other members. The key topics consisted of preprocedural management (including indications), preprocedural assessment, periprocedural technical modalities, and post-procedural management (including adverse events). The guideline development process included meetings and online discussions that took place from September 2019 to July 2020.

The authors performed a systematic literature search through PubMed/Medline, the Cochrane Library, and Embase for papers published on this topic up to January 2020. The search focused on fully published randomized controlled trials (RCTs) and meta-analyses. Retrospective analyses and case series were also considered for inclusion if they addressed topics not covered in prospective studies. For important outcomes, papers were individually assessed using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system for grading of evidence levels and recommendation strengths, as described in the ESGE guideline development policy [4]. Each author developed draft proposals which were each discussed and debated electronically and eventually through a face-to-face meeting held in January 2020 in Brussels, Belgium. After agreement among the authors on a final version, the manuscript was reviewed by two experts selected by the ESGE Governing Board and then disseminated to all ESGE-affiliated societies and individual members. After agreement on a final version, the manuscript was submitted for publication to the journal *Endoscopy*. All authors agreed on the final revised manuscript.

This Guideline is issued in 2020 and will be considered for review and update in 2024 or earlier, if new and relevant evidence becomes available. Any updates to the Guideline in the interim will be noted on the ESGE website: http://www.esge.com/esge-guidelines.html.

3 Definitions

The following definitions were used in this Guideline [5, 6]:

Enteral access is the creation of an artificial track into the gastrointestinal (GI) tract to provide EN, specific medication, or decompression, through an enteral tube. This communication to the GI tract can be percutaneous or through natural orifices.

A **nasogastric tube (NGT)** or **naso-(duodenal)-jejunal tube (NJT)** is a flexible synthetic tube that is inserted into the stomach or the jejunum through either nostril.

An **orogastric/orojejunal tube** is a flexible synthetic tube that is inserted into the stomach/jejunum through the mouth.

Percutaneous gastrostomy is the establishment of enteral access into the stomach through the abdominal wall which can be performed surgically (percutaneous surgical gastrostomy [PSG]), endoscopically (percutaneous endoscopic gastrostomy [PEG]) or with radiological (ultrasound or fluoroscopic) guidance (radiologically inserted gastrostomy [RIG]).

Percutaneous jejunostomy is the establishment of enteral access into the small intestine through the abdominal wall, which can be performed surgically (percutaneous surgical jejunostomy [PSJ]) or endoscopically (direct percutaneous endoscopic jejunostomy [D-PEJ]).

A **PEG with jejunal extension (PEG-J)** describes a percutaneous gastrostomy tube through which a narrower-bore extension tube is inserted to provide EN into the jejunum.

4 Preprocedural management

4.1 Indications for enteral tube insertion

RECOMMENDATION

ESGE recommends considering the following indications for enteral tube insertion: (i) clinical conditions that make oral intake impossible (neurological conditions, obstructive causes); (ii) acute and/or chronic diseases that result in a catabolic state where oral intake becomes insufficient; and (iii) chronic small-bowel obstruction requiring a decompression gastrostomy.

Strong recommendation, low quality evidence.

The indications for consideration/placement of an enteral tube have expanded significantly since the original technique was first described [7 – 9]. All patients who are referred have a functional GI tract but are either at overall nutritional risk/malnourished or are unable to meet their nutrient requirements through normal dietary intake. Although the conditions leading to EN requirement are numerous, various, and often complex, referral indications can be classified into subgroups according to the type of underlying disease [1, 10 – 12].

Neurological indications [13] include diseases characterized by neurologically derived dysphagia such as stroke [14 – 16], motor neuron diseases [17], parkinsonism [17], cerebral palsy [18, 19], head trauma [20], and, in selected cases, early dementia [17, 21].

Obstructive causes include oropharyngeal cancer, head and neck cancer (HNC) [11, 22, 23], esophageal cancer [24], and benign esophageal strictures [24].

Acute and/or chronic diseases generating a catabolic state may also require complementary EN where oral nutrition is insufficient or impossible to achieve adequately [12]; such conditions include general critical illness [25], severe burns [26], severe acute pancreatitis [27], oncological conditions [28], and chronic lung and/or cardiovascular disease [29]. *Conditions with reduced oral nutrition without concomitant organic disease*, such as anorexia nervosa, can also require enteral tube insertion in some situations [30].

Decompression (venting) gastrostomy may be required for patients with bowel obstruction, in order to decompress the GI tract from the build-up of digestive secretions and gaseous distension [31, 32]. While malignant bowel obstruction is often encountered in patients with ovarian or colon cancer [32, 33], benign conditions include chronic intestinal pseudo-obstruction [34] and gastroparesis with advanced symptoms [35].

The indication for EN needs to be assessed on a case-by-case basis, since each condition has a different baseline prognosis, irrespective of enteral support. Furthermore, within each subgroup, individual patient prognosis may vary considerably

from the time of presentation to referral [36]. More specific indications and underlying prognoses are outside the scope of this Guideline and will not be discussed further.

4.2 Preprocedural assessment for potential candidate patients for EN

RECOMMENDATION

ESGE recommends proceeding with careful case-by-case selection of patients under consideration for EN and the type of enteral access to be used. Regarding percutaneous endoscopically inserted enteral tubes, a preprocedural checklist should be available, according to local arrangements.

Strong recommendation, low quality evidence.

The decision-making processes for both the careful selection of candidate patients and the choice of enteral access remains crucial. A multidisciplinary team approach is recommended. This should include input from a speech and language therapist, a dietitian, clinical nutrition nurse specialist, and a gastroenterologist involved in endoscopic enteral tube insertion [37]. Case-by-case discussions are required with careful documentation of the rationale governing any decisions taken, with due consideration regarding the following: nutrition, quality of life (QOL), overall prognosis, procedural risk, and potential for early discharge. Scoring systems and prognostic indicators may be used as instruments to objectively inform the decision-making process [36, 38 – 40]. Despite all these measures, any decision taken may still be contentious and due consideration should also be given to any safeguarding concern and/or mental capacity issue. Under such circumstances, a "best interests" meeting would be appropriate and any further concern should be referred to the clinical ethics committee, the institution's governing board and, if necessary, the institution's chief executive officer.

There is a growing body of evidence that suggests that patients and carers often overestimate the potential benefits of EN support. This in turn may lead to disappointment with the final outcome and even regret regarding an invasive intervention [41 – 48]. This highlights the importance of preprocedural counselling, empathic management of expectations, and clear documentation.

All cases being considered for percutaneous enteral tube feeding should follow a predefined referral pathway [49 – 51]. The precise structure of the referral pathway will vary depending on local arrangements, but should always include the following elements:

1. A specific referral form
2. Preprocedure assessment (ward visits) by a member of the EN team. This is usually conducted by the dietitian or a clinical nutrition nurse specialist, depending on local provision
3. An assessment form to highlight important parameters including comorbidities, current medication (especially antiplatelet and anticoagulant treatment), allergies, and relevant previous surgical operations
4. A checklist for ward staff detailing the preprocedure protocol (full blood count, coagulation parameters, antibiotic prophylaxis, period of fasting)
5. A mechanism for considering consent issues and their management
6. Documentation regarding the type of tube selected and the feeding regimen recommended
7. Clear arrangements for feeding provision following discharge.

4.3 Enteral tube access modalities

4.3.1 What are the available access routes for an enteral tube?

As previously defined, available access routes include natural orifice access by NGTs or NJTs (inserted through either nostril), as well as orogastric or orojejunal tubes (inserted through the mouth). Because of lesser stimulation of the "gag reflex," the nasal route is generally better tolerated than the oral route, although no data on direct comparison are available.

Percutaneous access refers to percutaneous gastrostomy (gastric access), percutaneous jejunostomy (jejunal access), and gastric access with a jejunal extension. All the above can be performed using endoscopic techniques (PEG, D-PEJ, and PEG-J, respectively) (▶ **Fig. 1**).

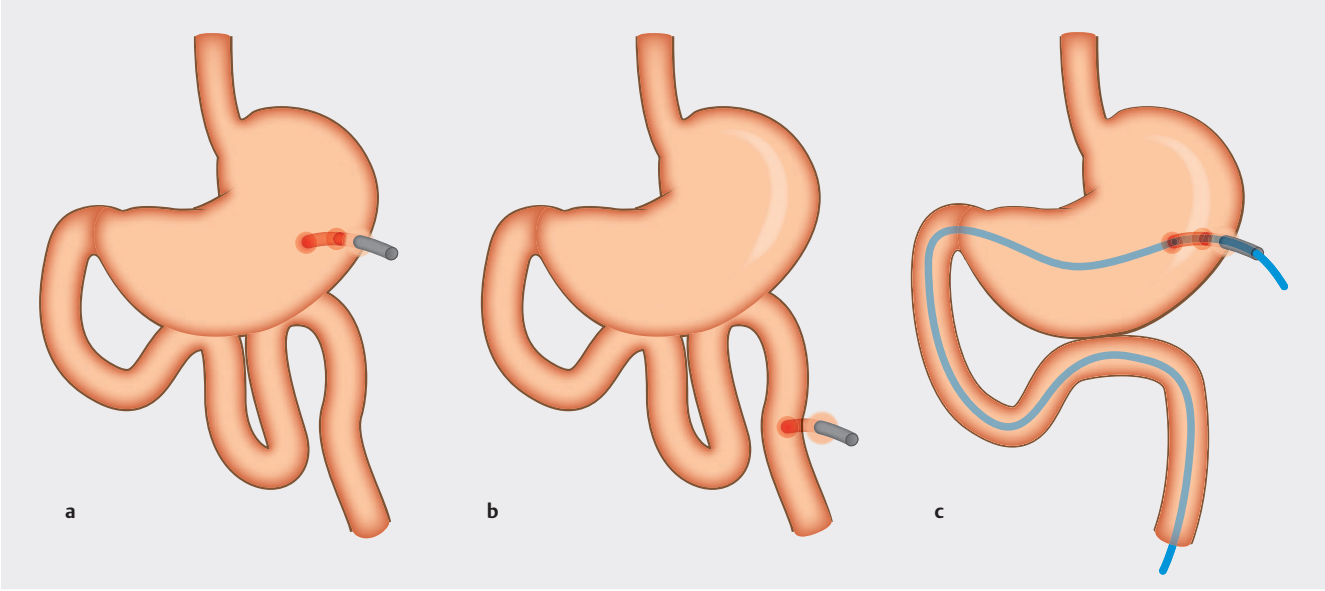
4.3.2 Should a natural orifice or a percutaneous access be used?

RECOMMENDATION

ESGE recommends the use of temporary feeding tubes placed through a natural orifice (either nostril) in patients expected to require EN for less than 4 weeks. If it is anticipated that EN will be required for more than 4 weeks, percutaneous access should be considered, depending on the clinical setting.

Strong recommendation, low quality evidence.

Published data comparing PEG to feeding tubes placed via a natural orifice (mostly nasogastric) involve different clinical settings, including patients with HNC and patients with stroke-related dysphagia. In the HNC setting, four systematic reviews [23, 52 – 54] concluded that body weight may be maintained similarly by either PEG or nasogastric feeding [23, 53] whilst the risk of tube dislodgement is lower [53] and QOL possibly better [55] with PEG. On the other hand, nasogastric feeding was associated with less dysphagia [53], fewer insertion site infections [55], and earlier weaning after completion of radiotherapy [23, 53]. However, in patients with stroke-related dysphagia, three systematic reviews of up to 11 RCTs concluded that the risk of death or dependency did not differ between PEG and nasogastric feeding, whereas PEG was associated with



▶ **Fig. 1** Different percutaneous endoscopic accesses for enteral feeding tubes: **a** percutaneous endoscopic gastrostomy (PEG); **b** direct percutaneous endoscopic jejunostomy (D-PEJ); **c** gastric access with a jejunal extension (percutaneous endoscopic gastrostomy with jejunal extension [PEG-J]).

fewer treatment failures, higher feeding delivery, and improved serum albumin concentration levels [14, 16, 56].

Therefore, most guidelines recommend a temporary feeding tube (NGT or NJT) if the duration of enteral tube feeding is expected to be of the order of less than 4 weeks, and percutaneous feeding if the need for EN is anticipated to be more than 4 weeks [1, 6, 12, 13, 57, 58]. The timeframe of 4 weeks is however an arbitrary cutoff, mainly aimed at avoiding premature PEG placement. Nevertheless, this is less clear in patients with HNC, where PEG insertion could be associated with a higher complication rate when compared with other clinical scenarios [1, 22, 23, 28, 53, 55]; this is covered in greater detail in a dedicated section below.

4.3.3 Should enteral tube access be gastric or jejunal?

RECOMMENDATION

ESGE recommends the gastric route as the primary option in patients in need of EN support. Only in patients with altered/unfavorable gastric anatomy (e. g. after previous surgery), impaired gastric emptying, intolerance to gastric feeding, or with a high risk of aspiration, should the jejunal route be chosen.

Strong recommendation, moderate quality evidence.

Gastric feeding is more physiological than jejunal feeding and well tolerated by most patients. Furthermore, placing feeding tubes into the stomach requires less expertise, can be performed at the patient's bedside, and may therefore reduce any potential delay in initiation of EN [12].

If gastric feeding is poorly tolerated, despite the use of prokinetic drugs, or is impossible to achieve because of anatomical reasons, jejunal feeding would be considered next. Indications for jejunal feeding include: need for enteral feeding in patients with altered gastric anatomy following surgery (e. g. gastrectomy, Roux-en-Y gastric bypass), gastric outlet obstruction, delayed gastric emptying, duodenal obstruction, gastroesophageal reflux, or increased risk of aspiration [12].

Two systematic reviews with meta-analyses on intensive care unit (ICU) patients found that post-pyloric/jejunal feeding is associated with a lower rate of aspiration pneumonia as compared with gastric tube feeding; although there was insufficient evidence for differences in other clinically important outcomes, including other complications, overall mortality, and length of ICU care [59, 60].

In another, more recent meta-analysis comparing NGT and NJT enteral feeding in patients with severe acute pancreatitis however, there were no significant differences in outcome measures including mortality, infectious or digestive complications, achievement of energy balance, and length of hospital stay (▶ **Table 1**) [27, 61].

▶ **Table 1** Indications for tube insertion for enteral nutrition (EN).

Nasoenteral access	
Nasogastric EN	*Nasojejunal EN*
Neurological diseases with dysphagia	Indication for EN + altered anatomy
▪ Stroke	▪ EN indication + previous gastrectomy
▪ Motor neuron disease	▪ EN indication + Roux-en-Y gastric bypass
▪ Cerebral palsy	Severe symptomatic gastroparesis
▪ Parkinson's disease	Gastric outlet syndrome
▪ Head trauma	Severe reflux with risk for aspiration pneumonia
Malignant obstruction	
▪ Head and neck cancer	
▪ Esophageal cancer)	
Benign esophageal strictures	
Acute diseases with hypermetabolism	
▪ Critically ill patients	
▪ Severe burns	
▪ Severe acute pancreatitis	
Chronic diseases with hypermetabolism	
▪ Oncological diseases	
▪ Chronic lung diseases	
▪ Anorexia nervosa	
Percutaneous access	
Percutaneous endoscopic gastrostomy (PEG)	*PEG and jejunal extension (PEG-J) or Direct endoscopic jejunostomy (D-PEJ)*
EN required > 4 weeks	EN required > 4 weeks

4.4 Contraindications to NGT/NJT insertion

RECOMMENDATION

ESGE recommends that mechanical obstruction of the GI tract distal to the site of intended tube placement, active peritonitis, uncorrectable coagulopathy, and ongoing bowel ischemia should be considered to be absolute contraindications for transnasal tube (NGT/NJT) placement for EN.

Strong recommendation, low quality evidence.

RECOMMENDATION

ESGE recommends that unhealed facial fractures, anatomical deformities, recent oronasal surgery, skull fractures with leakage of cerebral spinal fluid, high cervical fractures, and upper digestive obstruction should be considered to be relative contraindications for transnasal tube (NGT/NJT) placement.

Strong recommendation, low quality evidence.

RECOMMENDATION

ESGE recommends adherence to specific guidelines regarding antiplatelet and anticoagulant use, in order to maintain the low hemorrhagic risk of transnasal tube (NGT/NJT) placement.

Strong recommendation, low quality evidence.

Absolute contraindications to tube placement for EN include: mechanical obstruction of the digestive tract (unless the procedure itself is indicated for decompression), active peritonitis, uncorrectable coagulopathy, or ongoing bowel ischemia [5].

Specific problems that may preclude "blind" NGT or NJT insertion include facial fractures, anatomical deformities, recent oronasal surgery, skull fractures with leakage of cerebral spinal fluid, high cervical fractures, and upper digestive obstruction [5].

Regarding the management of anticoagulant or antiplatelet therapy, insertion of a NGT/NJT is considered a low-risk procedure [62]. Therefore, it is recommended to continue P2Y12 receptor antagonists (e. g. clopidogrel), as single or dual antiplatelet therapy (along with aspirin). Anticoagulant therapy should be continued but the international normalized ratio (INR) should not exceed the therapeutic range in the days prior to the insertion.

4.5 Contraindications to percutaneous enteral tube insertion (PEG, PEG-J, or D-PEJ)

RECOMMENDATION

ESGE suggests that recent GI bleeding due to peptic ulcer disease with risk of rebleeding should be considered to be a relative contraindication to percutaneous enteral access procedures, as should hemodynamic or respiratory instability.

Weak recommendation, low quality evidence.

RECOMMENDATION

ESGE suggests that the presence of ascites and ventriculoperitoneal shunts should be considered to be additional risk factors for infection and therefore, further preventive precautions must be taken in these cases.

Weak recommendation, low quality evidence.

RECOMMENDATION

ESGE recommends that percutaneous tube placement (PEG, PEG-J, or D-PEJ) should be considered to be a procedure with high hemorrhagic risk and that, in order to reduce this risk, specific guidelines for antiplatelet or anticoagulant use should be followed strictly.

Strong recommendation, low quality evidence.

The same absolute contraindications for initiating EN also apply to percutaneous enteral access by means of PEG, PEG-J, and D-PEJ. Relative contraindications specific to percutaneous enteral access include recent GI bleeding due to peptic ulcer disease with high risk of rebleeding, as well as hemodynamic and respiratory instability [5].

Percutaneous enteral tube insertion in the presence of ascites is challenging, as the latter may impair maturation of the stomal tract and increase the risk of bacterial peritonitis. A retrospective study of 29 patients with advanced cirrhosis undergoing PEG insertion [63] showed that the presence of ascites may be associated with increased mortality risk. However, a more recent study of 583 patients with cirrhosis (107 with ascites [18.3 %]), did not show any significant difference for bleeding, infection, or mortality in patients with ascites [64]. PEG tubes may be placed successfully after paracentesis, if re-accumulation can be prevented for a period of 7 – 10 days after tube insertion, in order to allow tract maturation. Gastropexy devices could be used to secure the stomach to the anterior abdominal wall and mitigate the risk of fluid re-accumulation [5].

Regarding ventriculoperitoneal shunts (VPSs) and concomitant PEG insertion, a recent systematic review of 208 patients concluded that VPS infection and malfunction rates were 12.5 % and 4.4 %, respectively [65]. VPS infections occurred more frequently among the 55 patients who first had a PEG and a subsequent VPS (21.8 %) and in the 16 patients who had simultaneous PEG tube and VPS placement (50 %) [65]. Therefore, a PEG tube should be preferably placed after the VPS.

Finally, abdominal wall defects such as an open abdomen, the presence of "ostomy" sites or drain tubes, surgical scars, and the presence of adhesions may increase the risk; more careful planning of the potential target location for PEG placement should be given in such cases. Maintaining a distance of at least 2 cm away from any abdominal surgical scar may reduce this additional risk, through attempted avoidance of any interspersed bowel loops, potentially trapped in scar tissue and adhesions between the abdominal wall and the outer surface of the stomach/jejunum [5].

In terms of potential hemorrhagic risk, percutaneous access (PEG, PEG-J, D-PEJ) is considered to be a high-risk procedure [5, 62]. The preprocedure assessment should incorporate laboratory investigations including a full blood count (with particular attention to the platelet count) and coagulation tests; the recommended thresholds are a platelet count of > 50 000/µL and an INR < 1.5 [5]. Management of anticoagulant or antiplatelet therapy depends on the individual patient's thrombotic risk [62]. In the case of low thrombotic risk, P2Y12 receptor antagonists (e. g. clopidogrel) should be discontinued for 5 days before the procedure [62]. In patients on dual antiplatelet therapy, aspirin therapy may be continued [62]. Anticoagulants should be discontinued from 2 to 5 days before the procedure (according to type) and the INR should be below 1.5 [62]. In the case of treatment with direct anticoagulant therapies, these should be stopped from 48 to 72 hours before the procedure, according to the specific type of medication and the individual patient's underlying renal function [62]. Finally, in patients with a high thrombotic risk, aspirin should be continued and a cardiologist should be consulted about the risk/benefit of discontinuing P2Y12 receptor antagonists (e. g. clopidogrel) [62]. In the context of a high thrombotic risk, oral anticoagulants should be discontinued but these should be substituted with low molecular weight heparin according to local policy [62]. Antiplatelet/anticoagulant therapy should be resumed up to 48 hours after the procedure depending on the perceived individual bleeding/thrombotic risks, respectively [62].

4.6 Enteral tube feeding in patients with amyotrophic lateral sclerosis

RECOMMENDATION

ESGE recommends an early percutaneous gastrostomy placement in patients with amyotrophic lateral sclerosis (ALS), if weight loss occurs despite oral nutritional support.

Strong recommendation, low quality evidence.

RECOMMENDATION

ESGE recommends placement of a percutaneous gastrostomy with endoscopic (PEG) or fluoroscopic guidance (RIG) in patients with ALS, according to local expertise and availability.

Strong recommendation, low quality evidence.

Motor neuron disease (including amyotrophic lateral sclerosis [ALS]) causes degeneration of motor neurons and subsequent progressive weakness and wasting of muscles controlling general movement, breathing, and swallowing [17]. Maintaining weight and overall nutritional status in patients with ALS may prolong survival [13]. A recent guideline from the European Society for Clinical Nutrition and Metabolism (ESPEN)

recommends consideration of EN support in all ALS patients in whom nutritional needs cannot be met by oral feeding and in whom it is estimated that malnutrition/dehydration could be responsible for reduced survival [13]. Considering that ALS care is always palliative and prolonged, the decision to start a patient on EN nearly always requires a percutaneous gastrostomy. A recent European survey of 244 patients showed that EN support through a percutaneous gastrostomy was used in 6 % – 23 % [66]. Even though there has been no RCT comparing EN to oral feeding in ALS patients in terms of survival, nutritional status, and QOL, two meta-analyses of 3 [67] and 10 cohort studies [68], respectively, showed a moderate survival advantage for patients with ALS on percutaneous gastrostomy EN support. The most recent analysis specifically showed a beneficial effect in 20-month survival rate (odds ratio [OR] 1.97, 95 %CI 1.21 – 3.21; $P = 0.007$], but no significant effect on 30-day, 10-month, and 30-month survival rates [68]. Moreover, a recent large cohort study of 957 patients with ALS (278 percutaneous gastrostomy users), concluded that percutaneous gastrostomy usage is associated with an overall significantly increased survival in this setting (21 vs. 15 months, $P < 0.001$) [69].

Placement of a percutaneous gastrostomy before the onset of respiratory dysfunction is recommended, ideally when forced vital capacity (FVC) is still above 50 % [70], because of the increased risk of peri- and post-procedural respiratory failure (through the use of sedation and gastric insufflation). Safer placement may still be achieved in patients with a lower FVC, with concomitant noninvasive ventilatory support [71]. As malnutrition is an independent risk factor for death after percutaneous gastrostomy [40], early placement is recommended, potentially even before the threshold of 10 % weight loss, as suggested by the European Federation of Neurological Societies (EFNS) [70].

The ESPEN guideline recommends that percutaneous gastrostomy placement should be discussed at an early stage, and at regular intervals as ALS progresses, according to the evolution of swallowing problems, in order to enhance safety and efficacy. The detection of dysphagia, slower oral feeding, weight loss, poor respiratory function, increased choking risk, and patient wishes should guide the decision for when to place a percutaneous gastrostomy [13].

Radiologically assisted gastrostomy placement may be associated with a lower risk of procedure-associated respiratory failure and has therefore been proposed as the method of first choice in patients with a FVC of < 50 %. A meta-analysis of 7 studies (701 patients) compared PEG with RIG and peroral image-guided gastrostomy [72]. When compared with the RIG or peroral image-guided gastrostomy groups combined, PEG had a lower success rate (88 % vs. 96 %, $P < 0.05$) but was associated with a lower incidence of pain (21 % vs. 41 %, $P < 0.001$). There were no differences in terms of infection rates, 30-day mortality, and overall survival. Another subgroup analysis of patients with ALS in a systematic review comparing PEG and peroral image-guided gastrostomy did not find any difference in terms of mortality and complications [73].

4.7 Enteral tube feeding in patients with head and neck cancers (HNCs)

RECOMMENDATION

ESGE recommends the use of EN with nasogastric or PEG tubes for patients with head and neck tumors requiring treatment by chemoradiation, presenting with dysphagia, reduced oral intake, and significant weight loss.
Strong recommendation, low quality evidence.

RECOMMENDATION

ESGE suggests prophylactic PEG placement for patients with HNC requiring treatment by combined chemoradiation, if they present risk factors suggesting requirement of prolonged tube feeding (> 4 weeks), such as pretreatment weight loss, advanced age, tumor site-related (nasopharyngeal/hypopharyngeal), and high radiation dosage (including bilateral irradiation).
Weak recommendation, low quality evidence.

RECOMMENDATION

ESGE suggests “push” PEG tubes in patients with HNC, to reduce the risk of tumor seeding and metastasis at the PEG site.
Weak recommendation, low quality evidence.

The incidence of malnutrition within the HNC patient population has been reported to range as high as 35 % – 50 %, underlying the need for tube-supported EN [22]. These consequences are more pronounced in high-risk situations, such as a hypopharyngeal primary site, T4 tumor, female gender, or combined chemoradiation leading to a risk of severe radiation-induced oral mucositis [28]. EN is required in the cases of dysphagia, reduced oral intake, and significant weight loss despite oral supplementation [28]. Four systematic reviews [23, 52 – 54] concluded that body weight may be maintained similarly by both PEG and nasogastric feeding [23, 53] whilst the risk of tube dislodgment is lower [53] and QOL better [55] with PEG. Conversely, NGTs were associated with less dysphagia [53], less infection relating to insertion [55] and earlier weaning after completion of radiotherapy [23, 53]. Nevertheless, the latter issues seemed to be a minor problem in a recent retrospective study of 250 patients with PEG, revealing a PEG dependency of only 3 % (6 % at 1 year after treatment) [74].

The high infection rate (up to 41 %) [75, 76] related to PEG insertion during treatment can lead to chemoradiotherapy interruption, and therefore a significant loss of tumor control rate [54]. Based on this concern, the strategy of placing a prophylactic PEG has been explored. A recent systematic review of 7 studies (4 retrospective, 1 prospective, and 2 RCTs) compared

prophylactic PEG to reactive PEG (placed during treatment if required) in patients with HNC undergoing combined chemoradiotherapy [54]. Prophylactic PEG placement appeared to be associated with less weight loss, a higher QOL and fewer adverse events than reactive placement [54]. Up to 11 % – 30 % required reactive PEG placement, because of signs of malnutrition during treatment [54]. Risk factors included advanced age, higher percentage weight loss at diagnosis, and radiation dose to the pharyngeal constrictor muscles [54]. A prospective study comparing prophylactic and reactive PEG in patients at high nutritional risk (with oral/oropharyngeal cancer requiring bilateral chemoradiation, nasopharyngeal/hypopharyngeal site, or an unknown primary tumor requiring chemoradiation, and/or severe malnutrition at presentation) found that prophylactic PEG placement improved nutritional outcomes and reduced unplanned hospital admissions [77]. Lastly, a retrospective study of 450 patients with HNC requiring chemoradiotherapy (294/450, 65 % warranting tube feeding for > 4 weeks), developed a predictive model to identify which subgroup of patients may benefit from a prophylactic PEG. The following parameters were included in the final model: body mass index and adjusted diet at start of treatment, percentage weight change at baseline, performance status, tumor site (oropharynx, pharynx, hypopharynx), higher TNM classification score, and mean radiation dose on the contralateral submandibular/parotid glands [78].

In summary, based on the present data, according to recent guidelines both PEG and NGT feeding can be provided for patients with obstructive HNC [22, 28, 79]. Prophylactic PEG may be proposed in the case of pre-existing risk factors that predict tube feeding of duration > 4 weeks.

Regarding the choice between endoscopic (PEG) and fluoroscopically assisted insertion (RIG), a meta-analysis of 2379 percutaneous gastrostomy placements in HNC patients revealed mortality rates of 2.2 % (95 %CI 1.4 % – 3.4 %) following PEG and 1.8 % (95 %CI 1.0 % – 3.2 %) following RIG. Furthermore, major complication rates following PEG were 7.4 % (95 %CI 5.9 % – 9.3 %) and 8.9 % (95 %CI 7.0 % – 11.2 %) after RIG, respectively; peritonitis was the most frequent major adverse event [80]. A subgroup analysis of HNC patients in a systematic review comparing PEG and RIG found lower rates of procedure-related mortality and infection- and tube-related complications with the former [73].

Although rare, metastasis to the PEG site in patients with upper aerodigestive tract malignancies is a dramatic adverse effect, especially in patients who have achieved remission with initial oncological treatment [81]. A recent meta-analysis including 121 cases, calculated the overall rate for this event to be of the order of 0.5 % (95 %CI 0.4 % – 0.7 %). Subgroup analysis showed event rates of 0.56 % (95 %CI 0.40 % – 0.79 %) with the "pull" technique and 0.29 % (95 %CI, 0.15 % – 0.55 %) with the "push" technique [81]. Late-stage disease (T3/T4) and lymph node involvement are additional risk factors. Therefore, the "push" technique should be preferred, and the PEG site should be regularly monitored. Further technical aspects of both "push" and "pull" techniques will be considered in the second part of this Guideline.

4.8 Enteral tube feeding in patients with dementia or reserved prognosis

RECOMMENDATION

ESGE recommends refraining from PEG placement in patients with advanced dementia.

Strong recommendation, low quality evidence.

RECOMMENDATION

ESGE recommends refraining from PEG placement in patients with a life expectancy shorter than 30 days.

Strong recommendation, low quality evidence.

Placement of enteral feeding tubes may appear to be a minor intervention, but the procedure may lead to complications, especially in patients who are in poor condition. Both a large retrospective [82] and another prospective [83] study, including 495 and 484 patients, respectively, reported a 30-day mortality ranging from 9 % to 12 %. Worth noting is that 1.6 % of patients died within 7 days of PEG insertion from causes unrelated to the procedure [82]. If a patient has a life expectancy shorter than 30 days, it is doubtful both from an ethical and a medical perspective whether the patient should receive a PEG tube, since the potential short benefit of EN is unlikely to justify any associated discomfort and complication risk.

The use of enteral feeding tubes in patients with advanced dementia poses a controversial ethical issue [21, 84]. Advanced stages of dementia are often associated with reduced oral intake, which leads to weight loss, and up to 50 % mortality at 6 months [85]. In these situations, caregivers and families are confronted with the dilemma regarding tube feeding to offer adequate nourishment for these patients. Nevertheless, assisted nutrition and hydration are considered medical interventions and not assimilated into the basic provision of food and fluids. Furthermore, patients with advanced dementia do not seem to suffer from hunger or thirst [86]. The American Geriatric Society Ethics Committee (AGSEC) do not recommend placement of feeding tubes in adults with advanced dementia when eating difficulties arise, but underline the importance of hand-feeding [87]. Additionally, there is no benefit in terms of physical functionality, reduction of pressure ulcers, or nutritional parameters [88]. Furthermore, patients with dementia in whom a PEG tube is placed have a 49 % increase in mortality risk as compared with patients without dementia [86]. ESPEN also recommends that patients with advanced dementia should be hand-fed, but underlines the potential dissimilarities among countries and cultures, which must also be taken into account. ESPEN also emphasizes the importance of accurately informing patients and their relatives about the potential benefits, risks and limitations [84].

4.9 Enteral tube feeding and QOL

RECOMMENDATION

ESGE recommends informing patients and when appropriate, relatives, about the potential benefits, risks, and limitations of enteral feeding tube placement. Informed consent should be sought from all patients if possible. Strong recommendation, low quality evidence.

A prospective study involving 104 patients who completed a questionnaire about their experience of living with a PEG, revealed that PEG feeding was considered time-consuming and an interference in their daily life [89]. The rate of dissatisfaction regarding PEG feeding reached 20 % [89]. The aforementioned perception depended on gender, age, education, and underlying diagnosis. Women reported a more negative experience [89]. A recent systematic review of 14 papers focused on the effect of enteral tube feeding on the health-related QOL of patients [90]. Overall, 9 of these studies reported an improvement in QOL, while the other 5 studies demonstrated either no significant difference or a reduction in QOL. Several confounding factors which may have influenced these outcomes however, were a heterogeneity in the type of PEG tubes and EN methods used (including duration of connection to the enteral feed/pump), and the underlying medical conditions of included patients [90].

Differences in expectations and experiences regarding enteral tubes may also depend on patient age, gender, indication for EN, and type of tube utilized. It is therefore of utmost importance that patients, and when appropriate their relatives, receive accurate information about potential benefits, limitations, and adverse events relating to enteral tube insertion and EN. With respect to different national policies, an informed consent should be sought from all patients if possible either through written consent or a formal statement in the patient's health record [1].

Acknowledgment

The authors are grateful to Dr. Robert Verdonk of the Department of Gastroenterology and Hepatology, St Antonius Hospital, Nieuwegein, The Netherlands, and Dr Cesare Hassan of the Gastroenterology Unit, Nuovo Regina Margherita Hospital, Rome, Italy, for their review of the manuscript.

Competing interests

T. Beyna receives consultancy honoraria and lecture fees from Olympus and Boston Scientific (ongoing), and lecture fees from Medtronic, the Falk Foundation, and Erbe (ongoing). E.J. Despott has received consultancy fees and speaker's honoraria from Boston Scientific, Ambu, and Fujifilm (2007 to 2019); his department has received educational grants from Fujifilm, Pentax, Olympus, Boston Scientific, Norgine, Cook, Erbe, Medtronic, Ankon, Diagmed, and US Endoscopy (2017 to 2019). S.M. Schneider has been a board member for Nutricia France (2016 to 2018); he has been or is a consultant for Laboratoires Grand Fontaine (2013), Nestlé Health Sciences (2020), and Baxter (2019). J.E. van Hooft has received lecture fees from Medtronic (2014 to 2015, 2019) and Cook Medical (2019), and consultancy fees from Boston Scientific (2014 to 2017); her department has received research grants from Cook Medical (2014 to 2019), and Abbott (2014 to 2017). M. Arvanitakis, A. Ballarin, K. Boeykens, P. Elbe, I. Gisbertz, P. Gkolfakis, A. Hoyois, O. Mosteanu, D. Sanders, and P. Thelin-Schmidt declare that they have no conflicts of interest.

References

[1] Bischoff SC, Austin P, Boeykens K et al. ESPEN guideline on home enteral nutrition. Clin Nutr 2020; 39: 5–22

[2] Kurien M, Westaby D, Romaya C et al. National survey evaluating service provision for percutaneous endoscopic gastrostomy within the UK. Scand J Gastroenterol 2011; 46: 1519–1524

[3] Hucl T, Spicak J. Complications of percutaneous endoscopic gastrostomy. Best Pract Res Clin Gastroenterol 2016; 30: 769–781

[4] Dumonceau JM, Hassan C, Riphaus A et al. European Society of Gastrointestinal Endoscopy (ESGE) guideline development policy. Endoscopy 2012; 44: 626–629

[5] Itkin M, DeLegge MH, Fang JC et al. Multidisciplinary practical guidelines for gastrointestinal access for enteral nutrition and decompression from the Society of Interventional Radiology and American Gastroenterological Association (AGA) Institute, with endorsement by Canadian Interventional Radiological Association (CIRA) and Cardiovascular and Interventional Radiological Society of Europe (CIRSE). Gastroenterology 2011; 141: 742–765

[6] Toussaint E, Van Gossum A, Ballarin A et al. Enteral access in adults. Clin Nutr 2015; 34: 350–358

[7] Ponsky JL. The development of PEG: How it was. J Interv Gastroenterol 2011; 1: 88–89

[8] Preshaw RM. A percutaneous method for inserting a feeding gastrostomy tube. Surg Gynecol Obstet 1981; 152: 658–660

[9] Gauderer MW, Ponsky JL, Izant RJ et al. Gastrostomy without laparotomy: a percutaneous endoscopic technique. J Pediatr Surg 1980; 15: 872–875

[10] Kurien M, Williams J, Sanders DS. Malnutrition in healthcare settings and the role of gastrostomy feeding. Proc Nutr Soc 2017; 76: 352–360

[11] Moran C, O'Mahony S. When is feeding via a percutaneous endoscopic gastrostomy indicated? Curr Opin Gastroenterol 2015; 31: 137–142

[12] McClave SA, DiBaise JK, Mullin GE et al. ACG Clinical Guideline: Nutrition therapy in the adult hospitalized patient. Am J Gastroenterol 2016; 111: 315–334 ; quiz 335

[13] Burgos R, Breton I, Cereda E et al. ESPEN guideline clinical nutrition in neurology. Clin Nutr 2018; 37: 354–396

[14] Dennis MS, Lewis SC, Warlow C et al. Effect of timing and method of enteral tube feeding for dysphagic stroke patients (FOOD): a multicentre randomised controlled trial. Lancet 2005; 365: 764–772

[15] Galovic M, Stauber AJ, Leisi N et al. Development and validation of a prognostic model of swallowing recovery and enteral tube feeding after ischemic stroke. JAMA Neurol 2019; 76: 561–570

[16] Geeganage C, Beavan J, Ellender S et al. Interventions for dysphagia and nutritional support in acute and subacute stroke. Cochrane Database Syst Rev 2012; 10: CD000323

[17] Stavroulakis T, McDermott CJ. Enteral feeding in neurological disorders. Pract Neurol 2016; 16: 352–361

[18] Bertoncelli CM, Altamura P, Vieira ER et al. Predictive model for gastrostomy placement in adolescents with developmental disabilities and cerebral palsy. Nutr Clin Pract 2020; 35: 149–156

[19] Gantasala S, Sullivan PB, Thomas AG. Gastrostomy feeding versus oral feeding alone for children with cerebral palsy. Cochrane Database Syst Rev 2013: doi:10.1002/14651858.CD003943.pub3

[20] Ohbe H, Jo T, Matsui H et al. Early enteral nutrition in patients with severe traumatic brain injury: a propensity score-matched analysis using a nationwide inpatient database in Japan. Am J Clin Nutr 2020; 111: 378–384

[21] Ayman AR, Khoury T, Cohen J et al. PEG insertion in patients with dementia does not improve nutritional status and has worse outcomes as compared with PEG insertion for other indications. J Clin Gastroenterol 2017; 51: 417–420

[22] Gill A, Givi B, Moore MG. AHNS Series – Do you know your guidelines?: Assessment and management of malnutrition in patients with head and neck cancer: Review of the NCCN Clinical Practice Guidelines In Oncology (NCCN Guidelines) Head Neck 2019; 41: 577–583

[23] Nugent B, Lewis S, O'Sullivan JM. Enteral feeding methods for nutritional management in patients with head and neck cancers being treated with radiotherapy and/or chemotherapy. Cochrane Database Syst Rev 2013: doi:10.1002/14651858.CD007904.pub3

[24] Spaander MC, Baron TH, Siersema PD et al. Esophageal stenting for benign and malignant disease: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. Endoscopy 2016; 48: 939–948

[25] Singer P, Blaser AR, Berger MM et al. ESPEN guideline on clinical nutrition in the intensive care unit. Clin Nutr 2019; 38: 48–79

[26] Chourdakis M, Bouras E, Shields BA et al. Nutritional therapy among burn injured patients in the critical care setting: An international multicenter observational study on "best achievable" practices. Clin Nutr 2020: doi:10.1016/j.clnu.2020.04.023

[27] Arvanitakis M, Dumonceau JM, Albert J et al. Endoscopic management of acute necrotizing pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) evidence-based multidisciplinary guidelines. Endoscopy 2018; 50: 524–546

[28] Arends J, Bachmann P, Baracos V et al. ESPEN guidelines on nutrition in cancer patients. Clin Nutr 2017; 36: 11–48

[29] Gomes F, Schuetz P, Bounoure L et al. ESPEN guidelines on nutritional support for polymorbid internal medicine patients. Clin Nutr 2018; 37: 336–353

[30] Rizzo SM, Douglas JW, Lawrence JC. Enteral nutrition via nasogastric tube for refeeding patients with anorexia nervosa: A systematic review. Nutr Clin Pract 2019; 34: 359–370

[31] Felsher J, Chand B, Ponsky J. Decompressive percutaneous endoscopic gastrostomy in nonmalignant disease. Am J Surg 2004; 187: 254–256

[32] Singh Curry R, Evans E, Raftery AM et al. Percutaneous venting gastrostomy/gastrojejunostomy for malignant bowel obstruction: a qualitative study. BMJ Support Palliat Care 2019; 9: 381–388

[33] Thampy S, Najran P, Mullan D et al. Safety and efficacy of venting gastrostomy in malignant bowel obstruction: a systematic review. J Palliat Care 2020; 35: 93–102

[34] Kirby DF, Raheem SA, Corrigan ML. Nutritional interventions in chronic intestinal pseudoobstruction. Gastroenterol Clin North Am 2018; 47: 209–218

[35] Camilleri M, Parkman HP, Shafi MA et al. Clinical guideline: management of gastroparesis. Am J Gastroenterol 2013; 108: 18–37; quiz 38

[36] Kurien M, Leeds JS, Delegge MH et al. Mortality among patients who receive or defer gastrostomies. Clin Gastroenterol Hepatol 2013; 11: 1445–1450

[37] Hvas CL, Farrer K, Blackett B et al. Reduced 30-day gastrostomy placement mortality following the introduction of a multidisciplinary nutrition support team: a cohort study. J Hum Nutr Diet 2018; 31: 413–421

[38] Leeds J, McAlindon ME, Grant J et al. Albumin level and patient age predict outcomes in patients referred for gastrostomy insertion: internal and external validation of a gastrostomy score and comparison with artificial neural networks. Gastrointest Endosc 2011; 74: 1033–1039, e1031-1033; quiz 1115 e1031-1034

[39] Holt DQ, McDonald JF, Murray ML et al. Clinical selection criteria can predict futile intervention in patients referred for percutaneous endoscopic gastrostomy insertion. Intern Med J 2015; 45: 648–652

[40] Barone M, Viggiani MT, Introna A et al. Nutritional prognostic factors for survival in amyotrophic lateral sclerosis patients undergone percutaneous endoscopic gastrostomy placement. Amyotroph Lateral Scler Frontotemporal Degener 2019; 20: 490–496

[41] Madigan SM, Fleming P, McCann S et al. General practitioners involvement in enteral tube feeding at home: a qualitative study. BMC Fam Pract 2007; 8: 29

[42] Jaafar MH, Mahadeva S, Morgan K et al. Systematic review of qualitative and quantitative studies on the attitudes and barriers to percutaneous endoscopic gastrostomy feeding. Clin Nutr 2016; 35: 1226–1235

[43] Kurien M, Andrews RE, Tattersall R et al. Gastrostomies preserve but do not increase quality of life for patients and caregivers. Clin Gastroenterol Hepatol 2017; 15: 1047–1054

[44] Kuraoka Y, Nakayama K. Factors influencing decision regret regarding placement of a PEG among substitute decision-makers of older persons in Japan: a prospective study. BMC Geriatr 2017; 17: 134

[45] Pineda-Cortes D, Paz-Rodriguez F, Trujillo-de Los Santos Z et al. Exploratory study on gastrostomy in patients with neurological diseases: usefulness and impact. Neurologia 2019: doi:10.1016/j.nrl.2019.04.003

[46] Mohandas N, Kumar R, Leelakrishnan V et al. International survey of physicians' perspectives on percutaneous endoscopic gastrostomy tube feeding in patients with dementia and review of literature. Cureus 2019; 11: e4578

[47] Sezer RE, Ozdemir KokenZ, Senol CelikS. Home percutaneous endoscopic gastrostomy feeding: difficulties and needs of caregivers, qualitative study. JPEN J Parenter Enteral Nutr 2020; 44: 525–533

[48] Ang SY, Lim ML, Ng XP et al. Patients and home carers' experience and perceptions of different modalities of enteral feeding. J Clin Nurs 2019; 28: 3149–3157

[49] Sanders DS, Carter MJ, D'Silva J et al. Percutaneous endoscopic gastrostomy: a prospective audit of the impact of guidelines in two district general hospitals in the United Kingdom. Am J Gastroenterol 2002; 97: 2239–2245

[50] Skitt LC, Hurley JJ, Turner JK et al. Helping the general physician to improve outcomes after PEG insertion: how we changed our practice. Clin Med (Lond) 2011; 11: 132–137

[51] Fessler TA, Short TB, Willcutts KF et al. Physician opinions on decision making for percutaneous endoscopic gastrostomy (PEG) feeding tube placement. Surg Endosc 2019; 33: 4089–4097

[52] Paleri V, Roe JW, Strojan P et al. Strategies to reduce long-term post-chemoradiation dysphagia in patients with head and neck cancer: an evidence-based review. Head Neck 2014; 36: 431–443

[53] Wang J, Liu M, Liu C et al. Percutaneous endoscopic gastrostomy versus nasogastric tube feeding for patients with head and neck cancer: a systematic review. J Radiat Res 2014; 55: 559–567

[54] McClelland S3rd, Andrews JZ, Chaudhry H et al. Prophylactic versus reactive gastrostomy tube placement in advanced head and neck cancer treated with definitive chemoradiotherapy: A systematic review. Oral Oncol 2018; 87: 77–81

[55] Corry J. Feeding tubes and dysphagia: cause or effect in head and neck cancer patients. J Med Imaging Radiat Oncol 2009; 53: 431–432

[56] Gomes CAJr., Andriolo RB, Bennett C et al. Percutaneous endoscopic gastrostomy versus nasogastric tube feeding for adults with swallowing disturbances. Cochrane Database Syst Rev 2015: doi:10.1002/14651858.CD008096.pub4

[57] Weimann A, Braga M, Carli F et al. ESPEN guideline: Clinical nutrition in surgery. Clin Nutr 2017; 36: 623–650

[58] Volkert D, Beck AM, Cederholm T et al. ESPEN guideline on clinical nutrition and hydration in geriatrics. Clin Nutr 2019; 38: 10–47

[59] Alkhawaja S, Martin C, Butler RJ et al. Post-pyloric versus gastric tube feeding for preventing pneumonia and improving nutritional outcomes in critically ill adults. Cochrane Database Syst Rev 2015: doi:10.1002/14651858.CD008875.pub2

[60] Sajid MS, Harper A, Hussain Q et al. An integrated systematic review and meta-analysis of published randomized controlled trials evaluating nasogastric against postpyloris (nasoduodenal and nasojejunal) feeding in critically ill patients admitted in intensive care unit. Eur J Clin Nutr 2014; 68: 424–432

[61] Zhu Y, Yin H, Zhang R et al. Nasogastric nutrition versus nasojejunal nutrition in patients with severe acute pancreatitis: a meta-analysis of randomized controlled trials. Gastroenterol Res Pract 2016; 2016: 6430632

[62] Veitch AM, Vanbiervliet G, Gershlick AH et al. Endoscopy in patients on antiplatelet or anticoagulant therapy, including direct oral anticoagulants: British Society of Gastroenterology (BSG) and European Society of Gastrointestinal Endoscopy (ESGE) guidelines. Endoscopy 2016; 48: 385–402

[63] Baltz JG, Argo CK, Al-Osaimi AM et al. Mortality after percutaneous endoscopic gastrostomy in patients with cirrhosis: a case series. Gastrointest Endosc 2010; 72: 1072–1075

[64] Al-Abboodi Y, Ridha A, Fasullo M et al. Risks of PEG tube placement in patients with cirrhosis-associated ascites. Clin Exp Gastroenterol 2017; 10: 211–214

[65] Oterdoom LH, Marinus Oterdoom DL, Ket JCF et al. Systematic review of ventricular peritoneal shunt and percutaneous endoscopic gastrostomy: a safe combination. J Neurosurg 2017; 127: 899–904

[66] Andersen PM, Kuzma-Kozakiewicz M, Keller J et al. Therapeutic decisions in ALS patients: cross-cultural differences and clinical implications. J Neurol 2018; 265: 1600–1606

[67] Katzberg HD, Benatar M. Enteral tube feeding for amyotrophic lateral sclerosis/motor neuron disease. Cochrane Database Syst Rev 2011: doi:10.1002/14651858.CD004030.pub3

[68] Cui F, Sun L, Xiong J et al. Therapeutic effects of percutaneous endoscopic gastrostomy on survival in patients with amyotrophic lateral sclerosis: A meta-analysis. PLoS One 2018; 13: e0192243

[69] Bond L, Ganguly P, Khamankar N et al. A comprehensive examination of percutaneous endoscopic gastrostomy and its association with amyotrophic lateral sclerosis patient outcomes. Brain Sci 2019; 9: 223

[70] EFNS Task Force on Diagnosis and Management of Amyotrophic Lateral Sclerosis. Andersen PM, Abrahams S, Borasio GD et al. EFNS guidelines on the clinical management of amyotrophic lateral sclerosis (MALS) – revised report of an EFNS task force. Eur J Neurol 2012; 19: 360–375

[71] Kak M, Issa NP, Roos RP et al. Gastrostomy tube placement is safe in advanced amyotrophic lateral sclerosis. Neurol Res 2017; 39: 16–22

[72] Yang B, Shi X. Percutaneous endoscopic gastrostomy versus fluoroscopic gastrostomy in amyotrophic lateral sclerosis (ALS) sufferers with nutritional impairment: A meta-analysis of current studies. Oncotarget 2017; 8: 102244–102253

[73] Strijbos D, Keszthelyi D, Bogie RMM et al. A systematic review and meta-analysis on outcomes and complications of percutaneous endoscopic versus radiologic gastrostomy for enteral feeding. J Clin Gastroenterol 2018; 52: 753–764

[74] Fraser A, Odelli C, Britton B et al. Gastrostomy dependency trends over 15 years of patients at a large tertiary referral center following the insertion of a prophylactic gastrostomy for chemoradiation for mucosal head and neck cancer. Asia Pac J Clin Oncol 2020; 16: e198–e206doi:10.1111/ajco.13342

[75] Corry J, Poon W, McPhee N et al. Prospective study of percutaneous endoscopic gastrostomy tubes versus nasogastric tubes for enteral feeding in patients with head and neck cancer undergoing (chemo) radiation. Head Neck 2009; 31: 867–876

[76] Hausmann J, Kubesch A, Muller von der Grun J et al. Prophylactic percutaneous endoscopic gastrostomy in patients with head and neck cancer: Influence on nutritional status, utilisation rate and complications. Int J Clin Pract 2019; 73: e13405

[77] Brown TE, Banks MD, Hughes BGM et al. Comparison of nutritional and clinical outcomes in patients with head and neck cancer undergoing chemoradiotherapy utilizing prophylactic versus reactive nutrition support approaches. J Acad Nutr Diet 2018; 118: 627–636

[78] Willemsen ACH, Kok A, van Kuijk SMJ et al. Prediction model for tube feeding dependency during chemoradiotherapy for at least four weeks in head and neck cancer patients: A tool for prophylactic gastrostomy decision making. Clin Nutr 2019: doi:10.1016/j.clnu.2019.11.033

[79] Talwar B, Donnelly R, Skelly R et al. Nutritional management in head and neck cancer: United Kingdom National Multidisciplinary Guidelines. J Laryngol Otol 2016; 130: S32–S40

[80] Grant DG, Bradley PT, Pothier DD et al. Complications following gastrostomy tube insertion in patients with head and neck cancer: a prospective multi-institution study, systematic review and meta-analysis. Clin Otolaryngol 2009; 34: 103–112

[81] Siu J, Fuller K, Nadler A et al. Metastasis to gastrostomy sites from upper aerodigestive tract malignancies: a systematic review and meta-analysis. Gastrointest Endosc 2020; 91: 1005–1014 e1017

[82] Vujasinovic M, Ingre C, Baldaque Silva F et al. Complications and outcome of percutaneous endoscopic gastrostomy in a high-volume centre. Scand J Gastroenterol 2019; 54: 513–518

[83] Blomberg J, Lagergren P, Martin L et al. Albumin and C-reactive protein levels predict short-term mortality after percutaneous endoscopic gastrostomy in a prospective cohort study. Gastrointest Endosc 2011; 73: 29–36

[84] Druml C, Ballmer PE, Druml W et al. ESPEN guideline on ethical aspects of artificial nutrition and hydration. Clin Nutr 2016; 35: 545–556

[85] Mitchell SL, Teno JM, Kiely DK et al. The clinical course of advanced dementia. N Engl J Med 2009; 361: 1529–1538

[86] van Bruchem-Visser RL, Mattace-Raso FUS, de Beaufort ID et al. Percutaneous endoscopic gastrostomy in older patients with and without dementia: Survival and ethical considerations. J Gastroenterol Hepatol 2019; 34: 736–741

[87] American Geriatrics Society Ethics Committeee, Clinical Practice and Models of Care Committee. American Geriatrics Society feeding tubes in advanced dementia position statement. J Am Geriatr Soc 2014; 62: 1590–1593

[88] Sampson EL, Candy B, Jones L. Enteral tube feeding for older people with advanced dementia. Cochrane Database Syst Rev 2009: doi:10.1002/14651858.CD007209.pub2

[89] Martin L, Blomberg J, Lagergren P. Patients' perspectives of living with a percutaneous endoscopic gastrostomy (PEG). BMC Gastroenterol 2012; 12: 126

[90] Ojo O, Keaveney E, Wang XH et al. The effect of enteral tube feeding on patients' health-related quality of life: A systematic review. Nutrients 2019; 11: 1046doi:10.3390/nu11051046

