Endoscopic feeding approaches: PEG, PEG-J, direct endoscopic jejunostomy

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Institution: Erasme Hospital, Brussels, Belgium
Enteral Nutrition

- Short- and long-term delivery of nutrients and medications into the GI tract of patients who cannot maintain their needs with oral intake

Why use the gut?

If GI tract functional, use it! Better clinical outcomes, including a lower rate of sepsis compared to parenteral nutrition

Heyland et al, JAMA 1998
Access devices

Short-term access

• Feeding tubes
  – Gastric
  – Jejunal

Long-term access

• Percutaneous gastrostomy
• (PEG)
• PEG with jejunal extension (PEG-J)
• Direct percutaneous jejunostomy (DPEJ)
• Surgical gastrostomy / jejunostomy

ASGE report, Gastrointest Endoscopy 2010
Figure 1a  PEG

Figure 1b  PEJ

Figure 1c  PEG-J
PEG tube in place
Common diameter: 18-20F
PEG – Pull technique
PEG – Introducer technique
PEG – Introducer technique
PEG – Introducer technique
PEG – Introducer technique
Gastropexy sutures

Adominal wall

Stomach wall
Correct PEG Tube Placement Using the Push Technique

1. Transillumination
   - Light seen through abdominal wall

2. Palpation
   - Endoscope with light
   - Hand pushing on abdominal wall
   - Pushing on abdomen wall seen on the stomach wall (through endoscope)

3. T-fastener placement
   - T-fastener

4. Needle and guide wire insertion
   - Needle
   - Wire

5. Dilator placement
   - Dilator
   - Gastrostomy tube in place

6. Gastrostomy tube in place
   - Gastrostomy tube
Incorrect PEG Tube Placement Using the Push Technique

1. Transillumination
   - Light NOT seen through abdominal wall
   - Transverse colon in front of stomach

2. Palpation
   - Pushing on abdomen wall seen on the stomach wall
   - Transverse colon in front of stomach not identified

3. T-fastener placement
   - Potential for puncture of the colon

4. Needle and guide wire insertion
   - Needle Wire
   - Potential for puncture of the colon

5. Dilator placement
   - Dilator placed against resistance

6. Gastrostomy tube in place
   - Failure to place gastrostomy tube
PEG-J

12 F jejunostomy tube in 24 F gastrostomy

or

9F jejunostomy tube in 20F gastrostomy.

Insertion with a biopsy forceps or over a guidewire
Direct percutaneous endoscopic jejunostomy (PEJ)
- Enteroscope, pediatric colonoscope
- Transillumination/finger indentation
- Fluoroscopic control
- Gastrostomy device (pull)
Vidéo DPEJ

- Add Jejuno Video
PEG

Techniques

• Pull technique (push-technique > direct "Introducer")

• Lumen: at least 15 charrière

• Incision at the puncture site sufficiently large (at least 8 mm)

• Free movement of the tube at least 5 mm

ESPEN, Clin Nutr 2005
PEG

Indications

• Each case should be considered on its own merits:
  – clinical situation
  – diagnosis
  – prognosis
  – ethical issues
  – expect effect on quality of life
  – patient's wishes
**PEG Indications**

- Stroke, neurological dysphagia (FOOD study)
- Head and neck cancer
- UGI tract
- Crohn's disease → no risk of fistula
- Mentally/physically retarded children (kyphoscoliosis!)
- Amyotrophic lateral sclerosis (before pulmonary dysfunction)
- Cystic fibrosis
- Dementia (controversial)
# Indications

<table>
<thead>
<tr>
<th>Gastric</th>
<th>Jejunal</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Swallowing difficulties</td>
<td>• Gastric, duodenal obstruction</td>
</tr>
<tr>
<td>» Neurological</td>
<td>• Gastroparesis</td>
</tr>
<tr>
<td>» Facial trauma</td>
<td>• Acute pancreatitis</td>
</tr>
<tr>
<td>» Mechanical obstruction</td>
<td>• Previous surgery in patients requiring EN (Roux-en-Y gastrectomy, By-pass, Whipple..)</td>
</tr>
<tr>
<td>• Insufficient oral input</td>
<td></td>
</tr>
<tr>
<td>» Chronic diseases (COPD, CF)</td>
<td></td>
</tr>
<tr>
<td>» Cancer patients</td>
<td></td>
</tr>
<tr>
<td>• Decompression</td>
<td></td>
</tr>
</tbody>
</table>

*ASGE report, Gastrointest Endoscopy 2010*
ORAL NUTRITION: no longer possible
no longer adequate

short-term
unknown duration

no surgery

no risk of aspiration

nasogastral tube

risk of aspiration

nasojejunal tube

prolonged requirement

long-term
(> 2 – 3 weeks)

no surgery

no risk of aspiration

PEG

risk of aspiration

PEJ

JET-PEG

surgery

NCJ

ESPEN Guidelines 2005
PEG

Contraindications

- Serious coagulation disorders
- Interposed organs (liver, colon)
- Marked peritoneal carcinomatosis
- Severe ascites
- Peritonitis
- Anorexia nervosa
- Severe psychosis
- Clearly limited life expectancy

ESPEN, Clin Nutr 2005
PEG
(relative) contraindications

• Mild-moderate ascites
• Ventriculoperitoneal shunts
• Peritoneal dialysis
• Pregnancy

ESPEN, Clin Nutr 2005
PEG
(relative) contraindications - Local problems

• Lack of transillumination (needle aspiration test) Θ
• Active ulcer ⊕
• Extensive tumor infiltration ⊕
• Previous partial-total gastrectomy Θ
<table>
<thead>
<tr>
<th>Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exclusion of contraindications</strong></td>
</tr>
<tr>
<td>**Current coagulation status (INR &lt; 1.5, Quick &lt; 50%, PTT &lt; 50s,</td>
</tr>
<tr>
<td>platelets &gt; 50,000/mm³)**</td>
</tr>
<tr>
<td><strong>Written informed consent</strong></td>
</tr>
<tr>
<td><strong>Indwelling venous catheter</strong></td>
</tr>
<tr>
<td><strong>Patient fasting overnight (8h)</strong></td>
</tr>
<tr>
<td><strong>Antibiotic prophylaxis (2 g cephazolin i.v.)</strong></td>
</tr>
<tr>
<td><strong>Shave the epigastric region above the umbilicus if necessary</strong></td>
</tr>
<tr>
<td><strong>Analgesia/sedation (e.g. midazolam i.v.), general anaesthetic for children</strong></td>
</tr>
<tr>
<td><strong>Placement of tube system under sterile surgical conditions</strong></td>
</tr>
</tbody>
</table>
Prophylactic antibiotics

• Local wound infection: 7.5-33.3%

• Factors:
  » Contamination from the oropharynx
  » Traction from the bumper?

• Meta-analysis of 10 RCT
  » RR reduction of 64%
  » NNT: 8
  » Penicillin- or cephalosporin-based regimen recommended

Jafri et al, Aliment Pharmacol Ther 2007
Nelson et al, Gastrointest Endosc 2003
PEG peristomal infection

Mycotic infection

Peristomal infection with cellulitis
<table>
<thead>
<tr>
<th>Aftercare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow external fixation plate to adapt over night with low traction (avoid tension!)</td>
</tr>
<tr>
<td>Ensure tube has sufficient free movement &gt; 5 mm after first change of dressing next morning</td>
</tr>
<tr>
<td>Sterile Y-compress under the external fixation plate</td>
</tr>
<tr>
<td>Cleansing and sterile renewal of dressings initially on a daily basis (later every 2-3 days)</td>
</tr>
<tr>
<td>Nutrients can be delivered via the tube 1h after uncomplicated PEG placement</td>
</tr>
<tr>
<td>Individual nutritional schedule (calories, fluids, etc.)</td>
</tr>
<tr>
<td>Training of patients and relatives</td>
</tr>
<tr>
<td>Organization of further aftercare and nutritional supply</td>
</tr>
<tr>
<td>Social support for patient and his family</td>
</tr>
</tbody>
</table>
The provision of a percutaneously placed enteral tube feeding service

- Patient solution, pre-assessment, post-procedural care
- Close working relations with community-based services
- An accredited therapeutic endoscopist should be a member of NST
- Every endoscopy unit should provide a basic PEG service
- Assuring various techniques (PEG, PEG-J, PEJ)
- Prevention and treatment of complications
- Ethical issues

Westaby D et al, GUT 2010, 59, 1592-605
Complications - Acute and severe complications (0.5% <)

- Perforation
- Serious abdominal haemorrhage
- Peritonitis
PEG Complications

- Local wound infection (15%) (less than 5 mm of reddening around the stoma is frequent)
- Treatment: local disinfection → antibiotics
- Pneumoperitoneum (50%) = is not a complication
- Peristomal pain (transient leukocytosis)
- Gastric content leakage
- Tube fracture
- Cellulitis
- Eczema or hypergranulation tissue
- Buried bumper syndrome (endoscopic treatment)

ESPEN, Clin Nutr 2005
Complications PEG/PEG-J/DPEG (2)

• Related to the tube

Overall complication rate $\rightarrow$ 5-10%

  – PEG-site infection (5.4% $\rightarrow$ 30%)
    • Patient related (obesity, diabetes, malnutrition, corticosteroids)
    • Technique related (small incisions, lack of antibiotics)
    • Nursing care related (excessive traction)
    • Rarely leads to peritonitis (0.4-1.6%) and necrotizing fasciitis

  – Excessive leakage
    • Increased gastric acid secretion
    • Bacterial or fungal cutaneous PEG-site infection
    • Use of corrosive agents

Singh et al, Gastroint Endosc Clin NA 2015
PEG

Removal

- Endoscopically removal is still recommended (simply cutting away)
- No removal within the first ten days
- No need for systematic exchange of the tube system
- After removal, the patient can eat immediately

ESPEN, Clin Nutr 2005
DPEJ - Largest series-Results

- First publications in 1991
- Largest series:
  - 307 procedures in 286 patients
  - Success rate: 209/307 (68%)
  - Higher rate of success in patients with altered anatomy

<table>
<thead>
<tr>
<th>Table 3. Mechanisms for DPEJ Placement Failure</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of adequate transillumination/finger indentation</td>
<td>79 (81%)</td>
</tr>
<tr>
<td>Absent</td>
<td>62 (63%)</td>
</tr>
<tr>
<td>Suboptimal, with an unsuccessful needle or trocar pass</td>
<td>17 (17%)</td>
</tr>
<tr>
<td>Unable to pass scope to jejunum</td>
<td>8 (8%)</td>
</tr>
<tr>
<td>Difficulty passing scope + lack of transillumination</td>
<td>6 (6%)</td>
</tr>
<tr>
<td>Adverse response to sedation</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>Technical equipment failure</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Total</td>
<td>98 (100%)</td>
</tr>
</tbody>
</table>

*Maple JT et al, Am J Gastroenterology 2005*
DPEJ - Largest series-Adverse effects

- Adverse effects in 69 (22.5%)

- Serious adverse effects (14 patients)(4.2%): bowel perforations, jejunal volvulus, major bleeding, aspiration

- Mortality (related to DPEJ insertion): 1 case (0.3%)

Maple JT et al, Am J Gastroenterology 2005
Comparison to PEG-J

• Retrospective comparative study

• PEG-J: 49 and DPEJ: 56
  – DPEJ: 20F feeding tube, PEG-J: 20F with 9F jejunal extension
  – Difference in patency
  – Reintervention in 19/49 (PEG-J) vs 5/56 (DPEJ), p<0.001

*Fan AC et al, Gastrointest Endosc 2002*
DPEJ for gastroparesis

• Selected group: patients with previous lung transplantation and gastroparesis

• Mechanisms:
  • Risk of thermal or mechanical injury to the vagus nerve during the surgical procedure
  • Immunosuppression
  • Fundoplication applied as a treatment for GERD

*Toussaint et al, Endoscopy 2012*
DPEJ for lung transplant patients

• Clinical data concerning all patients in whom a DPEJ was scheduled between 10/2008 and 5/2011 were retrospectively analysed

• 12 patients with 14 PEJ attempts

• Mean BMI: 17 kg/m2

• Mean FEV1: 0.83 L

• Under general anaesthesia and anti-bioprophylaxis

• Enteroscope or paediatric colonoscope

Toussaint et al, Endoscopy 2012
Results

- Technical success: 11/14 (78.6%) of procedures
- Technical failure because of lack of transillumination and finger indentation, despite optimal progression
- 18 French tubes with internal bumper
- Enteral nutrition well tolerated
- Mean duration of enteral nutrition: 20 weeks (2-44)

*Toussaint et al, Endoscopy 2012*
Complications

- No immediate complications

- 4/11 long term complications (36.4%), 2 severe
  - Jejunal volvulus requiring surgery and reduction (2 weeks after PEJ insertion)
  - Jejunocolonic fistula revealed after 44 weeks
PEG-J tube
PEG-J replacement
## Severe Adverse Effects

<table>
<thead>
<tr>
<th>Major complications</th>
<th>No./total major complication's no. (%)</th>
<th>No. of patients</th>
<th>Treatment type</th>
<th>Treatment modality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duodenal Ulcer</td>
<td>2/20 (10)</td>
<td>2</td>
<td>Endoscopy</td>
<td>PPI and definitive or temporary (9 days) J tube removal</td>
</tr>
<tr>
<td>Buried bumper syndrome</td>
<td>2/20 (10)</td>
<td>2</td>
<td>Endoscopy</td>
<td>Needle knife radia excision</td>
</tr>
<tr>
<td>J-tube impaction in the jejunum</td>
<td>1/20 (5)</td>
<td>1</td>
<td>Endoscopy</td>
<td>Endoscopic released with a guidewire</td>
</tr>
<tr>
<td>J-tube migration</td>
<td>6/20 (30)</td>
<td>5</td>
<td>Endoscopy</td>
<td>J tube replacement</td>
</tr>
<tr>
<td>J-tube dysfunction</td>
<td>6/20 (30)</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leakage</td>
<td>1/20 (5)</td>
<td>1</td>
<td>Endoscopy</td>
<td>J tube replacement</td>
</tr>
<tr>
<td>Kinking</td>
<td>1/20 (5)</td>
<td>1</td>
<td>Endoscopy</td>
<td>J tube replacement</td>
</tr>
<tr>
<td>Clogging</td>
<td>4/20 (20)</td>
<td>3</td>
<td></td>
<td>Guidewire recanalization (2/4) and replacement (2/4)</td>
</tr>
<tr>
<td>Covered duodenal perforation</td>
<td>1/20 (5)</td>
<td>1</td>
<td>Conservative</td>
<td>Antibiotic (amoxicillin/clavulanic acid, 2g3x/d, IV)</td>
</tr>
<tr>
<td>Jejunal perforation with duodenal fistula</td>
<td>1/20 (5)</td>
<td>1</td>
<td>Surgery</td>
<td>Intestinal resection</td>
</tr>
<tr>
<td>Infected intra-abdominal collection</td>
<td>1/20 (5)</td>
<td>1</td>
<td>Conservative</td>
<td>Antibiotic (piperacillin-tazobactam, 4g4x/d, IV)</td>
</tr>
</tbody>
</table>
Patient with duodenal ulcer
Duodenal minimal perforation
Adverse effects: previous studies

<table>
<thead>
<tr>
<th>Studies</th>
<th>Patient’s no. encountering a major complication/total patient’s no. (%)</th>
<th>Mean follow-up duration with PEG-J in place</th>
<th>Complication’s rate, %/month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disario et al. 1990</td>
<td>19/20 (95)</td>
<td>1.5 months</td>
<td>63</td>
</tr>
<tr>
<td>Delegge et al. 1995</td>
<td>1/17 (5.8)</td>
<td>2 months</td>
<td>2.9</td>
</tr>
<tr>
<td>Simon et al. 2000</td>
<td>7/13 (53.8)</td>
<td>Not specified</td>
<td>Unknown</td>
</tr>
<tr>
<td>Fan et al. 2002</td>
<td>19/49 (38.8)</td>
<td>6 months</td>
<td>6.5</td>
</tr>
<tr>
<td>Doede et al, 2002</td>
<td>11/12 (91.6)</td>
<td>36 months</td>
<td>25.44</td>
</tr>
<tr>
<td>Our study</td>
<td>12/27 (44.4)</td>
<td>49 months</td>
<td>0.9</td>
</tr>
</tbody>
</table>
Predictive factors of mortality after PEG insertion

- Higher age\(^1,4-6\) (procedure-related mortality at least 2\(^6\))
- Lower body mass index\(^1\)
- Diabetes mellitus\(^1\)
- Low albumin level\(^2-4\)
- High CRP\(^2,4\)
- Low albumin level + High CRP  HR 7.45\(^2\)

\(^1\)Zopf Y et al, JPEN 2011, 35, 50-55
\(^2\)Blomberg J et al, GI Endoscopy 2011, 73, 29-36
\(^3\)Tominaga N et al, Intern Med 2010, 49, 2283-2288
\(^4\)Suzuki Y et al, World J Gastroenterol 2010, 28, 5084-5091
\(^5\)Malmgren A et al, Food Nutr Res 2011, 55
\(^6\)Wirth R et al, J Am Med Dis Assoc 2011, Aug 25
Predictive factors of mortality after PEG insertion

- 30 days after PEG placement
  - $5.8\%^1$ - $6.5\%^2$ - $12\%^3$ - $18\%^4$ - $22\%^5$ (above 65 y)

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1 Richter-Schrage H et al, Can J Gastroenterol 2011, 25, 201-206
2 Zopf Y et al, JPEN 2011, 35, 50-55
3 Blomberg J et al, GI Endoscopy 2011, 73, 29-36
5 Malmgren A et al, Food Nutr Res 2011, 55
Complications PEG

• Specific complications

  – “Buried bumper syndrome” (3%-21%)
    • Simple ulceration → outward erosion through gastric/abdominal walls
    • Excessive tension, weight gain, poor wound healing
    • Nursing!!
  – Tumor implantation
    • Esophageal, laryngeal tumors
    • Up to 22% positive brushing positive for malignant cells when using pull technique!
  – Peristomal granuloma

Ellrichman et al, Endoscopy 2013
Singh et al, Gastroint Endosc Clin NA 2015
PEG peristomal granuloma
Buried Bumper Syndrome (BBS)

- Etiology: excessive compression of tissue between the external and internal fixation device
- Incidence: 1% (0.3 – 2.4%)
- BBS → GI bleeding, perforation, peritonitis, abdominal wall abscess, phlegm
- Prevention: adequate positioning of the external bolster
- Treatment: various endoscopic dissection technique (needle knife, argon plasma, papillotome,...) or surgery (disc localized out of the stomach)

Buried Bumper Syndrome (BBS)

- Incidence: 8 / 879 patients (0.9%)
- Median time between PEG insertion and BBS diagnosis: 22 ± 22.2 months
- Treatment: endoscopic treatment: 6/8
  - surgery: 2/8 (peristomal abscess)

*El Az et al, Acta Gastroenterol Belg 2011, 74, 312-6*
PEG: unclosed cutaneous gastric fistula

From Lemmers A, Erasme Hospital
• Macroclip Video to insert!
Take-Home messages

• To identify indications / contra-indications
• To choice the appropriate technique
• To follow protocols (importance of NST)
• Severe complications: rare
• Common complications: stoma infection, leakage, BBS
• Associated complications: pneumopathy