CHEST

Complications Following Therapeutic Bronchoscopy for Malignant Central Airway Obstruction

Results of the AQuIRE Registry

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BACKGROUND: There are significant variations in how therapeutic bronchoscopy for malignant airway obstruction is performed. Relatively few studies have compared how these approaches affect the incidence of complications.

METHODS: We used the American College of Chest Physicians (CHEST) Quality Improvement Registry, Evaluation, and Education (AQuIRE) program registry to conduct a multicenter study of patients undergoing therapeutic bronchoscopy for malignant central airway obstruction. The primary outcome was the incidence of complications. Secondary outcomes were incidence of bleeding, hypoxemia, respiratory failure, adverse events, escalation in level of care, and 30-day mortality.

RESULTS: Fifteen centers performed 1,115 procedures on 947 patients. There were significant differences among centers in the type of anesthesia (moderate vs deep or general anesthesia, $P < .001$), use of rigid bronchoscopy ($P < .001$), type of ventilation (jet vs volume cycled, $P < .001$), and frequency of stent use ($P < .001$). The overall complication rate was 3.9%, but significant variation was found among centers (range, 0.9%-11.7%; $P = .002$). Risk factors for complications were urgent and emergent procedures, American Society of Anesthesiologists (ASA) score > 3, redo therapeutic bronchoscopy, and moderate sedation. The 30-day mortality was 14.8%; mortality varied among centers (range, 7.7%-20.2%, $P = .02$). Risk factors for 30-day mortality included Zubrod score > 1, ASA score > 3, intrinsic or mixed obstruction, and stent placement.

CONCLUSIONS: Use of moderate sedation and stents varies significantly among centers. These factors are associated with increased complications and 30-day mortality, respectively.

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ABBREVIATIONS: APC = argon plasma coagulation; AQuIRE = American College of Chest Physicians (CHEST) Quality Improvement Registry, Evaluation, and Education Program; ASA = American Society of Anesthesiologists

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Malignant airway obstruction is a serious complication of lung cancer, resulting in dyspnea, decreased functional status, and asphyxiation risk. In addition, pulmonary metastases from other malignancies, including breast, colon, and renal cell cancer, commonly result in malignant airway obstruction.[1] There are three main types of malignant airway obstruction: endobronchial obstruction, extrinsic compression, and mixed pattern. For endobronchial obstruction, ablative techniques that destroy tissue are indicated, including lasers, electrocautery, argon plasma coagulation (APC), photodynamic therapy, microdebriders, and cryotherapy. For extrinsic compression, stents are used to strengthen the bronchial wall and keep the airway open. For mixed patterns, ablation followed by stenting is usually required. Treatment strategies often are multimodal, and variations exist in how physicians perform therapeutic bronchoscopy.

Prior studies of therapeutic bronchoscopy for central airway obstruction[2-12] have included both malignant and benign cases, and most were done retrospectively, although some have focused on malignant disease.[13-18] Reported complication rates are low, but complications and outcomes differ significantly depending on the indication for the procedure (ie, malignant vs benign disease, isolated hemoptysis vs central airway obstruction), and in most studies, significant heterogeneity existed in terms of patient population and indications.[1,4] Many of these studies focused on individual technologies, such as stents, microdebriders, or APC, and most were performed at centers of excellence as part of ongoing research programs. Whether variations in practice patterns affect complication rates is unknown and cannot be answered by single-center studies. In addition, because many previous studies had relatively small sample sizes, formal analysis of rare events like complications has been limited. Whether these results can be generalized to everyday clinical practice is unknown. Additional outcomes data on therapeutic bronchoscopy for malignant central airway obstruction in everyday clinical practice is, therefore, needed to establish benchmarks for quality improvement and clinical effectiveness.

Registries are well suited for this purpose because they provide a more generalizable picture of outcomes and clinical effectiveness. We used the American College of Chest Physicians (CHEST) Quality Improvement Registry, Evaluation, and Education (AQuIRE) program to evaluate therapeutic bronchoscopy for malignant central airway obstruction, focusing on complications and their clinical consequences and 30-day outcomes. The primary objective was to quantify the incidence of and risk factors for complications. The secondary objective was to quantify the incidence and risk factors for bleeding, hypoxemia, respiratory failure, and 30-day mortality and to evaluate the consequences of complications as measured by escalation in level of care and associated adverse events. Data regarding the success rate of therapeutic bronchoscopy and its impact on dyspnea and quality-adjusted survival have been presented separately.[19]

Materials and Methods

Data on patients undergoing therapeutic bronchoscopy from January 2009 to February 2013 were entered into the AQuIRE program.[20] Not all centers started participating at the same time; some centers participated for the entire duration, whereas others participated for ≥1 year. However, participating centers agreed to enter all consecutive patients for the duration of their participation. Institutional review board approval was governed by each site (see e-Appendix 1 for details). The principal investigator for each site was primarily responsible for data quality for that site. Informed consent or a waiver of consent was obtained in accordance with institutional guidelines. Data were entered through the AQuIRE web-based interface using standardized definitions, quality control checks, and protocols as previously described.[21-23]

Patients undergoing therapeutic flexible or rigid bronchoscopy for malignant central airway obstruction were included. Central airway obstruction was defined as occlusion of ≥ 50% of the trachea, mainstem bronchi, bronchus intermedius, or lobar bronchus. Because a registry was used, all clinical decisions, including type of intervention, were left to the discretion of the attending bronchoscopist.

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