Subcutaneous Emphysema following Endoscopic Zenker’s Diverticulum Repair and Postoperative Continuous Positive Airway Pressure Use

An earlier version of this report was presented at the Combined Otolaryngological Spring Meetings (COSM), San Diego, CA, USA, April 18–22, 2012.

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Received 20 September 2012; Accepted 26 March 2013

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Abstract Objective. We report a complication of endoscopic Zenker’s diverticulum repair after postoperative continuous positive airway pressure (CPAP) use. Study design. Case report and literature review. Results. Patient presented for Zenker’s diverticulum repair. He was treated endoscopically with gastrointestinal anastomosis stapler and carbon dioxide laser myotomy. He inadvertently resumed CPAP use early on postoperatively and subsequently presented with dysphagia. Imaging revealed subcutaneous emphysema. Conclusion. It is important to understand the implications that CPAP can have on recovery from Zenker’s diverticulum repair. It is reasonable to screen all surgical candidates for CPAP use and ensure they understand instructions regarding safe postoperative use.

Keywords Zenker’s diverticulum; obstructive sleep apnea; subcutaneous emphysema; CPAP

1. Introduction

A Zenker’s diverticulum (ZD) is a pulsion diverticulum of the hypopharyngeal wall, most commonly occurring on the left posterolateral aspect of the hypopharynx, interdigitating between the cricopharyngeus muscle and the inferior pharyngeal constrictor. It is presumed to result from dysfunction of the cricopharyngeal muscle, and whether it is related to muscle spasm, incoordination of function with premature upper esophageal sphincter contraction, or diminished upper esophageal sphincter opening is currently still debated. The estimated frequency of this disorder is 2 per 100,000 individuals [2]. Modern treatment options include endoscopic staple diverticulectomy versus laser myotomy. Open transcervical approaches are reserved for cases where endoscopic management has failed or where the anatomy is not conducive to endoscopic repair.

Among working-age adults, the prevalence of obstructive sleep apnea (OSA) is approximately 2–4% [6]. The most common form of therapy for OSA is continuous positive airway pressure (CPAP). It is a commonly encountered problem among otolaryngologists, as many patients who are refractory to CPAP therapy and lifestyle changes present to a general otolaryngologist for more definitive surgical treatment options. Here, we report a case of significant subcutaneous cervical emphysema due to postoperative CPAP after endoscopic ZD repair.

2. Case report

Our 66-year-old patient underwent uneventful repair of a left-sided ZD (see Figures 1(a) and 1(b)). A Weerda scope was used for exposure. Diverticulectomy was performed with a gastrointestinal anastomosis (GIA) stapler. Additional residual cricopharyngeus muscle was ablated with a CO2 laser under direct visualization with an operating microscope. The CO2 laser was set on 3-Watt continuous-pulse mode. The patient was discharged on postoperative day 1 on a clear liquid diet, with instructions to slowly advance to a normal diet. The patient inadvertently resumed CPAP use in the early postoperative period, despite a request to avoid CPAP use for several weeks.

The patient presented to the Emergency Department with worsening dysphagia and neck fullness on postoperative day 5 and was found to have extravasation of contrast as well as extraluminal air in (see Figures 2(a) and 2(b)). A nasogastric tube was inserted under direct visualization with a fiberoptic nasolaryngoscope. The patient was admitted for observation and treated with antibiotics and oral feeds were withheld. After 48 hours, the patient’s symptoms improved. At follow-up on postoperative day 15, the patient had no further dysphagia and oral feeding was restarted uneventfully. A follow-up swallow study at this time revealed complete resolution of the esophageal leak, and chest X-ray showed resolution of the subcutaneous air. His CPAP was resumed one month after surgery without incident.
3. Discussion

Over the last decade, there have been a series of evolutionary changes in the repair of ZD. While open transcervical repair was previously the standard of care, the current treatment of choice has shifted to endoscopic transoral approaches. A recent retrospective analysis of 155 patients compared endoscopic laser-assisted diverticulotomy and the transcervical approach, revealing that surgical time, duration of hospitalization, and occurrence of minor complications were significantly lower after endoscopic approach [3]. Another retrospective study revealed similar results when comparing 159 patients who underwent endoscopic staple diverticulostomy with statistics of open repair reported in the literature [1].

While it has been established in the literature that endoscopic approaches are favored over open repair, few studies have compared complication rates and morbidity among the different endoscopic techniques. Both Veronique et al. and Miller et al. compared carbon dioxide laser diverticulostomy with endoscopic staple-assisted diverticulostomy. Both of these retrospective analyses revealed improved efficacy, safety, and a shorter duration of hospitalization postoperatively with the stapling technique [4,5]. One complication that was significantly lower in the staple-assisted technique was the presence of postoperative extraspheageal air. Veronique et al. revealed that extraspheageal air may be detectable in up to 34% of patients after CO$_2$ laser treatment [5]. Use of the GIA, by comparison, was associated with postoperative free air in 9% of patients. Another study revealed lower complication rates altogether in the GIA stapler group versus the CO$_2$ laser cohort, 11% versus 31%, respectively, with 19% of patients in the CO$_2$ laser group experiencing subcutaneous emphysema postoperatively compared with 0% in the GIA stapler group [4].

We used a combined endoscopic approach to treat this patient, using a GIA stapler followed by CO$_2$ laser myotomy. This combined approach was used to ensure complete division of all cricopharyngeal muscle fibers, as the distal ends of the stapler do not cut and thus leave some fibers of the muscle intact. It is hypothesized that patients who require both GIA stapling and laser myotomy are at an increased risk of free air accumulation. Given the pathophysiology behind the cause of ZD as a pulsion diverticulum that arises from increased intraluminal pressure as a result of cricopharyngeal muscle dysfunction or uncoordinated contraction, it is reasonable to presume that anything causing increased intraluminal pressure postoperatively may run the risk of postoperative subcutaneous emphysema. Thus, the use of CPAP can be reasonably presumed to increase this risk.

Given the frequency with which otolaryngologists treat patients with both ZD and OSA, it is informative to consider the impact that CPAP therapy may have on recovery from endoscopic Zenker’s repair. Thus, it is reasonable to screen all surgical candidates for CPAP use and ensure they understand instructions regarding recommendations for safe postoperative use. It is unknown what the ideal duration is for abstinence from CPAP after ZD repair. Two weeks is our current practice pattern, and in cases where patients have heeded this advice, we have not seen this complication.

Patients with OSA who use CPAP should refrain from its use in the immediate postoperative period; however, the duration of safe avoidance is unknown. Otolaryngologists should diligently screen for CPAP use in patients with risk factors and/or previously diagnosed OSA in order to provide proper instructions to patients postoperatively.
References


