Case Report

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Aspiration Of Capsule Endoscopes: A Case Report And Treatment Experience From Respiratory Physician

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1.Abstracts:

Capsule endoscopy (CE) is an effective tool for evaluating the intestinal lumen through video, and its use has become widely accepted in gastrointestinal investigations. However, capsule aspiration into the trachea or bronchial tree is an emergent complication that requires immediate intervention. Here, we present the case of a 69-year-old male with a history of chronic bronchitis and emphysema who swallowed a CE, leading to capsule aspiration. We successfully retrieved the capsule using a snare with the help of a laryngeal mask airway for ventilation assistance. We then discuss the causes of capsule aspiration and suggest preventive measures. Physicians should be familiar with the management options for this fatal complication.

2. Keywords:
Capsule endoscope, Aspiration, Complication, Bronchoscope, case report.

3. Introduction:

Capsule endoscopy (CE) is currently a first-line diagnostic tool for small bowel diseases, which has the advantages of relatively non-invasiveness and safety in diagnosing mucosal diseases, and has pioneered a new mode of examination for the entire digestive tract[1, 2] However, adverse events such as CE retention, difficulty swallowing, aspiration, and missed diagnosis still occur during clinical applications[1]. Among these events, CE aspiration is an emergent complication that requires immediate intervention. Previous literatures have reported several methods to deal with CE aspiration, including using rigid or flexible bronchoscopyassistant with manipulating appliances[3]. However, up to now, there is still no standardized treatment strategies. The present report discusses the causes of capsule aspiration and suggests preventive measures. Physicians should be familiar with the management options for this fatal complication.

4. Case Presentation:

A 69-year-old male with a history of chronic bronchitis and emphysema presented to our hospital with intermittent melena for 7 months. Previous endoscopy revealed chronic atrophic gastritis and multiple colon polyposis. Upon swallowing the capsule endoscope (PillCam™ SB 3 Capsule Endoscopy System,Medtroinc), the patient immediately experienced coughing and subsequent chest tightness lasting approximately one minute. Physical examination revealed decreased inspiratory sounds and expiratory wheezing on the central part of the right lung, leading to the diagnosis of capsule aspiration. While the CE image showed a real-time recording of the tracheal cartilage ring and typical airways supporting this diagnosis [Figure 1a]. As the capsule was lodged in the lobar bronchus, the symptoms of cough and dysphagia were not evident. We encouraged the patient to cough actively and performed postural drainage combined with chest percussion therapy in an attempt to remove the capsule spontaneously. Unfortunately, the capsule remained lodged in the right intermediate bronchus. As previously reported, flexible bronchoscopy or hard endoscopy examination is the best way to retrieve the capsule. Given the patient's history of pulmonary disease and the unpredictable timing of surgery implementation, we opted to perform the surgery with general anesthesia while utilizing a laryngeal mask airway for ventilation assistance. Bronchoscopy revealed that the capsule was located in the right intermediate bronchus [Figure 1b&c]. Despite the challenge posed by the capsule's smooth surface coated in mucus, we were able to successfully retrieve it with the use of a snare [Figure 1d].

Figures and Figure legends:

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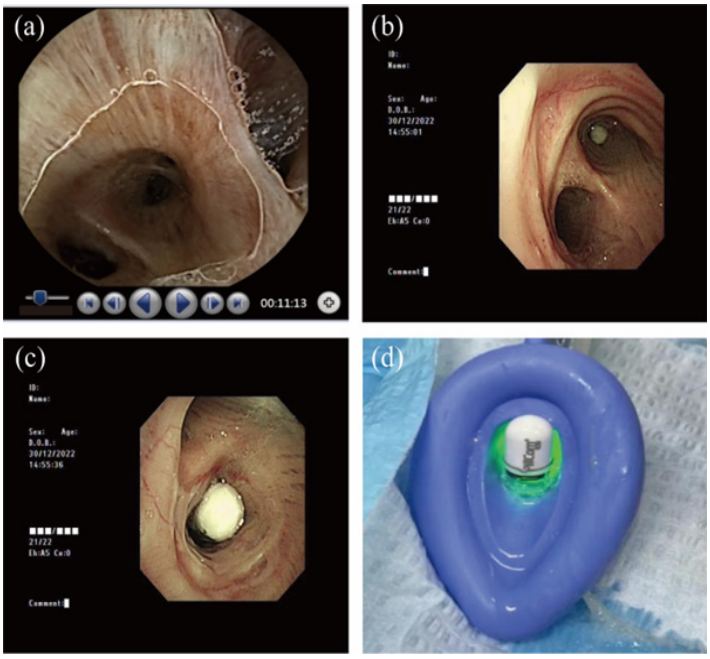
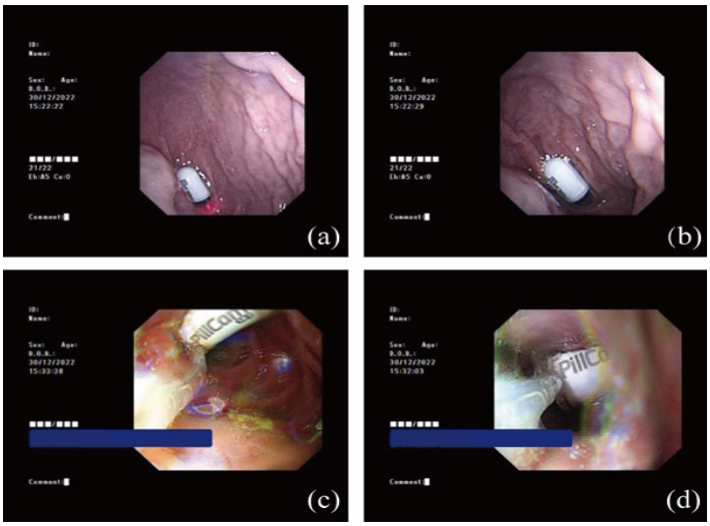


Figure 1: Removal process of capsule endoscopy (a: Real-time capsule endoscopic images show the tracheal cartilage ring and typical airways. b&c: Bronchoscopic view showing that the capsule plugged in the bronchus intermedius,band c is tracheal carina and right main bronchus, respectively. d: Capsule endoscopy was successfully removed from airway.)

Considering the patient's high risk of aspiration, we decided to bypass the esophagus and directly place the capsule into the duodenum using a gastroscope. However, during the procedure, we encountered several obstacles, such as difficulty in accurately entering the esophagus with the gastroscope and the capsule falling into the trachea again. This was because the capsule in front of the gastroscope obstructed the endoscope's view of its progression. Fortunately, by adjusting the patient's position and modifying the method of fixing the capsule onto the gastroscope, we successfully implanted the capsule into the duodenum [Figure 2]. And the patient recovered well and completed the video capsule endoscopy the following day.



5.Discussion

CE as an effective tool in directly evaluating intestinal lumen through video, has become widely accepted in nowadays clinic gastrointestinal investigation. With the high patient acceptance and safety, the indications of CE expand to obscure gastrointestinal bleeding, inflammatory bowel diseases without ileus, and other abnormality which could not be confirmed by gastrointestinal endoscopy or colonoscopy[4, 5]. The overall complication rate of CE is rare, while CE retention occurs in about 2% of all studies[6]. However, one isolated but emergence complication which need multi-department effort is the capsule aspiration into the trachea or bronchial tree. Professor W Stremmel published the first case of aspiration of an M2A capsule since this diagnostic method has become available to general clinical practice in 2003. And they retrieved the capsule from the right main bronchus by flexible bronchoscope[7].

CE aspiration can be classified as the foreign body aspiration, which mostly be found in children and performed as an incidentally but life-threatening situation that require immediate intervention[8, 9]. Depressed mental status, impaired cough reflex, esophageal sphincter relaxation and laryngopharyngeal sense recession are regarded as the main factors of foreign body aspiration, while due to this character, recent clinical doctor notice that the high-risk group, especially CE aspiration, has transfer to elderly patient[10, 11]. Specifically, advanced age, consciousness disorder, poor deglutitory function, cerebrovascular disease, and spinal abnormalities[11]. When aspiration happen, the clinical manifestations are variable and nonspecific. The onset of symptoms is mostly manifested by transient choking, cough, foreign body sensation, and dyspnea, while subsequent clinical manifestations and the risk level are closely related to the position of the CE incarcerated airway. A multi-center study showed that the right bronchial tree is the most common site of foreign bodies aspiration. Among this, foreign bodies are more likely stuck in the right bronchus intermedius and right lower lobe basal segment[12], while this is the same with most CE aspiration case reports.

Interestingly, recent research found that the iatrogenic causes of aspiration are increased, including intubation, tracheostomy tube change, dental procedures, and CE. Physicians should not only know the coping options for this fatal complication but also take some preventive efforts to avoid it. First, when conducting CE, gastroenterologists need to raise their awareness of the above-mentioned high-risk population, all medical histories should be evaluated concerning the neurological or degenerative or swallowing disorder. They must pay attention to the endoscopic return image in real-time and add auxiliary examinations such as chest X-ray or CT scan if necessary, thus timely localizing the place of the capsule. Next, when facing patients at risk of aspiration, selecting a suitable postural position, instructing and modifying swallowing is useful. Third, it is recommended that CE should be delivered into the duodenum with gastroscope assistance[13, 14], especially capsule endoscopy delivery device[15], in patients with abnormal hypopharyngeal and esophageal motility to avoid the occurrence of CE aspiration.

In terms of aspiration treatment, some can be discharged by active cough, chest percussion therapy, and postural drainage. However, CE aspiration often warrants an invasive procedure, while bronchoscopic retrieval is preferred to avoid long-term sequelae. Previous bronchoscopic techniques aimed at CE removal include rigid and flexible bronchoscopy, while assistant manipulating appliances contain foreign body forceps, expandable basket foreign body retrieval devices, balloon catheter, etc. From the present case as well as previous case reports, we summarize some experiences and suggestions for improvement, as follows: Due to its large size and smooth surface, the retrieval process of the CE is prone to slippage, making the timing of the operation unpredictable. Therefore, it is recommended to use general anesthesia with the assistance of a laryngeal mask airway for ventilation. As there is no point of fixation on the surface of the CE, using a snare or stone retrieval basket is more advantageous for the retrieval operation. Since aspiration has already occurred and the patient is currently under general anesthesia, it is recommended that CE should be directly delivered into the duodenum with gastroscope assistance[13, 14] during the operation in order to avoid further aspiration through active swallowing. During the process of pushing the CE into the gastrointestinal tract it is difficult to accurately entering the esophagus because of the CE in front of the endoscope blocking the endoscope's view of its progression. Thus, adopting a position with the neck flexed and head bowed or tracheal intubation to avoid the CE falling into the trachea again. As there is no designated grip point on the CE itself, surgical thread can be wrapped around the CE in case of present emergency for patients at risk of aspiration. For manufacturers, it would be beneficial to design a grip point on the surface of the capsule by improving the surface of the capsule, such as carving a groove in the middle of the CE or designing a grip point that matches the snare loop.

6. Conclusion:

In conclusion, more details are needed to tackle aspiration during CE practices. Elder and those with neurological or swallowing disorders, and spinal abnormalities should be regarded as the high-risk population of CE aspiration, while routine investigating of related medical history, taking precaution efforts, and real-time monitoring is required. Bronchoscopy has the dual advantages of inspection and treatment therefore preferred in CE retrieval. In addition, we also expect manufacturers to create more scientific and safe CEs.

Abbreviations:

VCE, Video capsule endoscopy; OGIB, obscure gastrointestinal bleeding; CE, capsule endoscopy;

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