

Unsedated In-office Transgastrostomy Esophagoscopy to Monitor Therapy in Pediatric Esophageal Disease

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ABSTRACT

Monitoring therapy in esophageal inflammatory disorders such as eosinophilic esophagitis and reflux esophagitis often requires frequent endoscopic evaluation. We recently reported the effective use of unsedated in-office transnasal esophagoscopy that significantly decreased costs and anesthetic exposure associated with pediatric esophagoscopy in eosinophilic esophagitis. Here we report a series of pediatric patients with esophagitis with gastrostomy tubes who underwent unsedated transgastrostomy esophagoscopy (TGE) in an office setting. Nine patients (ages 16 months–21 years) tolerated TGE without significant adverse events. Biopsy specimens were adequate for evaluation. This series confirms that unsedated in-office TGE can be used to successfully obtain mucosal biopsies to monitor esophageal inflammatory conditions in children without the use of sedation.

Key Words: endoscopy, eosinophilic esophagitis, gastroscopy, transnasal esophagoscopy

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Eosinophilic esophagitis (EoE) and reflux esophagitis are chronic diseases characterized by mucosal inflammation of the squamous epithelium. Although both have well established treatments that are known to induce both clinical and histological remission, symptomatic improvement alone does not always correlate with histologic remission in children and adults (1,2). Because ongoing inflammation may lead to complications in patients with EoE, such as esophageal strictures, or for Barrett esophagus or adenocarcinoma in peptic esophagitis, it is necessary to ensure histologic remission to optimize treatment.(1,2) This need creates a practical challenge because the assessment of esophageal mucosa traditionally has required sedated esophagoscopy.

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What Is Known

- Esophageal disorders such as eosinophilic esophagitis require frequent endoscopic evaluation to ensure proper response to therapy.
- Sedated endoscopy is associated with high costs, longer procedure times, and possible long-term effects of sedation.
- Transnasal endoscopy is a means to obtain esophageal biopsies without sedation.

What Is New

- Transgastrostomy esophagoscopy can be conducted without major complications in a clinic setting without sedation.
- Transgastrostomy esophagoscopy results in biopsy specimens that are adequate for histologic monitoring.

Although a safe procedure, the implications and cost of anesthetic use in children continues to be investigated (3,4).

To address this concern, we recently reported the successful use of in-office unsedated transnasal esophagoscopy (TNE) to monitor EoE in children (5). Philpott and Nandurkar (6) and others (7) have also reported the success of TNE in adults in monitoring of EoE. Together these studies found TNE to be effective, safe, well tolerated, and less costly. We recognized that several children with EoE who needed TNE also had gastrostomy tubes and hypothesized that unsedated retrograde esophagoscopy via gastrostomy, or transgastrostomy esophagoscopy (TGE), was feasible to procure esophageal mucosal biopsies in an outpatient clinic setting.

METHODS

We report the retrospective experience from September 1, 2015 to July 31, 2016 of children who underwent a TGE in the Digestive Health Institute of Children's Hospital Colorado. All patients had a well matured gastrostomy tract site with a gastrostomy tube present no <12 weeks. Children underwent a medical evaluation and an esophagoscopy was recommended as a part of their standard of care evaluation. Traditional sedated endoscopy, unsedated TNE, and TGE were offered as possible methods to assess the esophageal mucosa in an outpatient clinic setting. Clinical informed consent was obtained from parents or legal guardian. Patient's parent(s) were present during the procedure.

The patients were prepared by being NPO (nil per os) overnight with a minimum of 8 hours. On arrival, the patient's gastrostomy tube was removed and 2 to 3 (0.2 mL total) sprays of 4% aerosolized lidocaine were sprayed around the gastrostomy. Patients were offered distraction using video goggles (Karl Zeiss, Oberkochen, Germany, Cinemizer Goggles). Patients were placed in the supine position and an Olympus (Tokyo, Japan) N180 gastroscopy-14 gastrostomy size (4.9 mm diameter with 2 mm biopsy channel) or Olympus BFMP160F-12F Gastrostomy (4 mm diameter with 2 mm biopsy channel) was inserted through the gastrostomy site. Under direct visualization, the endoscope was advanced from the stomach in a retrograde fashion to the esophageal lumen. Standard esophageal biopsies (Boston Scientific Radial Jaw 4 Pediatric Biopsy Forceps) were used to obtain 3 distal and 3 proximal mucosal biopsies of the esophagus. When indicated, gastric and duodenal biopsies were also obtained. Tolerance of the procedure and ability to complete necessary biopsies were recorded and families were contacted within 24 hours after the procedure per standard clinical protocol. Mucosal pinch biopsies were assessed by a board-certified pathologist and

adequacy assessed by noting presence of squamous epithelium, lamina propria, and mucosal abnormalities per standard clinical care. Esophagitis was defined as pathologist-reported inflammatory esophageal epithelium features suggestive of reflux esophagitis such as: <15 eosinophils per high power field, basal cell hyperplasia, and rete peg elongation. If >15 eosinophils per high power field were present in the esophageal mucosa this was diagnostic of EoE. Gastritis was defined as pathologist labeled presence of inflammatory cells in the gastric mucosa such as neutrophils, lymphocytes, or damage of glandular architecture. Following TGE the gastrostomy tube was reinserted through their stoma and reinflated. Tube placement was checked with aspiration of gastric contents. Patients were discharged home and allowed enteral feeds immediately after completion of the procedure.

RESULTS

Nine patients, ages 16 months to 21 years, with esophagitis underwent unsedated TGE (Table 1). Indications for previous gastrostomy tube placement were primarily for nutritional support

TABLE 1. Demographics and pathology of patients undergoing TGE

Patient	Sex	Age, y	Reason for gastrostomy tube	Underlying GI disorder and comorbidities	Endoscopic findings	Histologic findings
1	Male	21	Nutrition unable to be taken orally because of neurological status	Eosinophilic esophagitis, developmental delay, psychiatric disorder	Visually normal	Esophagitis <4 eosinophils/hpf present. Esophageal lamina propria is not present.
2	Male	20	Nutrition inadequate because of feeding dysfunction	Esophagitis, restrictive lung disease, obstructive sleep apnea, quadriplegia	Visually normal with erythema of fundus present	Proximal and distal esophageal biopsies normal. Gastritis present. Esophageal lamina propria is not present.
3	Male	4	Elemental diet	Eosinophilic esophagitis	Visually normal	Normal esophageal and gastric biopsies. Esophageal Lamina propria is not present.
4	Male	3	Nutrition orally lead to silent aspiration	Eosinophilic esophagitis, hypertrophic cardiomyopathy, and liver transplant for arteriovenous malformation	Slight furrowing, white plaques of distal esophagus, otherwise visually normal	Esophagitis with 4–6 eosinophils/hpf. Esophageal lamina propria present and shows fibrosis.
5	Female	2	Nutrition orally lead to silent aspiration	Eosinophilic esophagitis, developmental delay, hypotonia, obstructive sleep apnea	Visually normal with slight furrowing of esophagus present	Distal esophageal biopsies normal. Proximal esophageal biopsies esophagitis with 10 eos/hpf. Esophageal lamina propria present.
6	Female	10	Nutrition orally lead to silent aspiration	Eosinophilic esophagitis, heart transplant	Visually normal with slight furrowing of distal esophagus with fundoplication present	Proximal and distal esophageal biopsies normal. Esophageal lamina propria present.
7	Male	12	Nutrition unable to be taken orally because of neurological status	Eosinophilic esophagitis, metabolic disorder, developmental delay	Visually normal	Proximal and distal esophageal biopsies normal. Gastric biopsies with proton pump inhibitor effect. Esophageal lamina propria present
8	Male	1.5	Nutrition orally lead to silent aspiration	Eosinophilic esophagitis, history of aspiration	Visually normal with furrowing of esophagus	Proximal and distal esophageal biopsies with eosinophilic esophagitis. Esophageal lamina propria fibrosis present.
9	Male	17	Nutrition unable to be taken orally because of neurological status	Reflux, recurrent aspiration, dystonia, congenital neuromuscular disorder	Visually normal with fundoplication present	Normal esophageal, gastric, and duodenal biopsies. Esophageal lamina propria not present.

Sex, age, biopsy results, adverse events, indication for G-tube, and comorbidities listed for the 9 patients reviewed. GI = gastrointestinal.

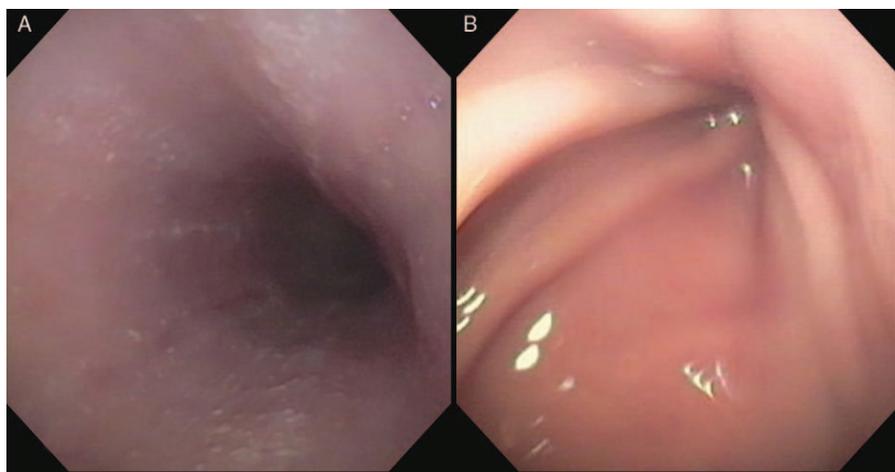


FIGURE 1. Endoscopic view from TGE. Endoscopic view of esophagus with mild exudate (A) and view from stomach of Nissen fundoplication (B).

of an elemental diet and concern for aspiration in the setting of neurologic delay. Of this group, 7 patients with EoE underwent esophagoscopy to assess the efficacy of treatment. Two patients underwent esophagoscopy to evaluate history of reflux with ongoing symptoms. Comorbidities included history of aspiration, metabolic disorder, heart transplant, liver transplant, neuromuscular disorder, developmental delay, and a psychiatric disorder.

The endoscopic view was adequate to appropriately obtain biopsies and characterize visualized findings (Fig. 1). All subjects completed the TGE without need to stop due to significant discomfort or difficulty. Some gagging during air insufflation, throat clearing, cough, and mild discomfort were evident during procedures. No significant adverse events occurred at the time of the procedure or during postprocedure phone call. Histopathological assessment revealed that 100% of biopsies were of adequate quality (Fig. 2). In addition, lamina propria was present in 5 out of 9 mucosal biopsies.

DISCUSSION

Diseases such as EoE and reflux esophagitis regularly require sedated endoscopy and biopsy to ensure histological responsiveness to treatment. Research in nonsedated methods of monitoring

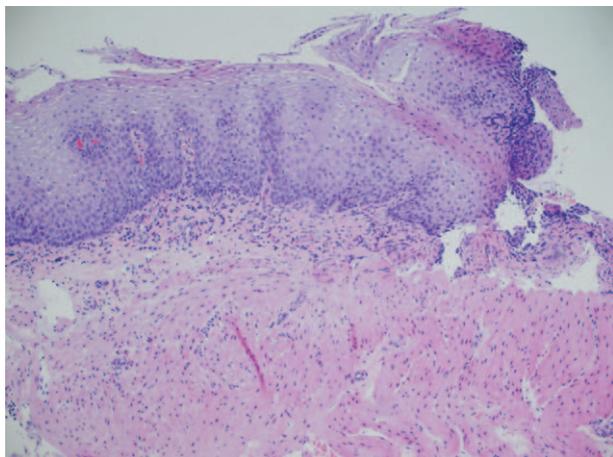


FIGURE 2. Representative pathology 100 \times . H&E staining from esophageal biopsies of patient with mild esophagitis (basilar cell hyperplasia and rete peg elongation) and lamina propria fibrosis.

inflammation including Cytosponge (Medtronic, Hampshire, NY), esophageal string test, fractionated exhaled nitric oxide, and confocal tethered endomicroscopy continue but none are not commercially available to date (8–11). Because peripheral biomarkers that correlate with esophageal inflammation are still not available, sedated endoscopic procurement of mucosal samples remains the criterion standard to assess for esophageal inflammation (12). Concerns surrounding this procedure in pediatrics include cost, unknown impact of sedation on the developing brain, cost, and time away from work and school (5). Thus, additional methods to assess esophageal mucosa are needed. In select patients, our series suggests that unsedated TGE may be a potential alternative to traditional sedated esophageal endoscopic evaluation and TNE.

We found that TGE was feasible and well tolerated in the assessment of mucosal inflammation of children and young adults with esophagitis. Many in our cohort in this series had significant underlying health issues, such as cardiac or chronic lung disease, which placed them at higher risk for anesthesia-related complications (12). Successful completion of TGE in this compromised group emphasizes the positive aspects of not using sedation and thereby increasing safety and decreasing cost in these high-risk patients. Although this series did not record exact time in office or charges, the provider-noted duration in clinic was similar to previous reported TNE (approximately 1 hour) and the procedure was without the use of costly general anesthesia (5). Subjects' families qualitatively expressed to the practitioner satisfaction with the quicker time, lack of need for anesthesia, and the ability to have an in-office procedure.

Adequacy of biopsy specimens using TGE was also confirmed. The histologic samples obtained with the standard 2 mm pediatric biopsy forceps used in TGE demonstrated the presence of esophageal lamina propria in 55% of patient specimens. This is near the reported 60% report of esophageal lamina propria found in some adult studies using standard 2.8 mm adult endoscopic biopsy forceps (13). Sampling of lamina propria can be helpful in determining degree of inflammation and fibrosis. The importance of lamina propria fibrosis to overall assessment and clinical care of children with eosinophilic disorders is still being researched (14).

Our results suggest that TGE can be done safely in an office setting without sedation in high-risk patients. Tissue samples were sufficient for assessment and patients and their families expressed satisfaction with the technique. This case series supports the potential use of unsedated transgastrostomy assessment of other mucosal diseases of stomach or duodenum in children and adults with gastrostomy tubes in an office setting; further research is needed.

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