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How I Do It

Preoperative Sinus Computed Tomography Scan Review Checklist

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Key Words: Sinus CT checklist, sinus computed tomography, sinus surgery, chronic rhinosinusitis, endoscopic sinus surgery, functional endoscopic sinus surgery, preoperative checklist, preop checklist, quality improvement, imaging.

INTRODUCTION

Initially adopted from the airline industry, the implementation of safety checklists in the medical field saves lives by preventing easily avoidable mistakes. The World Health Organization surgical time out has been implemented worldwide to prevent such mistakes from occurring within the operating room and has been tremendously successful, leading to a substantial decrease in surgical mortality from 1.5% to 0.8%. This checklist has been adapted for use in endoscopic sinus surgery (ESS) to increase adherence to safety protocols.

The principal function of checklists is to minimize the risk of preventable complications, but they also provide invaluable educational benefit. A study by Error et al. demonstrates that the use of an abbreviated mnemonic checklist for reviewing sinus computed tomography (CT) scans significantly improved otolaryngology residents’ ability to identify high-risk surgical anatomy. Yao et al. reported that such checklists increase trainees’ comfort level with surgical anatomy, and many continued to use one after they were no longer required to do so. Additionally, those trainees did not find the use of a checklist to be burdensome or to delay the start of the procedure.

The objective of this article was to share our systematic preoperative sinus CT checklist (Fig. 1) to improve preprocedural image review and enhance trainee education.

MATERIALS AND METHODS

Checklist Technique

Before beginning each procedure, the senior author reviews the preoperative sinus CT scan using the checklist. The checklist contains five sections that are each subdivided by laterality. The sections correspond to each of the four paranasal sinus pairs and the nasal cavity. During the study period, Wormald et al. redefined the classification of frontal sinus cells; thus, the checklist was adjusted to incorporate the new nomenclature. With experience, the checklist is reviewed in under 5 minutes. The checklist is designed such that normal anatomy associated with the lowest operative risk is in the left-hand column of each checklist section. Therefore, any flagged anatomic abnormality that may confer increased surgical risk is in the right-hand column and can quickly catch the surgeon’s attention at a glance.

The checklist is used for preoperative planning and training purposes only. In the operating room, the checklist is reviewed by the attending and resident preoperatively and then hung under the surgical navigation screen for continued intraoperative reference. High-risk findings are discussed, and the need for any special considerations or approaches is identified. The checklist is discarded postoperatively and does not enter the patient’s medical record.

Data Collection

Approval was obtained from the institutional review board at the Columbia University Irving Medical Center. The lead author’s deidentified case log was queried to isolate all endoscopic endonasal procedures performed from September 1, 2015 until September 1, 2019. The start date was determined by the date the checklist was instituted. All patients who underwent endoscopic endonasal sinus surgery, endoscopic endonasal orbital surgery, or endoscopic endonasal skull base surgery were included. Exclusion criteria included patients who underwent solely nasal endoscopy, septoplasty, turbinate surgery, or nasopharyngeal surgery.

RESULTS

Eight hundred fifty-nine consecutive patients who underwent endonasal sinus surgery, endoscopic endonasal orbital surgery, or endoscopic endonasal skull base surgery were included. The checklist was utilized for all patients during this time period. All procedures were performed by the senior author. There were zero skull base or orbital complications. There were zero inadvertent anterior or posterior ethmoid artery injuries; there were, however, intentional arterial ligations for skull base and tumor cases.
DISCUSSION

We present the utilization of this checklist as a model to increase the safety of endoscopic sinus and skull base surgery. Several different iterations of preoperative CT review frameworks have been published. To our knowledge, this is the first study to publish rates of orbital and skull base complications when using an image review checklist. This checklist provides an easy printout for residents in training to use when preparing for sinus surgery.
This checklist is designed to be comprehensive, in contrast to the CLOSE (Cribriform plate, Lamina papyracea, Onodi cell, Sphenoid sinus pneumatization, and [anterior] Ethmoidal artery) methodology of review, which highlights a crucial but limited number of anatomic variants. Although it is longer and likely more time consuming than other checklists, it provides a very thorough preoperative evaluation of a patient’s scan. Trainees have commented that the checklist helps them to prepare for surgeries using a structured framework. It also allows trainees to develop greater appreciation for the way that anatomic variants identified on a CT scan appear intraoperatively.

Although other detailed frameworks exist for reviewing preoperative scans, this checklist is designed to be easily completed and repeatedly referenced, such that it can be hung and easily visualized in the operating room. All abnormal variants are prominently displayed in the right-hand column of each section. This layout makes completion of the checklist fast and easy to reference intraoperatively.

The relatively low complication rate in ESS requires large study populations to detect meaningful changes in outcomes. This study is limited by its retrospective nature without a control group. Complication rates when using a preoperative CT checklist should be studied in a well-designed multi-institutional trial.

**CONCLUSION**

Thorough preoperative review of a patient’s CT scan and sinus anatomy is essential to prevent surgical complications. The use of checklists improves adherence to safety protocols and increases one’s likelihood to detect a high-risk anatomical variant. We hypothesize that utilization of this checklist will decrease the complication rate associated with ESS, but follow-up studies are necessary.

**BIBLIOGRAPHY**


