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ORIGINAL ARTICLE

Long-term Outcome After Percutaneous Endoscopic Gastrostomy in Children

Fu-Yu Wu, Jia-Feng Wu, Yen-Hsuan Ni*

Department of Pediatrics, National Taiwan University Hospital, Taipei, Taiwan

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Key Words
endoscopy;
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Background: Percutaneous endoscopic gastrostomy (PEG) is widely accepted as the preferred procedure to establish long-term enteral feeding.
Objective: To learn the long-term outcomes of the patients who have undergone PEG placement, we reviewed our experience with children who underwent this procedure in our institute.
Methods: A total of 83 pediatric patients (42 males and 41 females), who were aged from 3 months to 20 years, underwent PEG insertion in National Taiwan University Hospital from January 2000 to April 2011. The underlying diseases of the patients receiving PEG were neurological dysfunction ($n = 67$), metabolic disorders ($n = 9$), gastrointestinal disease ($n = 2$), and congenital heart disease ($n = 1$). This procedure was performed under intravenous sedation or under general anesthesia. Prophylactic antibiotics were administered for 1 day. Tube feeding began 24 hours after the PEG placement. The body weight of the patients was recorded 1 day before PEG placement and at least 6 months after PEG placement.
Results: The weight-for-age Z-score before and at 6 months after PEG placement were -1.5 ± 2.0 and -0.9 ± 2.1, respectively, which was statistically significant (paired t test, $p = 0.006$). The catch-up growth was recorded after PEG placement. Complications of PEG in our patients included cellulitis at the gastrostomy wound ($n = 14$), dislodgement of the tube ($n = 17$), and persistent gastrocutaneous fistula ($n = 3$). The PEG tube was removed permanently in seventeen patients because they resumed an adequate oral intake. During the follow-up period, 14 patients died of an underlying disease or infection.
Conclusion: Our experience confirmed that PEG placement is a good long-term route for nutritional supply with no serious complications in children.

* Corresponding author. Department of Pediatrics, National Taiwan University Hospital, Number 8, Zhongshan S. Road, Zhongzheng District, Taipei City 106, Taiwan.
E-mail address: yhni@ntu.edu.tw (Y.-H. Ni).

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1. Introduction

Children may require enteral tube feeding when they are unable to swallow because of neurological or neuromuscular disorders or when they cannot maintain adequate caloric intake because of congenital heart disease or oncologic disease.[1] Nasogastric (NG) tube feeding is frequently employed under such conditions. However, the long-term use of a NG tube may result in local nasopharyngeal irritation and excess secretion production, thereby increasing the risk of aspiration pneumonia. Other drawbacks of NG feeding are easy dislocation with repeated reinsertions of the tube, erosions and bleeding resulting from trauma by the NG tube tips, and possible social stigma. Since its introduction in 1980, percutaneous endoscopic gastrostomy (PEG) has been widely accepted as the preferred route for enteral nutrition.[2] It is relatively noninvasive and less expensive than surgical gastrostomy. The use of PEG can improve the nutritional status of patients[3] and improve the quality of life of their caregivers.[4,5] In this article, we reviewed the long-term outcomes of 83 children who underwent PEG placement in the Department of Pediatrics in a tertiary hospital in Taiwan.

2. Methods

We performed a retrospective chart review of 83 patients who underwent PEG placement in the Department of Pediatrics of the National Taiwan University Hospital from January 1, 2000 to April 30, 2011. Informed consent was obtained.

The indications for PEG placement in the patients were approved by multidisciplinary approaches. Before PEG insertion, patients received serial evaluations such as an upper gastrointestinal barium study, ^{99m}Tc gastric empty time, and 24-hour esophageal pH monitoring (the multichannel intraluminal impedance was added in January 2010). Percutaneous endoscopic gastrostomy is the preferred method for establishing an enteral nutrition route in patients, except for patients who fit the exclusion criteria, which includes severely prolonged gastric empty time (i.e., more than 85% of the tracer remains in the stomach after 1 hour), severe gastroesophageal reflux (defined as a DeMeester score greater than 14.72), unfavorable gastrointestinal anatomy, and limited life expectancy. Under the aforementioned conditions, a surgeon may shift to laparoscopic gastrostomy or abort this procedure.

All patients received intravenous sedation or general anesthesia during the procedure. We used a commercialized PEG kit with the Ponsky Pull PEG kit (Bard Access Systems, Inc, Salt Lake City, Utah, USA) or MIC PEG kit (Kimberly-Clark, Roswell, Georgia, USA) with a Ponsky-pull technique.[6] After performing a diagnostic esophagogastroduodenoscopy, the stomach was fully inflated to push the liver, spleen, and colon away from the gastrostomy puncture site. The ideal position of gastrostomy is the anterior wall of the middle or lower body. A dose of prophylactic antibiotics, generally first generation cephalosporin, was administered 30 minutes before the procedure. Three doses were subsequently administered. Twenty-four hours after the insertion of the PEG tube, the newly inserted gastrostomy tube was used for clean water feeding and later for a liquid diet, if there were no complications.

Body weight was recorded 1 day before PEG tube placement and at least 6 months after the insertion (6—9 months). The Z-score is the number of standard deviations by which a weight differs from the mean weight at a specific age. The weight-for-age Z-score was calculated with WHO Anthro v.3.2.2 software (World Health Organization, Geneva, Switzerland) in patients who were younger than 5 years old and with WHO AnthroPlus v.1.0.4 software (World Health Organization, Geneva, Switzerland) in patients who were 5—10 years old. An increase in the weight-for-age Z-score indicates "catch-up growth."

The PEG was replaced with a low profile button device (LPBD) or tube gastrostomy when long-term feeding support was indicated. The tube gastrostomy that we used was the CLINY flat balloon type (Create Medic Co., Hokkaido, Japan), and the LPBD that we used was either the Bard button device (Bard Access Systems, Inc, Salt Lake City, Utah, USA) or the Cook low profile gastrostomy set (Wilson-Cook Medical, Inc, Winston-Salem, North California, USA). Patients received gastrostomy replacement at least 3 months after the PEG insertion. The chosen type was decided after discussions with the caregivers, and the size of PEG tube used was based on the patient's body size.

Major events were recorded and included PEG tube removal, PEG tube dislodgement, peristomal infection, and mortality. The major complications were those that required a surgical or endoscopic procedure, use of nonprophylactic antibiotics, blood transfusion, or complications leading to death.[7]

3. Results

Eighty-three patients underwent PEG insertion from January 1, 2000 to April 30, 2011. There were 42 males and 41 females. The mean follow-up period was 6.8 years per person (range, 1—12.3 years). The mean age at gastrostomy insertion was 4.6 years (range, 3 months to 20 years), and 14 (16.9%) patients were younger than 1 year old. The mean weight at PEG insertion was 13.9 kg (range, 3.5—66.8 kg). Sixty-seven (80.7%) of 83 patients were partially or fully dependent on NG tube feeding at the time of PEG insertion. Table 1 lists the underlying diseases of the patients.

The weight-for-age Z-score was -1.5 ± 2.0 just before PEG placement and -0.9 ± 2.1 at 6 months later (paired t test, $p = 0.006$). There was an increase in the weight-for-age Z-score after PEG placement, which indicates catch-up growth after gastrostomy feeding.

The PEG was permanently removed from 17 (20.5%) of 83 patients in this study. The mean time interval between insertion and removal was 1.42 years (range, 1.2 months to 2.6 years). The children who had the gastrostomy removed were younger (mean age, 4 years) than children who remained on PEG feeding (mean age, 4.7 years). Twelve of the 17 patients showed improved oral intake ability and the PEG tube was to be removed. The other five patients either had an uncontrolled PEG wound infection ($n = 4$) or an unexpected gastrocutaneous tract closure due to prolonged PEG dislodgement ($n = 1$). After observation for a period of