Audit of Percutaneous Endoscopic Gastrostomy in Long-term Enteral Feeding in a Nursing Home

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Objectives: Percutaneous endoscopic gastrostomy (PEG) is now easily used in the event of long-term enteral nutrition. Tolerance of long-term enteral feeding has been documented in different populations but the documentation is incomplete in the case of older and frail people. Our aim was to describe early and late tolerance in this population, and to propose ways in which it could be improved.

Design: Retrospective study in two parts: tolerance and quality of care; case-control study for tolerance.

Setting: A nursing home with 240 beds in south-west France.

Study participants: The PEG group consisted of all patients who had undergone PEG insertion between January 1990 and June 1994. Fifty-eight patients were involved, 12 under 65 years (48 ± 10.6), and 46 over 65 (80.7 ± 9.3). The gastrostomy insertion was performed because of a vegetative state in 6 patients, swallowing difficulties in 31 and anorexia in 21. A control group was gathered in December 1996, which included all patients for whom the question of nutritional support was mentioned in staff books but where no artificial nutrition had been implemented due to the patients' or families' refusal or to a staff decision. This group included 50 patients, 5 younger than 65 years (54 ± 8.3), and 45 older (84.7 ± 7.6). In 22 cases the nutritional problem was swallowing difficulties and in 28 cases anorexia. Pressure ulcers were present before insertion in 34 patients in the PEG group and in 7 of the control group (p < 0.001).

Main outcome measures: Prognosis, early and late cutaneous, digestive (ileus, vomiting, gastroesophageal reflux) and pulmonary (bronchorrhea, dyspnea and aspiration pneumonia) complications for PEG and control groups, and patients with signs of poor behavioural tolerance of PEG were recorded in the chart. Audit of quality of care was performed in the PEG group using eight criteria: two concerned the pre-insertion period, two the early follow-up and four the long-term follow-up.

Results: Early mortality (4 weeks) was 13.8% in PEG (vs 10%, NS), mid-term mortality (between 4 and 8 weeks) was 12.1% (vs 14%, NS) and late mortality was 19.0% (vs 42.0%, length of follow-up 63.4 ± 42.1 weeks compared to 53.1 ± 63.8 weeks, NS). The duration of follow-up of the living patients was 63.4 ± 42.1 weeks compared to 53.1 ± 63.8 weeks, NS). Mid-term mortality (between 4 and 8 weeks) was 12.1% (vs 14%, NS) and late mortality was 19.0% (vs 42.0%, length of follow-up 63.4 ± 42.1 weeks compared to 53.1 ± 63.8 weeks, NS). Aspiration pneumonia was significantly associated with swallowing difficulties in both groups (p < 0.05). Vomiting occurred for 15.5% of the PEG group (vs 12%, NS), ileus in 13.8% (vs 6%, NS). Gastroesophageal reflux was found in 2 PEG patients, compared to 1 case among the control patients. Pressure ulcers were healing in 20 out of 34 patients in the PEG group (vs 2 out of 7) and new ulcers appeared in 6 out of 24 (vs 8 out of 43). Fifteen (25.8%) of the PEG patients attempted to withdraw the tube. © 1997 Elsevier Science Ltd.

Key words: Percutaneous endoscopic gastrostomy, pneumonia, older people, immobility, pressure sores.

INTRODUCTION

In a nursing home, with frail and dependent patients, long-term enteral feeding is frequently used. Inability to eat independently, anorexia or swallowing difficulties lead to further impairment of a patient's poor nutritional status. When long-term enteral feeding becomes necessary, percutaneous endoscopic gastrostomy (PEG) is now preferred to a nasogastric feeding tube [1,2]. The most basic reason that justifies this intervention is that it is needed in order to nourish the patient adequately and safely over a long period. Discussion about the expected quality of life of patients undergoing long-term enteral feeding led us to carry out this audit.

In this geriatric centre, the first PEG insertion was performed in 1990. It was obvious that tolerance was better than enteral feeding with a nasogastric feeding tube. In a short-term randomised comparison between nasogastric and PEG, Park et al. [3] pointed out the advantages of PEG, i.e. less treatment failure and better nutritional effectiveness. Hull et al. [4] described a long-term follow up of 49 dysphagic patients, fed via PEG, living in the community. This study reported an early mortality (before 30 days) of 8%. Forty-nine per cent of the living patients experienced late complications such as cutaneous infection around the PEG insertion-site and gastrointestinal intolerance. The patients concerned here were not older people, in contrast with the 161 patients of the Raha et al. [5] study. There, the overall early mortality was 20%, which dramatically increased to 80%, when the PEG was inserted for nutritional support and not for swallowing problems. The paper only describes early...
procedure-related morbidity, but it raises the question of the use of PEG within a very frail population. For this reason, it was important to implement an audit in a nursing home where most of the patients were frail. Our objective was to evaluate the tolerance of early and late PEG, and, secondly, to explore ways to improve it. For this purpose the study was conducted in two parts: (1) Tolerance and (2) Quality of care. Audit of quality of care permits observation of nursing and medical staff behaviour, which results from their knowledge and ethical, emotional beliefs. Comparison of the findings can lead to corrective recommendations.

METHODS

Study population

This nursing home, named “Long séjour”, is located in south-west France. It is part of the University Geriatric Centre of Bordeaux. Financial support comes in part directly from social health insurance (one third of total cost) and also from residents, their families or from the government depending on the financial situation of the residents. Admission to such facilities in France is based upon medical need. Patients must be dependent for activities of daily life, such as eating, transferring, dressing, bathing, toileting and incontinence, and should need medical supervision. In this study, patient needs were described using the Kuntzmann’s scale, with the possible score ranging from 0 to 10, indicating maximum dependence and medical need [6]. The nursing home concerned here included 240 patients in six wards. Since 1990, an average of 134.5 (±17) new patients have come in every year and 104.25 deaths (±12) have occurred per year. Two main categories of patients were present. Most were elderly patients with dementia (55%) or other neurological disorders (stroke 18.5%, Parkinson’s disease 2.5%) although some were frail because of multiple diseases (24%). About 10% were under 65 years old and were dependent due to neurological disorders. These two groups were different, as younger patients mostly had neurological disorders while the elderly patients presented with multiple diseases. The two groups will be considered separately. On average enteral feeding by PEG or nasogastric tube involved about 10% of the patient population. Decisions, such as whether or not to initiate enteral feeding, were usually discussed during staff meetings in each ward. A summary of the discussions was noted in what is called the staff book. Enteral feeding was initiated in the first month of the stay or when a nutritional problem arose, sometimes very late after admission.

A retrospective study was conducted and included all patients (PEG group) who had undergone PEG tube insertion during their stay in the nursing home from January 1990 to June 1994. A record summary book was used to identify those patients deceased or discharged who had undergone PEG insertion. We selected a control population in the same nursing home. These control subjects had swallowing difficulties or anorexia, but no artificial nutrition had been implemented due to patient or family refusal or to a staff decision. These patients were selected using the staff books of 1994 to 1996. The PEG group was gathered in May 1993 and completed in June 1994 and the control group was gathered in December 1996. The chart review for both the PEG and the control group, was performed by medical staff, over a one month period, mainly using nurses’ charts. We selected three groups of patients with the notation: “vegetative state” [7]; “anorexia”, corresponding to “decreased desire to eat” as described by Drickamer et al. [2] and to “nutritional support” as defined in Raha’s study [5]; and swallowing difficulties [2], corresponding to dysphagia in other studies [4,5].

The PEG insertion method is the pull technique, as described by Gauderer and Ponsky [1], with the Ansel Bioser Kit [8]. In 1993, after the first data collection and calculation of cutaneous complications, four patients underwent PEG insertion with a push-technique [9]: after abdominal wall puncturing, a guide thread was introduced into the stomach cavity. A “break-away” steel introducer allowed the insertion of a Foley-type tube. The insertion was strictly aseptic.

Feeding was delivered by constant infusion (60–120 ml per hour). When the patient was able to have a social life, infusions were initiated early in the morning, at the end of the afternoon and in the evening. Calorific and fluid needs were determined simply according to the French R.D.A. [10].

Definition of variables

Tolerance. In the first part of the study we recorded the complications (early and late) and the outcomes in the PEG group. Complications investigated were: cutaneous evolution around the PEG insertion site; digestive, such as vomiting or ileus/Ogilvie syndrome; and pulmonary, such as bronchorrhea, dyspnea or aspiration forms of pneumonia. Nurses’ notes were used to determine the incidence of complications. In the case of cutaneous complications, lesions were described in the chart, as they were for digestive complications, vomiting and constipation. Presence of Ogilvie syndrome was defined as notation of a medical observation complete with an X-ray diagnosis. Bronchorrhea and dyspnea events were found in the nurses’ chart, and cases of aspiration pneumonia were defined as documentation of a medical observation with an X-ray confirmation of the pulmonary infiltration.

We recorded deaths and the course of pressure ulcers. Evaluation of psychological tolerance was difficult when patients were incompetent or uncommunicative. Indications of attempts to pull out the tube or removal of the feeding line, as documented in the nurses’ notes, could be either accidental, because of an uncontrolled movement, or a sign of intolerance. However, we considered these
Audit of PEG in a nursing home

Table 1. Quality of care assessment for PEG group: criteria and results

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Number of charts addressing the criterion</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial criteria (2)</td>
<td>n = 58 (100%)</td>
<td></td>
</tr>
<tr>
<td>Indications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Indication of PEG insertion is clearly defined on record and enteral feeding is expected to go on for more than 1 month</td>
<td>43 (74%)</td>
<td>Acceptable</td>
</tr>
<tr>
<td>2. Decision of insertion is made with the information of patient and relatives</td>
<td>48 (83%)</td>
<td>Acceptable</td>
</tr>
<tr>
<td>Early follow-up criteria (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Delivery of the feeding must be defined: formula-quantity-rhythm</td>
<td>56 (96%)</td>
<td>Optimal</td>
</tr>
<tr>
<td>2. Patient is weighed before insertion</td>
<td>15 (26%)</td>
<td>Insufficient</td>
</tr>
<tr>
<td>Follow-up criteria (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Monitoring of stoma site is carried out at least once a week</td>
<td>54 (93%)</td>
<td>Optimal</td>
</tr>
<tr>
<td>2. Monitoring of weight is carried out until stabilisation</td>
<td>13 (22%)</td>
<td>Insufficient</td>
</tr>
<tr>
<td>3. Quality of life: at least once a week out of the bedroom</td>
<td>34 (59%)</td>
<td>Insufficient</td>
</tr>
<tr>
<td>4. Dysphagia therapy is attempted</td>
<td>35 (60%)</td>
<td>Acceptable</td>
</tr>
</tbody>
</table>

(Insufficient: < 59%; acceptable: between 60 and 80%; optimal: > 90%)

Efforts to be a sign of bad behavioural tolerance on the part of the patients themselves. We took into account families' complaints about the lack of necessity for enteral feeding and frustrations about the impossibility of oral feeding recorded in the nurses' notes, as a sign of psychological intolerance in the relatives.

The control group was used to assess pulmonary and digestive complications. Criteria that defined these complications were the same as in the PEG group. Deaths and the course of pressure ulcers were recorded.

A quality of care assessment made up the second part of the study; in this part, the audit was performed only on PEG group charts. Eight assessment criteria and standards were defined (Table 1). Two criteria concerned indications for PEG placement and the pre-insertion period, two assessed early follow-up and four long-term follow-up. Charts and staff books were used to assess the criteria. For psychological tolerance by the relatives, we looked for mention of meetings with relatives concerning the PEG insertion decision. In France, there is no informed consent procedure in such cases. Appropriateness of criteria to assessment was considered as follows: the result is insufficient when a criterion result is less than 59%, it is acceptable when between 60% and 80%, and optimal when 90%.

Statistical analysis. Statistical analyses were performed using the Statworks Software Package [11]. Categorical variables were compared using the Chi square test and numerical variables using a Student's t-test. These latter data were presented as mean ± standard deviation.

RESULTS

Study population

The PEG group was composed of 58 patients. Twelve were less than 65 years old (48.0 ± 10.6) and 46 were older patients (80.7 ± 9.3). Fewer patients were included in the control group, due to the small number of young patients with a potential and unmet need of artificial nutrition. The control group included 50 patients, five less than 65 years old (54 ± 8.3) and 45 older (84.7 ± 7.6). There was no significant difference for mean age between the PEG and control groups in each age class; or for dependence and medical needs according to Kuntzmann's scale: 9.6 ± 1.1 in the PEG group compared to 9.6 ± 1.2 in the control group. Distribution of the indication classes of potential need for artificial nutrition in the control group or PEG insertion in the PEG group were not statistically different (see Table 2). However, the number of subjects presenting pressure sores at the beginning of the follow-up period was higher in the PEG group (38, 65.5%) than in the control group (7, 14.3%) (p < 0.001).

Tolerance

Prognosis. In the PEG group, 28 patients died during the evaluation period (33 in the control group). Eight (13.8%) died before the end of the first month (vs 5, 10% in the control group); 7 (12.1%) during the second month (vs 7, 14% in the control group); 11 (19.0%) after 2 or more months (10-160 weeks, mean 63.4 ± 42.1). In the control group, 21 patients died after the second month (follow-up duration: 53.1 ± 63.8 weeks). Early mortality was not significantly associated with the distribution of indication classes. In the PEG group, five had swallowing difficulties and three needed nutritional support for anorexia. In the control group three were dysphagic and two were anorexic. The follow-up period for the living patients was 5–210 weeks (71.6 ± 61.8) in the PEG group and 3–230 weeks (48.0 ± 70.5) in the control group. For each prognosis sub group, duration of follow-up was not significantly different in the PEG from that in the control group. However, in the late mortality group and in living
patients duration of follow-up tended to be longer in the PEG than in the control. Owing to successful dysphagia therapy in two cases and anorexia therapy in one, it was possible to withdraw three of the tubes. In the PEG group, five patients continued to have persistent swallowing difficulties but only for liquid; two patients were discharged from the nursing home and could go back home, one with and one without the tube.

Complications (see Table 3). Only 20% of patients were free from any cutaneous complications around the PEG insertion site. Six abdominal abscesses occurred in the elderly group, none in the young group. Two of the patients who died early had an abscess. Four patients underwent the aseptic PEG insertion. They did not experience abscesses but tube clogging occurred in two cases and tube replacement was then necessary. A patient pulled out the tube in the first week, fortunately without severe complications.

Table 3). Two of the five patients who died early, experienced bronchorrhea and one presented an aspiration pneumonia. When these complications occurred, enteral feeding was interrupted until the situation improved. Pulmonary events led to death in two cases. These two patients had a severe gastro-oesophageal reflux. In the control group, digestive and pulmonary complications occurred at a similar rate (see Table 3). Two of the five patients who died early experienced bronchorrhea. In the control, as in the PEG group, aspiration pneumonias occurred significantly more often when swallowing difficulties were present (p < 0.05).

Pressure ulcers' course. Thirty-four patients in the PEG group had pressure ulcers before tube insertion, seven healed, thirteen improved, twelve were unchanged and two worsened. Unfortunately, pressure ulcers appeared after tube insertion in six patients with worsening in four. In the control group, seven patients had pressure ulcers at the beginning of the follow-up period, one healed, two were unchanged and four worsened. Pressure ulcers appeared during the follow-up period in eight patients with worsening in one and healing in two. Pressure sore incidence during the follow-up period was not statistically different in the two groups (25% in the PEG group vs 18.6% in the control).

Behavioural tolerance. Fifteen (25.8%) patients in the PEG group attempted repeatedly to pull out the tube and one succeeded. In such cases, the inner part of the PEG tube tended to become impacted in the gastric mucosa. This necessitated surgical removal of the tube in two cases. One patient clearly complained about the tube.

| TABLE 2. Indication of enteral feeding; 58 patients in PEG group, 49 in control group |
|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| PEG group | Control group |
| < 65 years | > 65 years | < 65 years | > 65 years |
| n = 12 | n = 46 | n = 12 | n = 46 |
| Vegetative state | 4 | 2 | 0 | 0 |
| With pressure ulcers | 0 | 1 | 0 | 0 |
| Without pressure ulcers | 4 | 1 | 0 | 0 |
| Swallowing difficulties | 7 | 24 | 4 | 18 |
| With pressure ulcers | 2 | 16 | 0 | 4 |
| Without pressure ulcers | 5 | 8 | 4 | 14 |
| Nutritional support for anorexia | 1 | 20 | 1 | 27 |
| With pressure ulcers | 0 | 15 | 0 | 3 |
| Without pressure ulcers | 1 | 5 | 1 | 24 |

Data for PEG and control were compared using the Chi square test; indication of nutritional support distribution, no statistical difference; pressure ulcers distribution, x² = 16.2, p < 0.001.

Gastrointestinal complications occurred in 20% of patients in the PEG group, often in combination with pulmonary symptoms. Ileus was frequent and occurred at any time of the enteral feeding. Pulmonary symptoms affected 23 patients in the PEG group (39%), these took the form of dyspnea, bronchorrhea and documented aspiration pneumonia in eight cases, two in the young group, six in the elderly group. Every patient in the PEG group who died early, experienced bronchorrhea and one presented an aspiration pneumonia. When these complications occurred, enteral feeding was interrupted until the situation improved. Pulmonary events led to death in two cases. These two patients had a severe gastro-oesophageal reflux. In the control group, digestive and pulmonary complications occurred at a similar rate (see Table 3). Two of the five patients who died early experienced bronchorrhea. In the control, as in the PEG group, aspiration pneumonias occurred significantly more often when swallowing difficulties were present (p < 0.05).

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Four patients' relatives exhibited bad tolerance. They complained about the tube, the long-term enteral feeding and the poor quality of life of their relatives. One tried to feed her husband despite nurses' advice.

Quality of care (see Table 1)

The indications were not defined clearly enough, particularly in the case of anorexia occurring during dementia or depression. Quality of life was poor. Patients and relatives were informed about the enteral feeding method but in 17% of cases no mention of this information was found in the chart. During the early follow-up period, as well as during the long-term follow-up period, weight change monitoring was insufficient.

DISCUSSION

The aim of this study was to evaluate the early and late tolerance of PEG, when used for long-term enteral feeding in a nursing home, and to propose ways to improve it. The greatest difficulty in our study was the selection of patients. Here the early mortality of PEG patients was close that in the control group, confirming a previous study that attributed early mortality to underlying disease processes [4]. Pressure sore prevalence was much higher in the PEG group before insertion than in the control group, reflecting the influence of this feature on the staff's decision whether or not to implement artificial nutrition. Pressure sore healing was expected with adequate tube feeding of these patients. However, data collected in the Finucane review [12] did not support the determinant effect of enteral feeding on pressure sore healing. On the other hand, since the feeding program was well defined in this audit [10], nutritional follow-up of the tube-fed patients was very poor and adequate nutritional support was then hazardous. Weighing disabled patients is often difficult due to the lack of special scales. In fact, mobility restriction in these tube-fed patients was dramatic as shown by their poor quality of life as we defined it, being out of their room at least once a week, necessitating only transfer from the bed to a wheelchair. We observed similar pressure sore occurrence in both tube-fed and control patients, but because of the small number of patients involved, no conclusion can be reached.

These recumbent patients were likely to present pulmonary or digestive complications linked to immobility. Elderly patients living in nursing homes are certainly a high risk group for aspiration pneumoniae [13,14]. Prevalence of aspiration pneumoniae in older people [14] was dramatically high in this study: 82% compared to 14% in our PEG group probably due to the difference in nutrition delivery. Indeed the use of slow fluid infusion in contrast to the bolus method, seems to reduce the risk of pneumoniae. Aspiration was one of the most important factors involved in the decision to begin tube feeding. Probably, careful spoon feeding provides no more aspiration pneumoniae than enteral feeding [15]. Indeed, no statistical difference between aspiration pneumonia or other pulmonary symptoms was demonstrated between PEG and control patients. Furthermore PEG patients with gastro-oesophageal reflux experienced chronic bronchorrhea and pneumoniae which led to death. Assessment of any reflux should be done prior to PEG placement. It was proposed [2,14] to insert a duodenal tube in such patients but studies comparing gastric and duodenal tube in this case are not available. Parenteral feeding needs also to be assessed in order to offer these patients a more comfortable and safer feeding.

Another limiting factor of enteral feeding with PEG was the frequency of cutaneous complications observed here and elsewhere [5,4,16]. Antibiotic prophylaxis was proposed but published studies have contradictory conclusions [17,18]. The gastroenterologist suggested improving aseptic insertion of the tube using the push technique [9] in order to avoid cutaneous infections. Indeed, there were no cutaneous infections around the site when the tube was inserted with the push technique and no impaction of the inner part of the tube in the gastric mucosae, but other problems arose and the risk of the tube being pulled out increased. The number of patients undergoing the push technique was not sufficient to put forward final conclusions.

The uncertainty about the risk of complications, related to PEG insertion or not, underlies the necessity to define precisely enteral feeding indications. In the case of swallowing problems occurring after a stroke, decision makers are more confident as to the benefit of tube feeding [19]. In fact, in contrast to Raha et al. [5], we did not find a better outcome (mortality, complication rate) of dysphagia than in anorexic patients. Starting tube feeding in anorexic, depressed or demented elderly people should only be proposed when it can truly be considered as a medical treatment with a benefit/burden analysis; in this case a better outcome can be expected [20,21]. In fact, these three conditions (dementia, depression, swallowing disorders) should be assessed in the same way. A better nutritional state could improve the course of the disease, but as noted with regard to the course of pressure ulcers, this expected improvement was not accompanied by enough quality of care in nutritional follow-up. With regard to the persistent vegetative state [7], there is no real alternative to artificial feeding and the patients' wishes cannot be evaluated.

We have pointed out that chart information frequently lacks mention of enteral feeding indications and includes inadequate information about patients and relatives. On the one hand, this could be due to imprecision of transcription, as this was a retrospective study. On the other hand, this may reflect insufficient interest on the part of the staff. Ethical discussion about life-sustaining treatment often occurred in the case of elderly patients with dementia [21] or poor prognosis due to polyopathy. These patients are very disabled and often unable to express their wishes. We were unable to reach conclusions.
about patient behavioural tolerance as we have defined it. As described by McNabney, it is actually possible to have relatives participate in the decision about PEG placement. In most cases, this helps them to accept the decision [22]. Surrogate or patient decision should only be reached after provision of adequate information based on our knowledge about the outcome of enteral feeding with PEG in this kind of patient, and knowledge about the likely prognosis without enteral feeding. This needs further investigation in well designed, prospective and randomised studies.

In conclusion, we propose corrective recommendations as follows:

1. Indications for enteral nutrition should be carefully examined. Life expectancy should be at least 3 months, and a better outcome with enteral nutrition expected.
2. Gastroesophageal reflux should be assessed and feeding techniques other than PEG preferred.
3. When possible, both patients and relatives should participate in the PEG insertion decision after being adequately informed.
4. Better nutritional follow-up should be implemented in order to achieve a better nutritional state and improvement of nutrition-related morbidity.

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