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TECHNICAL NOTE

Videofluoroscopy-guided balloon dilatation for treatment of severe pharyngeal dysphagia

Koichi Yabunaka, Hideki Konishi, Gojiro Nakagami, Jyunko Matsuo, Atsushi Noguchi, Hiromi Sanada

ABSTRACT
Balloon dilatation is a widely accepted technique in the management of esophageal and other types of gastrointestinal strictures, but it is rarely used for the treatment of pharyngeal dysphagia. Therefore, the aim of our prospective study was to evaluate the use of videofluoroscopy-guided balloon dilatation (VGBD) for the treatment of severe pharyngeal dysphagia. The study included 32 stroke patients who had been diagnosed with oral and/or pharyngeal dysphagia. All patients underwent dilatation of the esophageal inlet using a balloon catheter under videofluoroscopic guidance during one or more sessions. Following esophageal dilatation, manual feeding was provided twice weekly. VGBD was effective in 10 out of 32 patients; however, the remaining 22 patients were unable to attempt oral food consumption because aspiration was not completely resolved on videofluoroscopy. According to this case series, VGBD may provide treatment for patients with severe pharyngeal dysphagia, who have not consumed food orally for a long period of time.

From the Departments of Radiology (K.Y.), and Rehabilitation Medicine (H.K.), Katsuragi Hospital, Osaka, Japan; the Department of Gerontological Nursing/Wound Care Management (K.Y., G.N., H.S.), Graduate School of Medicine, University of Tokyo, Tokyo, Japan; School of Nursing (J.M.), Osaka Medical College, Osaka, Japan; School of Health Sciences (A.N.), Butsuryo College of Osaka, Sakai City, Japan.

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Videofluoroscopy is the gold standard to study the pharyngeal mechanisms of dysphagia in stroke patients. Treatment of dysphagia patients is subject to some controversy regarding the effect of swallowing therapy in preventing malnutrition and aspiration pneumonia. Stroke severity may be difficult to assess and comorbidities such as chronic obstructive pulmonary disease may complicate the case (1). Dysphagia in stroke patients may lead to complications such as aspiration pneumonia, which increases the length of acute stay and leads to persistence and perhaps even worsening of dysphagia during the first month after stroke (2–4). It is important to maintain or restore oral intake to improve the quality of life and nutritional status of these patients. Although beneficial in terms of improved quality of life, it can be difficult to introduce partial oral feeding in patients being tube fed, because of their increased risk of aspiration pneumonia. Because radical treatment is typically not indicated for such vulnerable patients, effective and noninvasive treatment options are highly demanded.

Videofluoroscopy-guided balloon dilatation (VGBD) is a technique frequently used to treat problems of the lower esophageal sphincter caused by achalasia (5). VGBD has also become a widely accepted technique for the management of esophageal and other types of gastrointestinal strictures. Several reports have described the successful treatment of patients with achalasia and esophageal tumors using balloon catheter dilatation (6–8). Balloon catheter dilatation with catheter insertion into the pharynx or the esophageal inlet is not a preferred, first-line management technique for pharyngeal dysphagia, and there is little or no information available regarding the use of this technique in such patients (9). The purpose of this study was to investigate whether upper esophageal balloon catheter dilatation is an effective method for treating severe pharyngeal dysphagia.

Methods

Patients

We performed VGBD in 32 patients with stroke-related dysphagia during the hospitalization period. In this prospective single-centered study, 32 consecutive patients (six men and 26 women; median age, 77.4 years; range, 70–85 years) had been fed via percutaneous endoscopic gastrostomy for a period of 6–15 months. Informed consent for the study was obtained from all patients or from their proxy, as approved by the ethics committee of the hospital. In addition to dilatation treatment, all patients were taught standard compensatory and rehabilitative swallowing and feeding techniques to reduce or eliminate aspiration.

Diagnostic criteria of severe pharyngeal dysphagia were as follows: 1) aspiration in all cases; 2) aspiration when the patient is fed pureed food prepared in less than 5 mL of water and when the food is consumed with the patient reclining at a 30°–45° angle; 3) pharyngeal dysfunction and aspiration before, during, or after food swallowing; 4) absence of mechanical stenosis of the upper esophagus.

Treatment procedure

Upper esophageal expansion was noted during slow manual feeding of 5–20 mL of water containing 30% barium. Lateral videofluoroscopic swallow views were collected using a Winscope 5000 X-ray TV system (Toshiba Medical Systems). Lateral fluoroscopic images were defined as the portion of the esophageal inlet (located approximately between C4 and C6). Topical anesthesia was applied with 8% lidocaine spray (Xylocaine pump spray, AstraZeneca) in the nasal cavity.

A balloon catheter (12 F Bard Foley Tray, Bard Medical) was gently inserted through the nasal cavity until the balloon was estimated to be at the proximal part of the esophageal inlet by the lateral fluoroscopic image. If the patient did not cough and phonation was normal, balloon expansion commenced at a low pressure (1.5–2 atm), and then the balloon was gradually inflated until it achieved a diameter of 20–25 mm. After successful completion of this maneuver, the tip of the balloon was manually moved a slight distance to the proximal part of the esophageal inlet, and the balloon was then expanded. We attempted to stretch the cricopharyngeal muscles to achieve the deglutition reflex.

Similar expansions were performed several times and safety of the procedure was confirmed under fluoroscopy approximately 20 min after VGBD, indicating no damage to the esophagus. The whole process lasted approximately 40 min each time. Patients with a positive response to the first dilatation procedure (i.e., videofluoroscopy after VGBD revealing decreased aspiration), underwent repeated dilatations once every two weeks for three months, resulting in a total of six dilatations per patient. Further dilatation treatments could not be performed because the length of hospital stay is limited up to 12 weeks for these patients under restriction policy of healthcare insurance system in Japan. During the three-month period of VGBD treatments no inflammatory changes were noted in the blood test findings and the patients could keep their aspiration conditions.

Clinical evaluation of swallowing

Clinical assessment methods of swallowing included tongue strength, movement of the soft palate, gag reflex and response, and swallowing and feeding ability. The functional oral intake scale (10, 11) was administered and tolerance of oral intake was scored as follows: Level 1, nothing by mouth; Level 2, tube-dependent with minimal attempts of food or liquid; Level 3, tube-dependent with consistent oral intake of food or liquid; Level 4, total oral diet of a single consistency; Level 5, total oral diet with multiple consistencies but requiring special preparation or compensations; Level 6, total oral diet with multiple consistencies without special preparation but with specific food limitations; and Level 7, total oral diet with no restrictions. Swallowing function noted at baseline and after treatment were compared using Wilcoxon signed rank test. The level of statistical significance was set at $P < 0.05$.

Results

VGBD was effective in 10 of 32 patients (31%). Before VGBD, functional oral intake score of these 10 patients was Level 1; after VGBD, the score increased to Level 5 in four patients, Level 4 in four patients, and Level 3 in two patients. Wilcoxon signed rank test showed a significant improvement ($z= -2.842$, $P = 0.004$) in swallowing function, which was clinically relevant.

All symptoms permanently disappeared (for at least six months) in three patients after one dilatation, and in five patients who received repeated dilatations at regular intervals. A good response was observed in two other patients, who improved from Level 1 to Level 5 during the three-month period of VGBD treatments. These 10 patients could orally consume a meal once daily during the course of VGBD as administered over three months. In one patient, the percutaneous endoscopic gastrostomy tube was no longer required, as the patient could consume food orally three times daily (Fig. 1). These patients were monitored for six months, and none developed aspiration pneumonia or experienced difficulty during oral food intake. In the remaining 22 patients, the effect was transient after the first dilatation and these patients were unable to attempt oral food consumption because aspiration was not completely resolved on videofluoroscopy (Fig. 2).

Discussion

In our study, VGBD was successful in expanding the esophageal inlet in 10 of 32 patients, enabling them to ingest at least one meal per day orally after the first expansion.

VGBD has become a common method for treating a variety of gastrointestinal tract strictures, and it is particularly effective in treating patients with esophageal conditions (8, 9, 12–14). Another modality, retrograde endoscopic balloon dilation, has been recommended as a first-line treatment in some cases; it has been proven safe and reliable for treating complete strictures of the hypopharynx (15). Retrograde endoscopic progressive balloon dilatation enables esophageal dilatation under direct visualization and provides palliative care for deglutition difficulties in patients with stenoses that are not treatable with traditional techniques. The risks of perforation and other complications arising from the blind dilatation of strictures are expected to diminish when an appropriate technique tailored for each individual is used (16). With regard to the treatment of esophageal achalasia, Yi et al. (17) reported that fluoroscopy-guided, double-balloon dilatation has a greater long-term effect than endoscopy-guided, single-balloon dilatation. In this study, VGBD was used to treat pharyngeal dysplasia patients and was able to produce long-term beneficial effects in some patients. This technique was chosen because retrograde endoscopic balloon dilation is difficult

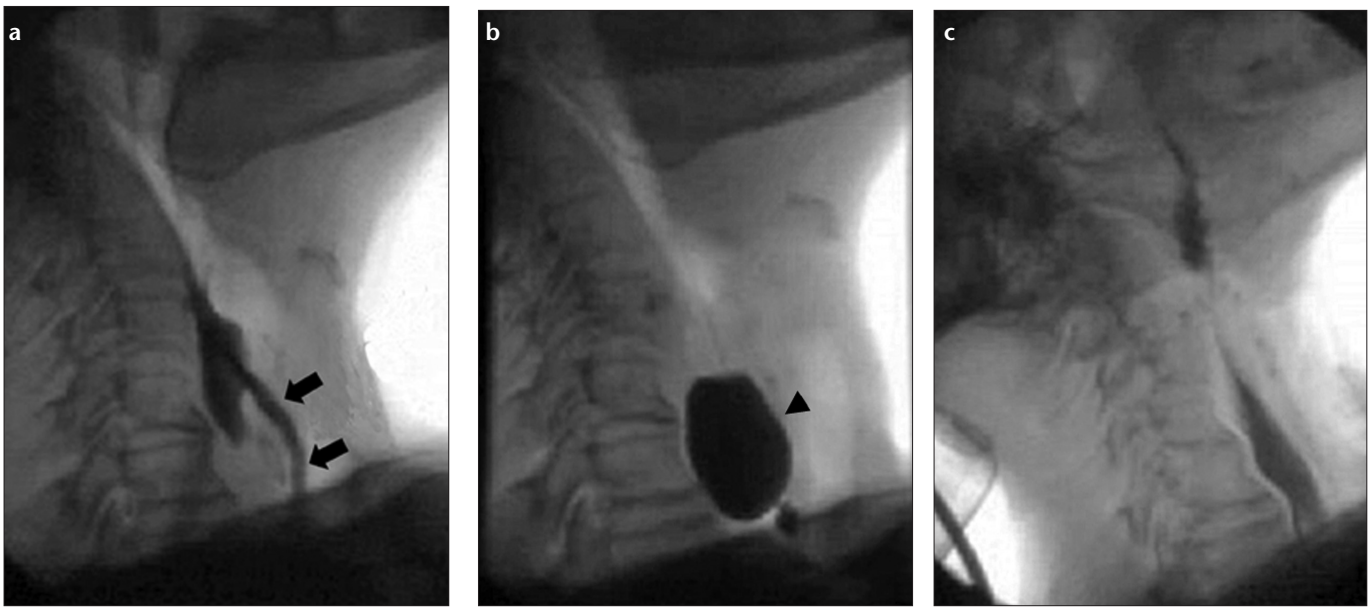

Figure 1. a–c. Videofluorographic swallow study images of an 80-year-old woman with severe pharyngeal dysphagia. Videofluorography **(a)** shows aspiration before the first videofluoroscopic-guided balloon dilatation *(arrows)*. Balloon is inflated using contrast media *(arrowhead,* **b**). Videofluorography **(c)** shows no aspiration after balloon expansion.

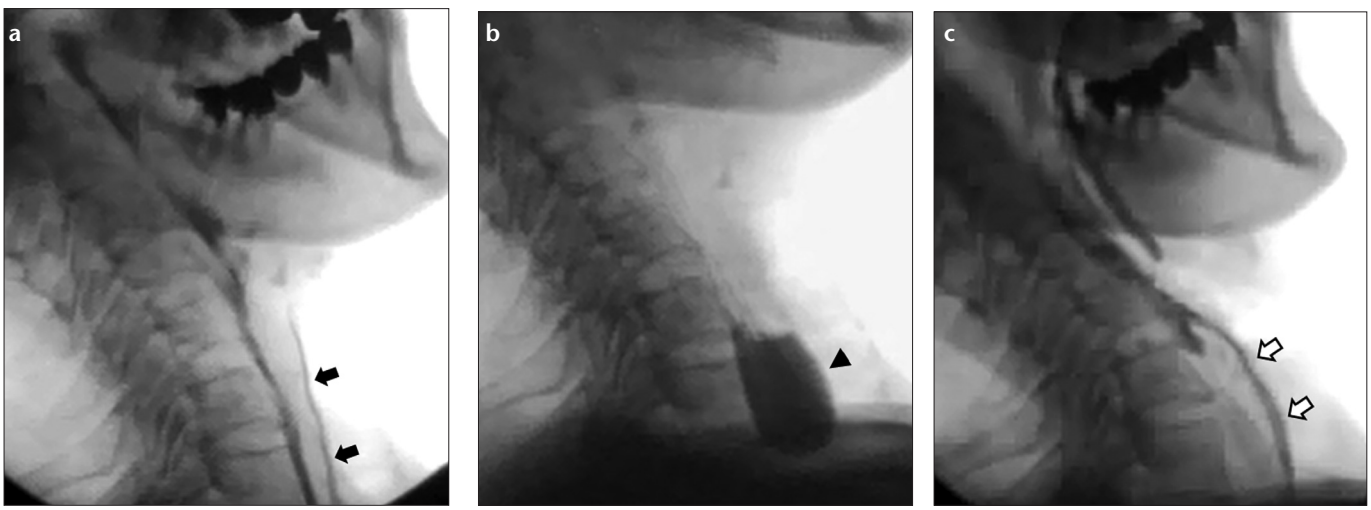

Figure 2. a–c. Videofluorographic swallow study images of an 83-year-old man with severe pharyngeal dysphagia. Videofluorography **(a)** shows aspiration before the first videofluoroscopy-guided balloon dilatation *(black arrows)*. Balloon is inflated using contrast media (*arrowhead,* **b**). Videofluorography **(c)** shows some aspiration after balloon expansion *(white arrows)*.

to use in treating pharyngeal dysphagia patients, as it may increase the risk of perforation and other complications associated with sedation, and also because patients are often reluctant to undergo retrograde endoscopy. Traditional manometric methods include the use of perfusion catheters or intraluminal solid-state strain gauges. Rapid and asymmetric pressure variations in the upper esophageal sphincter and difficulty in compensating for pharyngolaryngeal elevation during deglutition limit the usefulness of these methods (18).

In this study, we demonstrated that dysphagia improved following dilatation of the esophageal inlet in 31% of patients with pharyngeal disorders. Positive results were achieved by stimulating the dysfunctional cricopharyngeal muscles and by gradual dilatation of the esophageal inlet with a balloon catheter. Balloon dilatation technique may not be effective for all types of dysphagia, but it can be attempted as a minimally invasive method of treating patients at risk for developing dysphagia due to disuse of the deglutition muscles. Even though many patients noticed significant improvement after the first treatment, all pharyngeal dysphagia patients should receive regular follow-up to promptly identify disease progression.

One limitation of this study is that we could not identify predictors of treatment success. Therefore, indications for the use of this method require clarification in future studies. Another limitation is that we were unable to follow the patients for a longer duration to prove the permanency of dysphagia treatment.

In conclusion, VGBD may potentially provide treatment for patients with

severe pharyngeal dysphagia, who have not consumed food orally for a long period of time. However, studies on larger series are needed to confirm our results and identify patient populations that are likely to benefit from this treatment.

Conflict of interest disclosure

The authors declared no conflicts of interest.

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