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ORIGINAL ARTICLE

Transnasal versus conventional peroral insertion of percutaneous endoscopic gastrostomy using pull method

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Summary *Background:* Several cases of successful percutaneous endoscopic gastrostomy (PEG) through the transnasal route have been reported, and *Pseudomonas aeruginosa* infection in transnasal PEG was described earlier. This study was conducted to investigate the difference between transnasal PEG and conventional PEG.
Methods: A retrospective case—control study was conducted to compare pull-type transnasal (T-PEG) and peroral (O-PEG) placement of a 20 Fr PEG tube in a community hospital. Thirty-eight T-PEG and 38 O-PEG were analyzed in 76 chronic dysphagic patients from homes or nursing homes. The operating time, occurrence of choking during PEG, stomal site infection, bacterial pathogens, and post-PEG complication were recorded and analyzed.
Results: The mean age was 76.3 ± 10.3 years for T-PEG versus 79.3 ± 6.9 years for O-PEG; 67% were male versus 48% female; operating time was 14.6 ± 4.0 minutes for T-PEG versus 11 ± 3 minutes for O-PEG ($p = 0.0028$), and choking occurred in three patients in the T-PEG group versus five in the O-PEG group. There were 10 stomal site infections (9 with *P. aeruginosa*) in the T-PEG group and 14 (8 with *P. aeruginosa*) in the O-PEG group ($p < 0.001$). One systemic infection of the urinary tract, one buried bumper, and one stomal soiling were observed in the T-PEG and O-PEG groups. No PEG-related mortality occurred within 3 months after all PEG procedures.
Conclusion: Transnasal insertion of PEG using a pull method is a feasible and safe alternative when conventional pull-method PEG is not possible. However, *P. aeruginosa* infection is

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common when using T-PEG; therefore, more studies focusing on prophylaxis of T-PEG-associated *P. aeruginosa* infection are required.

Introduction

Percutaneous endoscopic gastrostomy (PEG) is a world-wide standard enteral feeding procedure for patients with swallowing dysfunction [1]. PEG is safe and has fewer minor adverse events compared with conventional surgical gastrostomy [2—4]. However, peroral PEG (O-PEG) is a big challenge in some patients who have trismus or oral cancer, and historically, surgical gastrostomy with its accompanying anesthetic risk has been the only alternative for these patients. Successful transnasal insertions of a PEG tube with a 5.9-mm pediatric endoscope and even a regular adult scope have been reported by pioneers in the field, with good results [5—11]. Dominant *Pseudomonas aeruginosa* infection of the stomal site has been reported in a series of cases of transnasal PEG (T-PEG) [12]. However, there have been no case—control studies comparing T-PEG and O-PEG. Thus, this work is the first to compare the clinical differences between transnasal and peroral insertion of PEG using the pull method.

Methods

A retrospective, case—control study was conducted and approved by the Institutional Review Board of Pingtung Christian Hospital, Pintung, Taiwan (IRB458A). PEG is not popular in Southern Taiwan due to a lack of understanding among the general population. In Taiwan, nasogastric (NG) tube rather than PEG is a standard feeding method for patients with dysphagia and PEG is recommended only in patients who remove NG tubes frequently, or in whom NG tube insertion is difficult or fails. So, all of the PEG procedures performed from 2009 to 2013 at Pingtung Christian Hospital were enrolled into this study. However, patients meeting the following criteria were excluded from the study: estimated survival time $<$ 2 months, aged $<$ 20 years, hospitalized for an acute disease or infection, receiving ongoing treatment with warfarin or clopidogrel, had undergone tracheostomy, required mechanical ventilation, complex comorbidity, or an inadequate record of medical information.

T-PEG was performed in patients who tolerated nasal intubation or who had difficulty with oral intubation due to trismus or oral malignancy. O-PEG was performed in patients who rejected nasal intubation. Neither the nasal cavity nor the oral cavity was decolonized prior to either type of PEG; prophylactic cefazolin 1 g was intravenously administered prior to each PEG. Additional spraying of lidocaine solution and epinephrine solution into the nasal cavity and using an ultrathin 5-mm endoscope (GIF-N-260; Olympus, Tokyo, Japan) were applied to the T-PEG. The other premedication and procedure were the same as those used in conventional pull-method PEG to insert a 20 Fr PEG tube (MIC PEG kits; Kimberly—Clark, Roswell, GA, USA) for enteral feeding. All of the patients were hospitalized for the PEG procedure, observed for 1—2 days in hospital after the PEG procedure, and followed-up in the outpatient department at 7 days after PEG. All of the adverse events and stomal site examination results were recorded routinely. A gastrostomy site infection was defined as wound erythema with discharge or pus discharge with/without wound erythema. Bacterial culture was obtained routinely if stomal site infection occurred.

The age, sex, cause of dysphagia, type of residence, comorbidity, details of the PEG including the route of insertion and the occurrence of choking or aspiration during PEG, cardiopulmonary function monitoring results, and post-PEG adverse events including gastrostomy site infection, bacterial pathogens, systemic infection, tube dislodgement or migration were also recorded and analyzed. The results were expressed as the mean (standard deviation) for quantitative variables and frequency for categorical variables. Normally distributed quantitative variables were analyzed by the Student t test. The categorical variables were analyzed using the χ^2 test.

Results

Ninety-eight patients with dysphagia who had removed their NG tube frequently or who experienced a difficult insertion of an NG tube, and therefore underwent PEG, were enrolled. Twenty-one participants were excluded; four with complex comorbidity, three with tracheostomy, two with mechanical ventilation, three aged $<$ 20 years, two with an estimated survival time $<$ 2 months, three with active infection, and four with active disease. Additionally, T-PEG failed in one patient. In all, 38 patients with dysphagia who underwent T-PEG and 38 who underwent O-EPG (from home or a nursing home) were included in the study (Fig. 1). Comparing the T-PEG and O-PEG patients, the mean age was 76.3 $\pm$ 10.3 years versus 79.3 $\pm$ 6.9 years, the percentage male patients was 67% versus 48%, length of surgery was 14.6 $\pm$ 4.0 minutes versus 11 $\pm$ 3 minutes ($p = 0.0028$), and choking occurred in three patients versus five patients (no occurrence of subsequent pneumonia). One systemic infection of the urinary tract, one buried bumper, and one soiling of the stoma were observed in both the T-PEG and O-PEG groups. No PEG-related mortality occurred within 3 months after PEG. There were 10 gastrostomy site infections in T-PEG and 14 stomal site infections in O-PEG. Although stomal site infection was less common with T-PEG than O-PEG (10/38