with previously validated assessment scales, and surgical experience. This study was limited by the small number of participants. Including additional training programs would be insightful.

However, several interesting trends were observed. First, significant improvements in hand motion and efficiency were noted--regardless of training level--between the initial and second attempt, showing that the trainees became rapidly accustomed to the instruments, simulator, and task. Second, improvements in scores and HMA were not seen until the 4th year of training, highlighting that endoscopic skills are not acquired in this program until later in the training course. Further study using HMA to evaluate the acquisition of other otolaryngology surgical skills would be interesting.

CONCLUSIONS

Surgical training programs have placed increasing emphasis on competency-based curricula. Thus, tools for assessing the acquisition of surgical skills provide valuable information on the effectiveness of training. They also highlight areas of focus for improvement. Hand motion analysis appears to be a valid tool for evaluating sinus endoscopy skills and provides an objective measurement to complement subjective assessment constructs.

REFERENCES

2. Chin KJ, Tse C. Hand Motion Analysis Using the Imperial College Surgical Assessment Device Validation of a Novel and Objective Performance Measure in Ultrasound-Guided Peripheral Nerve Blockade. Regional Anesthesia and Pain Medicine 2011; 213-219