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PERCUTANEOUS ENDOSCOPIC GASTROSTOMY (PEG): RETROSPECTIVE ANALYSIS OF 10-YEAR CLINICAL EXPERIENCE IN A SINGLE CHILDREN'S HOSPITAL

PERKUTANA ENDOSKOPSKA GASTROSTOMA (PEG): RETROSPEKTIVNA ANALIZA 10 GODINA KLINIČKOG ISKUSTVA JEDNE DEČJE BOLNICE

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*Abstract*

*Key words*

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*Ključne reči*

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Percutaneous endoscopic gastrostomy (PEG) is preferred route for enteral feeding in children with inadequate oral intake. Many conditions fall this category. PEG procedure is fast, safe and comfort. Minor complications rate is high. Major complications are rare, but can be very serious. This study aimed to review and evaluate indications, complications and benefits associated with PEG insertion in a single, tertiary children's hospital.

A total of 86 children were retrospectively reviewed. Medical and endoscopic records were retrospectively reviewed for patients demographic, indications for PEG, underlying diseases, complications associated with PEG insertion and use, length of hospital stay and nutritional status improvement. Parents/caregivers of 79 children were interviewed for long-term results.

Median age at the initial PEG insertion was 2 years (ranged 3 months-9 years). The indications for PEG tube insertion were failure of adequate intake in 97,7% of patients, out of which 70,2% suffered from inability to swallow or dysphagia. Neurological disorder was the most often underlying disease (68%). Major complications occurred in 7% of all patients. Minor complications were observed in 31% of all patients. The median length of hospital stay was 1,8 days. Median increase in weigh-for-length z-score was 0,4, about 6 months after PEG insertion. A positive attitude towards PEG was given out of 95% of parents/caregivers.

Our 10-year clinical experience showed a wide spectrum of underlying diseases in patients who had indication for PEG insertion. Many children with PEG placement experienced minor complications, but major complications were rare. We recorded nutritional status improvement and parent's/caregiver's satisfaction with better quality of child's, caregiver's and family's life after PEG insertion.

*INTRODUCTION*

Percutaneous endoscopic gastrostomy (PEG) is one of the most commonly used gastrostomy in children. The most popular modification of the original Gauderer's technique is the „pull” technique <sup>(1)</sup>. In children, procedure is performed

under general anesthesia. The main general indication for PEG is failure of adequate intake due to impossible or inadequate oral intake <sup>(2)</sup>. Children with neurological disorders make up the majority of patients who fall under this category <sup>(3)</sup>. The other specific indications in this category are: different craniofacial abnormalities, malnutrition in malignan-

cy, chronic renal failure, cystic fibrosis, short bowel syndrome, Chron's disease, pulmonary diseases of neonatal onset, metabolic, genetic and cardiac disorders (4). The other general indication for PEG is gastric drainage and decompression, but it is very rare. Bleeding disorders, severe ascites, peritonitis, pharyngeal/esophageal obstruction and acute sever illness present the absolute contraindications. Relative contraindications for PEG are numerous.

The PEG insertion should be simple, but the complications rate is notably high because the patients have complex medical problems. Major and serious complications (major infections, colonic perforation, gastrocolocutaneous fistula, tube migration with intestinal obstruction or „buried bumper“ syndrome, esophageal tear and failure to enter the stomach) have been reported with incidence of 5% to 17% (2). Minor complications occur in up to 50% of patients (2).

In the Mother and Child Health Care Institute of Serbia, we have noticed an increase in the number of referrals to the abdominal surgery unit for PEG each year. The aim of this study was to make a retrospective chart review of pediatric patients who underwent PEG placement in Mother and Child Health Care Institute of Serbia. Our goals were to document the indications and principal diagnosis, determine complications and to follow, where possible, the patient progress.

## MATERIALS AND METHODS

We have analyzed the children who underwent the PEG insertion between January 2005 and December 2014 (10-year period) in the Mother and Child Health Care Institute of Serbia. Corresponding patient medical and endoscopic records were reviewed to assess indication, underlying condition, complications associated with PEG insertion and PEG use, length of hospital stay and weight gain shown through z-score (5). The additional information on caregivers satisfaction with PEG was also obtained by direct telephone contact. The caregivers gave positive or negative opinion on PEG, which considered the improvement of child's, caregiver's and family's quality of life (6). The follow up period was for at least 6 months.

In all patients PEG insertion was performed under general anesthesia, using the pull technique described by Gauderer (1). Contrast radiographs of the upper gastrointestinal tract were made before performing the procedure. Routine antibiotic prophylaxis before PEG was not applied.

## RESULTS

During the period 1 January 2005 – 31 December 2014 a total of 90 PEG procedures were performed (86 initial insertions and 4 tube replacements), out of which 89 tubes were

successfully inserted. The tube insertion was unsuccessful in a patient with Silver-Russel syndrome, because of difficult ventilation after insufflation of air in stomach during the gastroscopy. A male/female ratio was 47/39. Median age at the initial PEG insertion was 2 years (ranged 3 months -9 years). Two children died during the hospitalization for PEG revision, but the cause in both of them was the underlying disease.

The indications for PEG tube insertion were failure of adequate intake in 97,7% (n=84), out of which 70,2% (n=59) of patients were suffering from inability to swallow or dysphagia, 21,5% (n=18) didn't have adequate caloric intake, 3,6% (n=3) required special feeding requirements as some unpalatable feeding formula or as reliable gastric access in metabolic/genetic diseases and 4,7% (n=4) required continuous enteral feeding. Gastric drainage and decompression was indication for PEG insertion in 2,3% (n=2) of patients. One of these patients was suffering from visceral myopathy manifested as pseudo-obstruction, and the other had short bowel syndrome.

Neurological disorder was the most often underlying disease, even in 68% (n=57) of patients. Other underlying diseases were: chronic respiratory failure in 19% (n=16), cardiac anomalies in 4,8% (n=4), metabolic/genetic diseases in 3,6% (n=3), malabsorption in 3,6% (n=3), oropharyngeal anatomic malformations in 2,4% (n=2) and short bowel syndrome in 1,2% (n=2) (Table 1).

Postoperative complications were observed in 33 patients (38,3%). Major complications occurred in 7% of all patients (n=6), which included 1 patient who developed cellulitis, 1 patient who developed gastroesophageal reflux receiving fundoplication, 3 patients with „buried bumper“ syndrome and 1 patient with failure fistula formation and peritonitis. Minor complications were observed in 31% of

Table 1. Indications and underlying diseases in pediatric patients requiring a PEG

Indications	No	Underlying disease	No
Inability to swallow or dysphagia	59	Neurological disorders	57
		Oropharyngeal anomalies	2
Inadequate caloric intake	18	Cardiac anomalies	4
		Chronic respiratory failure	16
Special feeding requirements	3	Unpalatable formula or reliable gastric access in metabolic/genetic diseases	3
Continuous enteral feeding	4	Short bowel syndrome	1
		Malabsorption	3
Gastric drainage and decompression	2	Short bowel syndrome	1
		Visceral myopathy	1

Table 2. Morbidity associated with PEG insertion and PEG use

Complications	No (%)		No (%)
Major	6 (7%)	Gastroesophageal reflux receiving fundoplication	1 (1,2%)
		Cellulitis	1 (1,2%)
		Failure fistula formation and peritonitis	1 (1,2%)
		„Buried bumper“ syndrome	3 (3,5%)
Minor	27 (31.4%)	Wound infection	16 (18.6%)
		Granuloma	9 (10,5%)
		Falling out of the tube	2 (2,3%)

all patients (n=27): wound infection and leakage in 16 patients, granuloma in 9 patients and falling of the tube in 2 patients (Table 2). Neurologically impaired patients were at greater risk for complications (Chi-square = 5,538; p=0,019). Complications were observed in 45,6% (n=26) of them, and in 17,2% (n=5) of other patients.

The median length of hospital stay was 1,8 days, ranged 1-9 days. About a half of patients stayed in hospital for 1 or 2 days.

Data on patients' weight and within 3 months before and 6 months after PEG insertion were available for 76 patients. Preoperative median weight-for-age z-score was -2,1 (range -3,1 - -0,7). Median z-score 6 months after PEG insertion was -1,7 (range -2,6 - +0,3). Based on median z-score, our patients were moderately malnourished before PEG insertion (-3 < z-score < -2), but adequate nourished 6 months after PEG insertion (-2 < z-score < +2). Median increase in z-score was 0,4.

After median follow up time of 1,9 years (range 0,5 - 6 years), 79 caregivers were interviewed about their impressions of PEG. The majority of them (95%, n=75) reported that PEG had positive influence on child's, caregiver's and family's quality of life and that they would have chosen PEG insertion again.

In 2 patients the tubes were removed because of establishment of a satisfactory orally entry.

## DISCUSSION

This paper reports our experience with PEG in the major children hospital. We felt it timely to audit our results to learn how to choose suitable patients, perform the procedure safely, and minimize the complications and to determine the outcome.

In our institution, PEG procedure is not considered a minor procedure since performed in the medically complex children. The decision for PEG insertion can only be made after careful consideration and discussion between the managing physicians, endoscopist, surgeon, anesthetist and family. It seems to be good practice (7). Among the other things, the result is only one unsuccessful tube insertion and no death associated with PEG insertion.

Inability to swallow or dysphagia is the most often indication for PEG insertion, as well as neurological disorder as underlying disease. A second common indication for PEG was inadequate caloric intake. Many of these children suffered from bronchopulmonary dysplasia and cardiac anomalies. Less commonly, PEG placement was indicated for special feeding requirements: in patients without appetite to reliable gastric access (Silver-Russell syndrome and Patau syndrome) and in patient with chronic renal failure because of need for a lot of unpalatable medicaments and formulas (4). Rarely, PEG was performed for continuous enteral feeding in patient suffered from malabsorption or with short bowel syndrome. In one patient with short bowel syndrome (only 10 cm of small intestine length), PEG performed for gastric drainage and decompression (4). Also, PEG was helpful for gastric drainage and decompression in patients with serious pseudo-obstruction which was visceral myopathy manifestation (2).

PEG tube insertion was found to be safe in the aspect of invasiveness and rates of major complication. However, consideration of this topic should include comorbidity, different definition of complications and some knowledge about the long-term outcomes (8,9). Rate of minor complications in our series is common high and expected in line to the other series (2, 10). We believe that this rate could be reduced with optimal education of caregivers regarding PEG, such as wound care and tube feeding. The complication was defined as major if required endoscopic, radiological or surgical intervention, as well as additional hospitalization for parenteral therapy. Major complications happened in early post-operative period (failure fistula formation and peritonitis), a few months after tube insertion (serious gastro-esophageal reflux) and 1-4 years after tube insertion („buried bumper” syndrome). All of them were resolved surgically: failure fistula formation and peritonitis resolved with laparotomy and stomach sutures, gastro-esophageal reflux resolved with Nissen's fundoplication, the „buried bumper” syndrome in 3 patients was removed through a local abdominal wall incision, and a more extensive abdominal procedure was performed in one patient. A new tube was placed through the same or different site, depending of previous surgical solution (11).

Length of hospital stay was largely determined by a moment of starting feeding through PEG. Late feeding (24 hours after PEG procedure) was a common practice in our institution many years for a safety reason. In recent years early feeding (6 hours after PEG procedure) has been adopted as standard procedure in our institution, because it was proved as safe (12). Early feeding meant earlier recognition of potential complications and early caregiver's training for the care and use of the tube as well as earlier discharging from hospital.

PEG tube placement allowed improvement of the nutritional status in our patients. Nutritional rehabilitation improved overall health. In our institution, nutritional support is the integral part of the management of all serious, chronically ill children, as it is recommended for neurologically impaired children (13). Nutritional status improvement also contributed to the overall caregiver's positive attitude towards PEG. The quality of life is not easy to define or measure. Satisfaction with improvement of child's, caregiver's and family's quality of life depends on many factors: significant reduction in the duration of feeding and full doses medication, reducing number of significant aspiration, decreasing the amount of epileptic seizures and more time for rehabilitation, as well as stoma care and need for timely detection of complications and adequate reaction to them (6, 14). Better caregiver's education about PEG, involving of home health care specialist in team for PEG procedure and PEG use and regular visits of experienced nurse in child's home are possibilities for improvement caregiver's perspectives (6, 11).

### Sažetak

Perkutana endoskopska gastrostoma (PEG) je najčešći put enteralne ishrane kod dece sa neadekvatnim oralnim unosom. Mnoga stanja potpadaju pod ovu kategoriju. PEG procedura je brza, bezbedna i komforna. Male komplikacije su česte. Veće komplikacije su retke, ali mogu biti vrlo ozbiljne. Cilj ove studije je pregled i evaluacija indikacija, komplikacija i dobiti u vezi PEG-a u jednoj tercijarnoj, dečjoj bolnici.

Retrospektivno je prikazano 86 dece. Medicinski i endoskopski zapisi su retrospektivno pregledani i obrađeni po pitanju demografskih karakteristika pacijenta, indikacija za PEG, osnovne bolesti, komplikacija vezanih za ugradnju i korišćenje PEG-a, dužine hospitalizacije i popravljavanja nutritivnog statusa. Intervjuisano je 79 roditelja /staratelja za dobijanje informacija o dugoročnim rezultatima.

Srednji uzrast pri inicijalnoj inserciji PEG-a bio je 2 godine (od 3 meseca do 9 godina). Neadekvatno uzimanje hrane oralnim putem bilo je indikacija kod 97,7% pacijenata, od kojih je 70,2% imalo problem gutanja i disfagije. Neurološke bolesti bile su najčešće osnovne bolesti (68%). Veće komplikacije bile su zastupljene kod 7% pacijenata. Male komplikacije su se javile kod 31% pacijenata. Srednja dužina hospitalizacije bila je 1,8 dana. Srednji porast z-skora težine prema uzrastu bio je 0,4, 6 meseci posle ugradnje PEG-a. Pozitivan stav prema PEG-u dobijen je od 95% roditelja/staratelja.

Naše desetogodišnje iskustvo pokazalo je prisustvo širokog spektra osnovnih oboljenja kod pacijenata kojima je ugrađen PEG. Kod velikog broja pacijenata bile su prisutne manje komplikacije, ali su velike bile retke. Zabeležili smo popravljavanje nutritivnog statusa i zadovoljstvo roditelja/staratelja zbog boljeg kvaliteta života deteta i porodice posle ugradnje PEG-a.

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