Increased risk of peristomal wound infection after percutaneous endoscopic gastrostomy in patients with diabetes mellitus

Background. Results of prospective studies on the effect of prophylactic antibiotics before percutaneous endoscopic gastrostomy are conflicting. Factors for increased risk of peristomal wound infection have not been clearly identified.

Aim. To evaluate the incidence of complications of percutaneous endoscopic gastrostomy and to determine the predictors of wound infection.

Patients and Methods. Percutaneous endoscopic gastrostomy was performed on 134 patients in different disease groups between January 1996 and June 2000. Medical records were carefully reviewed for demographic data, indications for percutaneous endoscopic gastrostomy, use of prophylactic antibiotics, complications and comorbid conditions predisposing to wound infection.

Results. Of 134 patients, 22 (16.4%) developed complications after percutaneous endoscopic gastrostomy. Wound infection, the most common complication, occurred in 19 patients (14.2%) and Pseudomonas aeruginosa was the most frequently isolated microorganism. In univariate analysis, non-malignant disease and diabetes mellitus were significantly associated with peristomal wound infection after percutaneous endoscopic gastrostomy. In multivariate analysis, only diabetes mellitus was an independent risk factor for the development of peristomal wound infection after percutaneous endoscopic gastrostomy (p=0.035).

Conclusions. Patients with diabetes mellitus have a higher risk of peristomal wound infection after percutaneous endoscopic gastrostomy.

Introduction

Maintaining adequate nutrition remains a critical goal in the optimum management of many diseases. In patients with a functioning gastrointestinal tract but who are unable to consume sufficient oral intake to meet metabolic demand, a nasogastric tube is usually the first choice route for administering feedings. After Gauderer et al. first successfully performed percutaneous endoscopic gastrostomy (PEG) in 1980, it has become the procedure of choice to achieve long-term enteral nutrition. This technique has a high success rate associated with low mortality and morbidity, even in patients with severe debility from underlying diseases.

Peristomal wound infection occurs in 5% to 30% of PEG patients and is the most common procedure-related complication. Although measures to reduce infectious complications have not always been successful, a recent meta-analysis recommended the administration of a broad-spectrum antibiotic before PEG. However, widespread routine use of prophylactic antibi-
Diabetes mellitus and wound infection after PEG

otics might predispose to increased risk of resistant organisms. Risk factors for infectious complications after PEG need to be identified in order to select patients who will benefit from the antibiotic prophylaxis before the procedure.

In the present investigation, attempts have been made to identify risk factors for peristomal wound infections after PEG.

Patients and methods

Collection of data

Medical and endoscopic records were retrospectively reviewed of 134 patients who had an initial PEG placement at Samsung Medical Centre during the period from January 1996 to June 2000. The ratio of male (n=98) to female (n=36) patients was 2.72:1. Mean patient age was 62.3±13.0 years (range 16 to 89, median 64).

The indications for PEG placement, use of prophylactic antibiotics, complications, and comorbid conditions such as diabetes mellitus, bleeding tendency, use of steroids, chemotherapy, radiotherapy, anticoagulation, and anti-platelet treatment were determined in all cases. Complications of PEG were systemically reviewed and divided into focal or non-specific complications, according to the classification of Cotton.

PEG placement

All PEG procedures were performed in an endoscopy room or, in critically ill patients (n=2), at the bedside. Patients had been fasting for more than 8 hours before the procedure. Topical pharyngeal spray of anaesthetic was used in patients with gag reflex. During the procedure, the patient was in the supine position. A parenteral sedative agent was not given routinely. Oxygen saturation and pulse rate were monitored with pulse oxymetry and some patients were given supplementary intranasal oxygen when required. A PEG tube was inserted by the Ponsky-Gauderer (pull-through) technique. A commercial PEG kit (Ponsky Pull PEG Kit, Bard, Bellerica, MA, USA) was used in all procedures. Patients were not fed through the gastrostomy tube for 24 hours after the procedure. After this period, liquid diet feeding was given every 4 hours. Placements of the gastrostomy tube was successful in all cases. The site of tube insertion was checked by the attending doctors and dressed daily for at least 2 weeks.

Analysis of factors related to wound infection

The presence of an abscess or thick exudate was considered to be a wound infection.Transient hyperaemia near the PEG tube insertion site or local tenderness was not considered as a wound infection. Cases of peristomal wound infection, detected within 14 days of the PEG procedure, were included in the analysis. Demographic and clinical factors were analysed to detect variables associated with the development of wound infection after PEG procedures. A total of 31 patients (23.1%) had been treated with insulin (n=16) or oral hypoglycaemic agents (n=15) following the diagnosis of diabetes mellitus. Before the procedure, antibiotics were administered to 111 patients (82.8%). Furthermore, 95 patients had been receiving antibiotics for a prolonged period (more than 1 day) due to various medical conditions, including pneumonia in 35 patients (36.8%), fever of uncertain aetiology in 32 (33.7%), and urinary tract infection in 14 (14.7%). The most commonly used antibiotics, in these patients, were cefotaxime in 55 patients (57.9%) and ceftriaxone in 21 (22.1%). Only 16 patients received 1 to 3 doses of prophylactic antibiotics for the prevention of infectious complications after PEG, 12 of whom received cefazolin and 4 cefotaxime.

Statistical analysis

Univariate analysis using Fisher exact test was performed to compare the rates of wound infection according to various clinical parameters. Multiple logistic regression was used to determine the independent risk factors for wound infection after PEG. A p-value <0.05 was considered significant.

Results

Indications for PEG

Neurological disorders causing dysphagia (n=93) were the most frequent indication for PEG insertion. Of the neurological disorders, cerebrovascular lesions (n=78) were the most common followed by various degenerative neurological disorders (n=10) and hypoxic brain damage (n=5). Malignant obstruction of the pharynx, or the oesophagus, was also a frequent indication of PEG placement (n=40). There was one case of tuberculosis of the hard palate causing difficulty in swallowing.

Complications after PEG

Of 134 PEG placements, 25 complications were identified in 22 patients (16.4%) (Table I). Among these, peristomal wound infection (n=19) was the most frequently identified complication. Of these 19 cases with wound infection, 14 (73.7%) were treated conservatively with intravenous antibiotics and daily dressing.
Variables associated with wound infection: univariate and multivariate analysis

In the univariate analysis, non-malignant disease and diabetes mellitus were significantly associated with peristomal wound infection after PEG (Table III). Age, gender and use of antibiotics were not associated with peristomal wound infection. In the multivariate analysis, only diabetes mellitus was an independent risk factor for the development of peristomal wound infection after PEG (p=0.035). The rates of wound infection were not significantly different between patients on insulin or oral hypoglycaemic agents (25.0% vs 33.3%). Among diabetic patients, with or without peristomal wound infection, there was no significant difference in the mean initial fasting serum glucose (158.2 mg/dl vs 160.5 mg/dl) and the mean haemoglobin A1c levels (8.1% vs 7.9%).

Table III. Univariate analysis of factors associated with peristomal wound infection after PEG.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Peristomal wound infection (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>16/98 (16.3)</td>
<td>0.280</td>
</tr>
<tr>
<td>Female</td>
<td>3/36 (8.3)</td>
<td></td>
</tr>
<tr>
<td>Age (yrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 64</td>
<td>13/66 (19.7)</td>
<td>0.086</td>
</tr>
<tr>
<td>≥ 64</td>
<td>6/68 (8.8)</td>
<td></td>
</tr>
<tr>
<td>Indications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malignant diseases</td>
<td>1/40 (2.5)</td>
<td>0.013</td>
</tr>
<tr>
<td>Non-malignant diseases</td>
<td>18/94 (19.1)</td>
<td>1.000</td>
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<tr>
<td>Antibiotics</td>
<td></td>
<td></td>
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<tr>
<td>Used</td>
<td>15/111 (14.4)</td>
<td></td>
</tr>
<tr>
<td>Not used</td>
<td>3/23 (9.4)</td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence</td>
<td>9/31 (29.0)</td>
<td>0.015</td>
</tr>
<tr>
<td>Absence</td>
<td>10/103 (9.7)</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

In the present study, the overall complication rate after PEG was 16.4%, while there was no mortality related to the procedure. The rate of wound infection, the most common complication, may differ significantly depending on the definition used in studies. In order to reduce the development of infectious complications, many methods have been attempted, such as prophylactic antibiotics, improvement in the design of the PEG tube, reducing oropharyngeal contamination by gargling with an antibiotic solution, the creation of an adequate skin incision and avoiding excessive traction on the internal bumper, and applying a povidone-iodine ointment to the stoma. In the present study, the
rates of wound infection were not affected by the use of antibiotics before the procedure (Table III). Results from eventive controlled trials on this issue, however, are controversial. In a recent study analysing pooled data from 7 prospective trials, routine use of prophylactic antibiotics was recommended to reduce wound infections after PEG. However, the conclusion of this meta-analysis should be interpreted with caution, since the definitions of wound infection and the antibiotics used in the individual trials were different. Widespread routine use of prophylactic antibiotics might predispose to an increased risk of resistant organisms. The reason for the frequent recovery of P. aeruginosa from our patients is not clear, but we presume that long-term use of wide-spectrum antibiotics before PEG, in some patients, may be one possible explanation. Infection from a contaminated endoscope is another possible scenario. However, it is very unlikely since we found no P. aeruginosa contamination on endoscopes following disinfection procedures in our hospital. It has been suggested that patients receiving prolonged antibiotics, for other indications, had a lower incidence of wound infection, but we failed to find such a protective effect. In our opinion, a more prudent use of antibiotics seems to be necessary in order to avoid possible adverse effects such as selection of more resistant organisms. In the univariate analysis, we found that the risk of wound infection is higher in patients with non-malignant disorders or diabetes mellitus (Table III). The level of oral hygiene may be influenced by the intensity of patient care in different hospitals, and mouth care may have lower priority in patients with severe neurological disorders. In our opinion, this could have contributed to the increased rate of wound infection in the neurological patients of this study. In the multivariate analysis, only the presence of diabetes mellitus was an independent risk factor for post-stomal wound infection after PEG. Abnormalities in granulocyte adherence, chemotaxis, phagocytosis, and microbicidal function in patients with poorly controlled diabetes mellitus have been demonstrated. In addition, diabetes mellitus can cause significant changes in stomach function, which may exert an effect on the development of wound infection after PEG. Catheter-related infections are approximately five times more common in diabetic patients receiving total parenteral nutrition (TPN) compared with the general TPN population. In a study examining the relationship between post-operative infection and diabetes, a high rate of nosocomial infection was observed in diabetic patients with poor glucose control. However, no association could be found with the level of glucose control and the development of peristomal wound infection in diabetic patients.

In conclusion, we found that administration of antibiotics before PEG did not reduce the risk of wound infection and the presence of diabetes mellitus was the only predictor of wound infection after PEG.

**List of abbreviations**
PEG: percutaneous endoscopic gastrostomy; TPN: total parental nutrition.

**References**


XIV SYMPOSIUM

"ASSOCIAZIONE R. FARINI PER LA RICERCA GASTROENTEROLOGICA"
SECOND EDITION

FEMALE GENDER AND LIVER:
HORMONAL, GENETIC, METABOLIC,
AND IMMUNOLOGIC FACTORS IN LIVER DAMAGE

L'Aquila (Italy), September 2003
(date to be arranged)

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