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RESEARCH LETTER

Rhinoplasty

Evaluation of a High-Definition Intraoperative Exoscope in Rhinoplasty Education and Workflow

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Introduction

Surgical observation is critical to enhance both cognitive and technical skills among trainees.¹ However, operations such as rhinoplasty are restricted to a narrow surgical field that limits visualization and thus intraoperative teaching opportunities.² Surgical staff also often face an obstructed operative field making it difficult to be in sync with the surgeon. Herein, we assess both trainee- and surgical staff-perceived satisfaction with intraoperative exoscope use to evaluate its value for both surgical education and workflow efficiency.

Methods

A 90° exoscope (video telescopic operating microscope [VITOM]; Karl Storz Endoscopy, Tuttlingen, Germany) was implemented in 65 consecutive open rhinoplasty operations (Supplementary Table S1). It was mounted at the head of the operating table under sterile technique and placed ~40–60 cm from the surgical field to appropriate focal length (Supplementary Video S1). Magnified images were displayed on high-definition operating room (OR) monitors (Fig. 1).

After each operation, trainees and OR personnel completed distinct questionnaires assessing their satisfaction with the intraoperative learning environment and workflow, respectively, using a 100 mm visual analog scale of 0 (strongly disagree) to 100 (strongly agree).

Results

Of the 30 participants in this study, 13 (43%) were trainees, including 6 (20%) medical students and seven (23%) otolaryngology residents. Seventeen (57%) participants were OR staff, including 12 (40%) surgical technicians and 5 (17%) OR nurses. During their rotation, 10 (77%) trainees observed 0–10 rhinoplasty cases, 1 (8%) observed 11–20 cases, and 2 (15%) observed >20 cases.

Overall, trainees agreed that with the exoscope they could follow procedural steps very well (80.1/100), visualize what the main surgeon was doing very well (84.4/100), and identify relevant anatomical structures (75.0/100).

Among OR personnel, 6 (35%) reported staffing <10 rhinoplasty cases, 8 (47%) staffed 11–100 cases, and 3 (18%) staffed >100 cases. Overall, they strongly agreed that with the exoscope, they could follow procedural steps very well (94.3/100), visualize what the main surgeon was doing very well (95.4/100), confidently anticipate the surgeon's instruments (89.5/100), and the overall workflow was undisruptive (89.5/100). Both trainees and surgical staff strongly agreed that the exoscope should be incorporated into other operations (94.6/100 and 96.7/100, respectively).

Discussion

As there is traditionally a paucity of early residency training in rhinoplasty, it is critical to maximize learning opportunities in each operation.^{3,4} In this regard, the exoscope offers several noteworthy strengths. Its sterile mount and camera can be adjusted intraoperatively to ensure unobstructed visualization of key procedural steps. In addition, magnifying the surgical field onto OR monitors introduces direct teaching opportunities. Junior trainees can be more actively engaged in asking and answering questions about projected techniques or anatomy that would be otherwise difficult to visualize. For more senior trainees, the attending surgeon can view and critique the procedure at a distance without the impression of interfering.

The potential for the VITOM to improve surgical workflow was previously discussed by Frykman et al., although surgical staff have not yet been assessed on their experience in any codified manner.⁵ OR personnel in our study strongly agreed that overall workflow of the case

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Fig. 1. The video telescopic operating microscope system (Karl Storz Endoscopy, Tuttlingen, Germany) was mounted to the head of the surgical table. The surgeon's view was projected onto operating room monitors.

was undistruptive. As such, exoscopes may be an attractive educational and quality-improvement adjunct for rhinoplasty surgeons.

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Supplementary Material

Supplementary Table S1
Supplementary Video S1

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