Nutrition accesses among patients receiving enteral treatment in the home environment

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ABSTRACT: Enteral feeding in the home environment is connected with creating access to digestive tract, and thanks to that, this kind of treatment is possible. The gold standard in enteral nutrition is PEG, other types of access are: nasogastic tube, gastronomy and jejunostomy. In the article 851 patients who were treated nutritionally in the home environment, in the nutrition clinic, Nutrimed Górny Śląsk, were analyzed. It was described how, in practice, the schedule of nutrition access looks like in the nutrition clinic at a time of qualifying patients to the treatment (PEG 47.35%, gastronomy 18.91%, nasogastic tube 17.39%, jejunostomy 16.33%) and how it changes among patients treated in the nutrition clinic during specific period of time – to the treatment there were qualified patients with at least three-month period of therapy (second evaluation: PEG 37.01%, gastronomy 31.13%, nasogastic tube 16.98%, jejunostomy 15.86%). The structure of changes was described, also the routine and the place in what exchanging or changing nutrition access was analyzed.

Conclusions: The biggest changes in quantity, among all groups of ill people concerned patients with PEG and gastronomy. In most cases the intervention connected with exchanging access to the digestive tract could be implemented at patient’s home.

KEYWORDS: PEG, gastronomy, clinical nutrition

INTRODUCTION

Enteral feeding is the preferred type of nutritional treatment. It should be used in all patients with the maintained function of the gastrointestinal tract [1]. Several types of accesses to the gastrointestinal tract are available. Percutaneous endoscopic gastrostomy (PEG) is currently considered to be the gold standard in this type of treatment [2]. In cases when PEG insertion is impossible, most commonly due to a tumor within the upper gastrointestinal tract, surgical gastrostomy or jejunostomy is performed. Other types of nutrition access used in clinical practice include nasogastric or nasoenteral tubes. An access making use of an already installed PEG to provide nutrients directly to the jejunum (PEG/PEJ) was also developed.

PEG is the gold standard of enteral treatment. It should be used in all patients in whom the estimated time of enteral feeding will be longer than 2-3 weeks [2]. Numerous studies demonstrated the superiority of percutaneous gastrostomies as compared to surgical gastrostomies [2]. A significant advantage of PEG as compared to nasogastric tube consisting of lower complication rates and better quality of life was also demonstrated [2]. Several techniques are available to perform percutaneous gastrostomy. The most popular is the classic “pull” method that facilitates the placement of the access under endoscopic control, i.e. PEG. The classic PEG method also facilitates nutritional access to the jejunum by means of a compatible jejunostomy kit being installed on the PEG set and the feeding tube being introduced into the jejunum under endoscopic monitoring (PEG/PEJ). Indications for such a procedure consists of intestinal motility disorders, pyloric stenosis, or high risk of aspiration [2]. According to our own experience, the enteral tube may also be inserted under fluoroscopic control, even through a G-tube placed instead of the PEG [3]. Another method to achieve percutaneous gastrostomy is referred to as “push” method. The idea consists in external puncture being made and G-tube being introduced into the stomach, usually through a split cannula. Before the procedure, the stomach should be fixated to the integuments, for example using a gastropexy kit. The procedure is performed under X-ray guidance and air insufflation. The method facilitates placement of percutaneous gastrostomy even in patients with high BKI values in whom the endoscopic camera light source is insufficient to achieve translumination [4]. The procedure may also be guided by ultrasonography; in such cases, the stomach is filled with fluid [5]. The aforementioned techniques should be referred as PRG and PUG. A variant of the “push” procedure consists in the use of laparoscopy (PLG). Percutaneous gastrostomy procedures are safe with success rates of 99% and procedure-related mortalities close to 0% [2]. Contraindications include significant coagulation disorders, interposition of the liver or colon, peritonitis, intraperitoneal cancer spread, ascites, psychological anorexia or severe psychoses. PEG-related complications may be classified as early (pain in the tube insertion area, local inflammation, leaking gastric contents, less commonly peritonitis or the internal bumper puncturing through abdominal integuments) or late (tube congestion, damage resulting in tube leak, tube prolapse, excessive granulation within the gastrostomy lumen, connectivitis) [2]. The unquestionable advantages of PEG include the ease of being replaced by other types of gastrostomies. Low-profile gastrostomies are particularly beneficial for younger, socially active patients. At some centers, as many as 20-30% of PEGs are quickly changed to low-profile gastrostomies [2]. No guidelines are available with regard to routine schedule PEG replacement. The durability of the kit depends on its maintenance; in some cases, PEGs may be used for more than 10 years [2]. Removal of percutaneous gastrostomy consists in cutting the gastrostomy kit off and removing the fixating bumper using the endoscopic loop. It is also permitted to cut off the kit and leave the internal part to be excreted by natural means; however, one should keep in mind the risk of causing mechanical obstruction leading to surgery and potential further complications that might end up with death. In
children, all efforts should be made to remove PEGs under endoscopic guidance [2]. There is no need for closing the surgical canal after the gastrostomy as there is no rationale for depriving the patient of food following the PEG kit removal [2].

Conventional gastrostomy is a popular access method used in nutritional feeding. It may be achieved by the classic or laparoscopic methods. Currently, conventional gastrostomy tubes should be placed only in patients in whom no PEG/PRG/PUG procedure may be performed as per the ESPEN guidelines with the provision that a patient in whom stomach is to be used following a reconstructive surgery, e.g. esophageal resection, should undergo jejunostomy rather than gastrostomy. Numerous technical variants of the procedure exist. The most popular include the Stamm procedure consisting in the introduced tube being stitched around using the purse string suture without intramural tunnelization and ligated with suturing to the abdominal integuments [6]. The method makes use of G-tubes which replaced the previously used Foley catheters or Pezzer tubes. Another popular method is the Witzel procedure consisting in the tube being introduced through the anterior stomach wall and subsequently tunnelized [6]. Compared to PEG, surgical gastrostomy is associated with higher mortality and complication rates as well as longer convalescence periods [2]. On the other hand, the frequency of surgical gastrostomy being properly placed is higher than in the case of PEG (99.99% vs. 97%) [7]. The experience of the authors of this article suggests that in Poland, surgical gastrostomy is also performed in patients qualified for PEG procedures at sites where the latter are not performed for various reasons (lack of experience, equipment, etc.). The advantages of surgical gastrostomy are similar to those observed in the case of PEG. Also the complications are similar yet more common than in the case of percutaneous access. Similarly to percutaneous gastrostomy, surgical gastrostomies may be replaced by other systems implanted via the gastrostomy lumen, particularly after tube displacement or damage.

Surgical jejunostomy may be performed using the conventional or the laparoscopic method. Transgastric jejunostomy was already mentioned above. The technique for jejunostomy placement is similar to that used in Witzel gastrostomy [6]. A variant of this procedure is used in needle microjejunostomy, where tunnelization is replaced by submucosal puncture. Roux-en-Y jejunostomy is a less common procedure. Indications for jejunostomy, particularly needle jejunostomy, include surgeries within the higher segments of the gastrointestinal tract such as esophageal or gastric resection, Whipple’s procedure, gastrosophaegal tumor, pyloric stenosis, intestinal motility disorders, or high risk of aspiration [2,7]. Complications of jejunostomy include mild complications such as catheter obstruction, subcutaneous tissue infection, catheter displacement, intestinal volvulus, and severe complications such as peritonitis, obstruction, or necrosis of the small intestine [7].

Nasogastric or nasoenteral tubes are usually the first types of feeding accesses installed in patients of neurology and intensive care units. According to the ESPEN guidelines such tubes should not be used for more than 2–3 weeks [2]. Nasogastric or nasoenteral tubes generate a high number of local complication (ulceration, irritation, bleeding), often result in tube displacement or obstruction, and may lead to aspiration potentially followed by pneumonia due to the impaired antireflux mechanism. Unfortunately, as shown by our own observations and the material presented below, in a large group of patients the nasogastric tubes may be used for years. The most common causes include the lack of consent for the PEG placement from the patient or the family or the severe baseline condition of the patient warranting abandonment of the procedure during hospitalization.

MATERIAL AND METHODS

Records of 851 patients treated from 01.01.2010 through 01.10.2016 at the Nutrimed Górny Śląsk nutrition clinic were subjected to retrospective analysis. Patients undergoing treatment for less than 3 months were excluded from the study. The study population consisted of 357 women and 494 men. Mean age for women and men was 59.77 and 54.69 years, respectively, while the median age was 67 and 61, respectively. The baseline distribution of nutrition accesses was as follows: PEG was installed in 403 patients (47.36%), various types of nasal tubes were installed in 148 patients (17.39%), various types of gastrostomies were installed in 161 patients (18.92%), and jejunostomy was installed in 139 patients (16.33%). The most common reasons for admission to the clinic consisted of neurological disorders in 504 patients (59.22%), cancer in 294 patients (34.55%), and other causes in 53 patients (6.23%).

The baseline and the final distribution of nutrition accesses was assessed in the study population according to the neurological, cancer, or other background. Reasons for accesses being changed during the treatment were analyzed. The percentages of cases in which the change was interventional or scheduled as well as the percentage of patients who did not require a change in the nutrition access throughout the treatment were analyzed. Numbers of patients undergoing appropriate intervention in hospital versus home setting were also determined. The time until the need to replace/change the PEG was analyzed along with the identification of causes. Also analyzed was the percentage of patients who qualified for PEG but did not undergo the PEG placement procedure. Mild local complications were excluded from the analysis which focused on the causes for the replacements of nutrition accesses and the changes in their distribution in individual groups of patients. An attempt was also made at identifying the access that generated the lowest costs during the treatment.

RESULTS:

Patients were divided into two groups according to the baseline and final distribution of types of accesses.

Baseline and final distribution of nutrition accesses in the study group

I. Baseline PEG 403 (47.36%), gastrostomy 161 (18.92%), nasogastric tube 148 (17.39%), jejunostomy 139 (16.33%).

Baseline distribution of nutrition accesses in the study group.

II. Distribution of nutrition accesses in patients who underwent at least 3 months of treatment at the clinic. PEG 315 (37.02%), gastrostomy 266 (31.26%), nasogastric tube 135 (15.86%), jejunostomy 135 (15.86%).

Final distribution of nutrition accesses in the study group.

The largest changes were observed in the group of patients with gastrostomy – an increase by 104 (+39.24%) and in the group of
patients with PEG – a drop by 88 (-21.84%). The number of patients with nasogastric tubes was reduced by 12 (-8.11%) while the number of patients with jejunostomy was reduced by 4 (-2.88%).

In the baseline group, PEG was the predominant type of nutrition access. In the group of patients treated at the clinic for at least three months, the number of patients with PEG dropped significantly by 21.84 % while the number of patients with gastrostomy increased by 39.24%. The percentages of patients with nasogastric tubes and jejunostomies did not change significantly in both groups.

The results were subjected to statistical analysis. The χ² test was used to assess the independence of variables. A non-parametric hypothesis was formulated consisting in the independence of the percentage change in the numbers of PEG and gastrostomies after the treatment as compared to the numbers of PEG and gastrostomies before the treatment. For the significance level of P=0.01 and K=2, the degree of freedom as provided in χ² distribution tables is χ²=9.21. The zero hypothesis stating that the analyzed variables are independent must be ruled out due to the empirical result of 97.05> χ² being indicative of a significant correlation between the variables. The measure of this correlation may be provided by Yule’s φ coefficient. In this case, φ=XXX which confirms the previously identified correlation.

Similar analyses were carried out in the remaining 3 groups of patients to determine the distribution of nutrition accesses in groups of patients with the same type of disorders.

I. Accordingly, baseline and final results in the group of patients with neurological disorders were as follows: PEG 301 vs. 237 (-21.26%), gastrostomy 61 vs. 138 (+77/126.23%), nasogastric tube 139 vs. 126 (-13/-9.35%), jejunostomy 3 vs. 3 (no change).

II. The results of the analogous analysis in cancer patients was as follows: PEG 68 vs. 61 (-7/-10.29%), gastrostomy 94 vs. 103 (+9/+9.57%), nasogastric tube 5 vs. 5 (no change), jejunostomy (-2/-1.57%).

III. In the group of patients with other disorders, the results were as follows: PEG 34 vs. 17 (-17/-50%), gastrostomy 6 vs. 25 (+19/+316.67%), nasogastric tube 4 vs. 4 (no change), jejunostomy 9 vs. 7 (-2/-22.22%).

The percentage of patients with PEG in every group decreased while the number of patients with gastrostomy increased.

Baseline and final analysis was performed with regard to the distribution of nutrition accesses according to the type of disorder:

The baseline group of PEG patients consisted of 403 individuals, including 301 (74.69%) neurological patients, 68 (16.87%) cancer patients, and 34 (8.44%) patients with other disorders. The final group of PEG patients consisted of 315 individuals, including 237 (75.24%) neurological patients, 61 (19.37%) cancer patients, and 17 (5.39%) patients with other disorders. Despite the reduction in the overall number of patients with PEG, the percentage of patients in groups according to the type of disorder did not change in a significant manner.

The baseline number of patients with gastrostomy was 161, including 61 (37.89%) neurological patients, 94 (58.38%) cancer patients, and 65 (3.73%) patients with other disorders. The baseline number of patients with gastrostomy was 266, including 138 (51.88%) neurological patients, 103 (38.72%) cancer patients, and 25 (9.40%) patients with other disorders. Significant increase in the numbers of patients with gastrostomy was observed in every group, particularly among neurological patients and patients with other disorders. In the group of cancer patients, the increase in the absolute number was the lowest and corresponded to an apparent reduction in percentage.

The baseline number of patients with nasogastric tubes was 148 including 139 (93.92%) neurological patients, 5 (3.38%) cancer patients, and 4 (2.70%) patients with other disorders. The final number of patients with nasogastric tubes was 135 including 126 (93.33%) neurological patients, 5 (3.70%) cancer patients, and 4 (2.97%) patients with other disorders. The small reduction in the group of patients with nasogastric tubes was due only to the reduction in the number of neurological patients.

The baseline number of patients with jejunostomy was 139, including 3 (2.16%) neurological patients, 127 (91.37%) cancer patients, and 9 (6.47%) patients with other disorders. The final number of patients with jejunostomy was 135 including 3 (2.22%) neurological patients, 125 (92.60%) cancer patients, and 7 (5.18%) patients with other disorders. No significant changes were observed in this group between the baseline and final results. Cancer patients were predominant in this group.
Analysis of access type changes including the setting and mode of intervention

A total of 381 patients (44.77%) in the entire study group underwent a replacement or change of the nutrition access. Of these, 253 (29.73%) patients required medical intervention while the remaining 128 (15.04%) required a nursing intervention involving tube replacement. The latter subgroup was not included in the analysis. The group of 253 patients requiring medical intervention included 115 cases when a particular type of nutrition access was changed to another one. The procedure was performed in a hospital setting in 42 patients and in a home setting in 73 patients. In 138, the nutrition access was replaced by one of the same type (24 x in hospital, 114 x at home). In total, 66 and 187 interventions were performed in hospital and home settings, respectively. In the group of patients undergoing a change in the type of access, the most common change consisted in PEG being replaced by G-tube in 96 patients (83.48%). Hospital interventions included 29 PEG to G-tube changes (causes: 9 x scheduled change, 8 x PEG prolapse, 2 x PEG obstruction, 7 x PEG damage, 3 x BBS), 8 nasogastric tube to PEG changes (causes: 8 x scheduled change), 2 jejunostomy to PEG changes due to local complications, 2 jejunostomy to gastrostomy changes (1 x local complications, 1 x scheduled change), and 1 G-tube to PEG change due to continuous recurrent damage to G-tube balloon. Home interventions included 67 PEG to G-tube changes (causes: 19 x PEG prolapse, 41 x PEG damage/ destruction, 4 x PEG obstruction, 3 x PEG prolapse). Six patients required latex gastrostomies being replaced by G-tubes (causes: 2 x massive leak around the tube, 3 x prolapse and 1 x tube damage).

The analysis of the group of 115 patients requiring medical intervention revealed that emergency interventions accounted for 97 (84.35%) cases as compared to scheduled intervention in the remaining 18 patients. All home interventions (73) were of emergency nature, whereas the percentage of emergency interventions (24 out of 42 total interventions) in the hospital setting was lower (100% vs. 57.14%).

In 138 patients, medical intervention consisted in nutritional access being replaced by one of the same type. In 24 cases, the procedure was performed in hospital settings; PEG to PEG replacement was performed in 9 cases (cause: 9 x BBS), and jejunostomy to jejunostomy replacement was performed in 13 patients (causes: 7 x scheduled replacement, 1 x tube obstruction, 2 x massive leak around the tube, 2 x tube prolapse, 1 x massive infection around the jejunostomy). In this group of patients, home interventions were performed in 114 patients, with different types of gastrostomies being replaced (causes: 41 x scheduled replacements including 14 x low-profile gastrostomies, 53 x G-tube balloon rupture, 9 x leaks around the gastrostomy tube, 4 x breakage of the tube cap, 5 x n-port valve leak, 2 x gastrostomy obstruction). Twenty-four out of 138 patients undergoing replacement of the nutrition access to one of the same type were subjected to the intervention in hospital setting. A total of 15 emergency interventions (62.5%) was performed as compared to 73 out of 114 (64.04%) patients subjected to emergency interventions in home setting. Overall, emergency interventions were performed in 97 patients (63.76%). We observed that hospital replacements consisted mainly in jejunostomy and PEG replacements while home replacements consisted mostly of G-tube replacements.

Overall, a total of 182 patients required emergency medical intervention associated in a change in the nutrition access. This amounted to 47.77% of all interventions (71.94% of the group of interventions requiring the presence of a physician) and 21.39% of all patient population.

Intervention was taken up in 105 patients with baseline PEG access; these included a PEG to G-tube change in 96 patients and PEG replacement in 9 patients. Causes: 48 x PEG damage (45.71%), 27 x PEG prolapse (25.71%), 12 x BBS (11.43%), 9 x scheduled replacement (8.57%), 6 x PEG tube obstruction (5.72%), 3 x PEG prolapse (2.86%). Damage/destruction of PEG access in the course of its use was the most common cause for the change being required.

Mean duration of clinical treatment of PEG patients until the moment of change/replacement was 944 days (max. 2095 days, min. 41 days, median 879 days).

Considering the fact that the mortality rates associated with PEG placement is very low, it should constitute the baseline type of access in a possibly large group of patients. In the study population of neurological patients, other types of accesses were used in 204 patient, another 4 patients with other diseases having a different type of access would qualify for PEG placement. Overall, this amounted to 208 patients, or 24.44% of the entire population.

The material costs generated by individual types of accesses during the treatment. The mean time of PEG usage was 944 days. The kit cost was PLN 260. Since 944/365 = 2.58 year, the annual material cost of PEG access was PLN 100.77 per patient per
year. In patients with nasogastric tubes, routine replacement is performed according to the standards every 6 weeks, i.e. about 8 times a year. The cost of a silicon tube ranges, depending on the manufacturer, between PLN 25 and 35, amounting to the annual cost of PLN 200-280. Our own observations suggest that G-tube gastrostomies are replaced at least twice a year. The cost of the G-tube, depending on the manufacturer, ranges from PLN 130 to 160, and therefore the minimum annual cost is PLN 260-320. The costs of jejunostomies were not analyzed since jejunostomy replacements were rare and usually performed in hospital settings.

**DISCUSSION**

Not many studies on the changes of nutrition access in patients receiving enteral nutrition in home settings could be found in the literature. In our study, the largest group of patients receiving enteral nutrition at home consisted of neurological patients (nearly 60%), followed by cancer patients (ca. 35%). In an Australian study, most patients receiving enteral nutrition consisted of cancer patients [8]; on the other hand, patients with neurological disorders were prevalent in a multicenter European study (49.1%) [9]. The summary of 6 years of experience in nutrition treatment in Spain revealed that the predominant group of patients consisted of cancer patients with neurological patients accounting for about 15% of the population [9]: however, the difference was likely due to the fact that the study population included patients receiving ONS. Our study group was most similar to that in the multicenter European study. Likewise, it is difficult to relate to the frequency of PEG accesses (47.35% in our study), since most available articles considered patients receiving oral nutrition to be parts of their study groups. In the previously cited European analysis, patients with PEG accounted for 58.2% of total population [9]; our study would probably be similar should all patients qualifying for the procedure had undergone PEG placement. No articles were found in the literature regarding the frequency of access replacements in home nutritional treatment despite the fact that a large number of studies are available on the techniques and methods for the replacement of any type of nutritional access including lists of causes and potential complications. Buried bumper syndrome (BBS) is a classical complication resulting in PEG replacement. It was also the most common cause of PEG replacements in our study group. The symptoms were observed in 12 patients (2.97%), which was in line with the literature data suggesting the incidence rate of 2-4.5% When assessing the results of our analyses, one should assume that in all types of conditions, the need to replace the nutrition access will develop in the group of patients receiving nutritional treatment at home under emergency medical supervision. A natural process should include a reduction in the number of PEG accesses and an increase in the number of G-tube gastrostomies. The numbers of nasogastric tubes and jejunostomies should remain relatively constant.

**CONCLUSIONS**

1. PEG is the predominant type of nutrition access in patients undergoing nutritional treatment at a nutrition; About 25% of patients had other access installed despite being qualified for the PEG feeding.

2. After several months of treatment at the clinic, the number PEG dropped while the number of G-tubes increased in all patient groups.

3. The percentages of patients with jejunostomies and nasogastric tubes did not change significantly, with jejunostomy being significantly predominant in cancer patients.

4. A replacement/change in the type of nutrition access is quite commonly required in the course of the treatment. The procedures were usually performed in emergency mode and therefore more often at patient’s homes; in virtually all cases of nutritional access being damaged, patients can receive appropriate management at their homes.

5. The most common cause of interventions in PEG patients consisted in mechanical damage to the device.

6. The most common cause for hospital-based exchanges of PEG accesses in our study material was BBS.

7. PEG is the least costly nutrition access used in patients undergoing nutritional treatment in outpatient setting.

**REFERENCES**


