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Transnasal esogastroduodenoscopy (EGD): comparison with conventional EGD and new applications

Massimo Maffei, Jean-Marc Dumonceau

Division of Gastroenterology and Hepatology, Geneva University Hospitals, Geneva, Switzerland

Summary

Technical improvements have allowed to significantly reduce the diameter of endoscopes used to examine the upper gastrointestinal tract. Hence, transnasal introduction of endoscopes used to perform a standard esogastroduodenoscopy (EGD) has become possible. Transnasal EGD (T-EGD) is better tolerated by patients than conventional EGD (C-EGD), and it presents the advantage of requiring no sedation in most patients (and, consequently, to reduce associated costs). However, the reduction in endoscope diameter has been obtained at the expense of a somewhat inferior image quality and a smaller biopsy channel diameter. Specific diagnostic and therapeutic applications taking advantage of the transnasal approach have also recently emerged (e.g., cholangioscopy placement of feeding tubes or of nasobiliary drains). The technique, feasibility, patient tolerance to unsedated procedure, diagnostic accuracy, costs, and novel therapeutic applications of T-EGD are reviewed.

Key words: endoscopes; gastrointestinal/standards; endoscopy; gastrointestinal/methods; stomach diseases/diagnosis; patient satisfaction; conscious sedation/contraindications

Introduction

Esogastroduodenoscopy (EGD) is a cardinal procedure to investigate many common digestive symptoms such as abdominal pain, heartburn, dyspepsia and dysphagia. In Switzerland, 77% of EGDs are performed under sedation using midazolam or, more recently, propofol that provides deeper sedation and faster recovery [1]. Although sedation improves patient tolerance, it presents significant drawbacks, including morbidity (mainly from respiratory depression) and costs related to patient monitoring [1–3]. Transnasal EGD has been proposed in 1994 by Shaker to improve patient tolerance to EGD, and so to allow unsedated procedures in a majority of patients [4]. The use of this approach by gastroenterologists sharply varies between countries: while it is dramatically increasing in Japan (half of endoscopes sold in this country are small-diameter models, likely because of the high number of endoscopic screening procedures for gastric cancer in this country), the adoption of this technique in Western countries has been slower [5].

Here, we review the technical aspects, feasibility, diagnostic accuracy, side effects, patient tolerance and acceptance of diagnostic T-EGD, as well as therapeutic applications that have more recently been proposed for this technique.

Technique

As for C-EGD, patients should fast 6 hours before undergoing unsedated T-EGD (UT-EGD). In contrast with conventional EGD (C-EGD), no intravenous line is placed on a routine basis and the procedure may be performed with the patient either seated or in the left lateral position (similar to C-EGD). Nasopharyngeal anaes-

Abbreviations

EGD	esogastroduodenoscopy
T-EGD	transnasal esogastroduodenoscopy
UT-EGD	unsedated transnasal esogastroduodenoscopy
C-EGD	conventional esogastroduodenoscopy
PEG	percutaneous endoscopic gastrostomy

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thesia is usually performed using a 2% lidocaine gel (the patient first sniffs lidocaine, and this is then applied into the nasal cavity by introducing a cotton-tipped swab) or, less frequently, cocaine. A few minutes after local anaesthesia, the endoscope is inserted through the most patent nostril (if insertion fails, it is attempted through the other nostril, and then through the mouth). A standard EGD, including biopsy sampling if indicated, is performed (fig. 1). Patients in the seated position are able to look at live endoscopic images on a videoscreen, and they are encouraged to discuss endoscopic findings with the endoscopist during the examination (speak ability is preserved with small-diameter endoscopes).

Unsedated T-EGD lasts between 5 and 15 minutes [6–23]. This is slightly longer than C-EGD because navigation through the nasal cavity is more technically demanding than through the mouth and inflation/sucking capabilities of small-diameter endoscopes are weaker compared to those of conventional models. However, when patient preparation and post-procedural monitoring after sedation are taken into consideration, UT-EGD is shorter than sedated C-EGD [24].

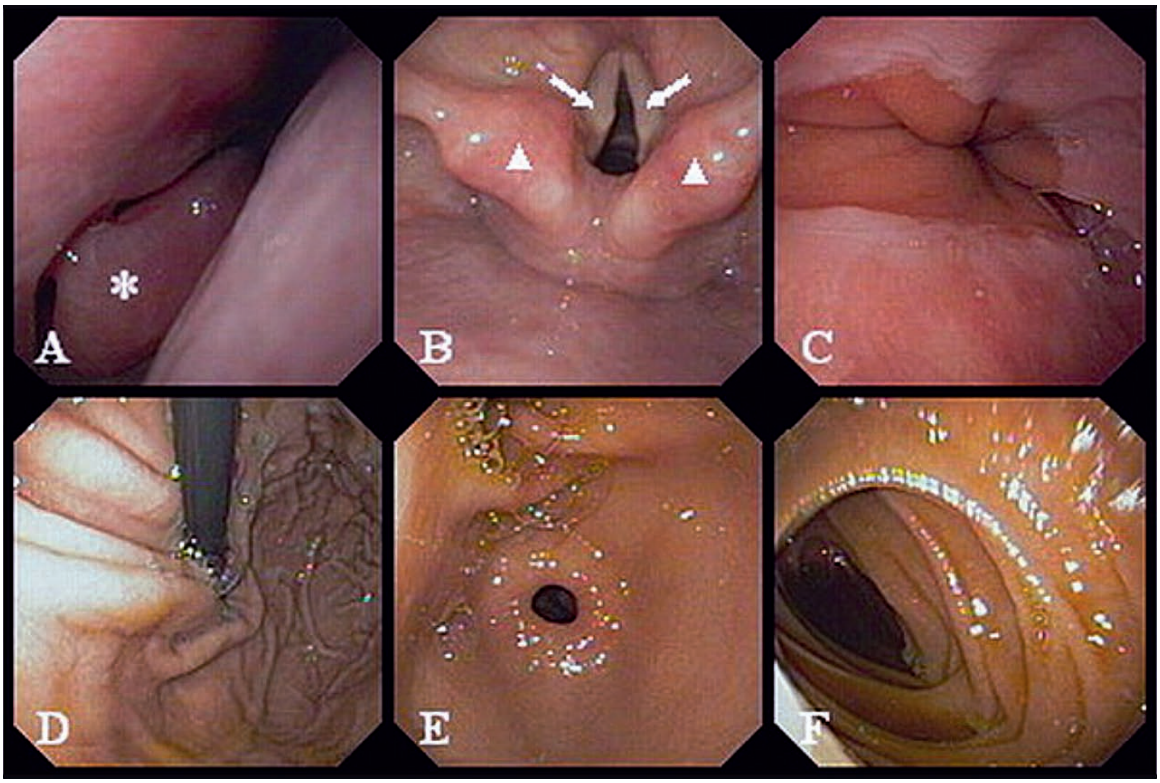

Figure 1

Transnasal-EGD.
A. Nasal cavity (*, inferior nasal concha);
B. Larynx (▲, arytenoids; arrows, vocal cords);
C. Oesogastric mucosal junction;
D. Gastric fundus, retroflexion view.
E. Gastric antrum.
F. Second portion of the duodenum.

Procedure feasibility, side effects and patient tolerance

Unsedated T-EGD has been successful in >90% of patients only if the most recent, thinnest, endoscopes were used because nasal anatomy may impede the passage of the endoscope. The diameter of the endoscope has been identified as one of the main success factors for UT-EGD: an endoscope diameter ≤5.3 mm is associated with successful transnasal intubation in 90–100% of cases, as compared to 78–100% with larger endoscope models [4, 6–40]. In a study that included >1000 patients, two other factors were independently associated with procedure failure in multivariate analysis: female gender and young (<35 years) age [25]. If insertion through both nostrils fails, the unsedated peroral route can be used with the same endoscope. Patient tolerance may however be inferior to the transnasal route [6, 8, 10, 12–14, 20, 21].

As unsedated transnasal esophagoscopy is generally well tolerated and requires no post-procedure surveillance, this examination has gained wide popularity as an office procedure among otolaryngologists [41]. Examination is usually performed using a short endoscope and limited to the oesophagus (patients with reflux symptoms alone are unlikely to have a major pathological finding in the stomach or duodenum [42]). In a large study, main indications for unsedated transnasal oesophagoscopy by otolaryngologists included gastro-oesophageal reflux symptoms, globus and dysphagia [43]. This option may avoid referral to a gastroenterologist, for example for the numerous patients who seek advice from an otolaryngologist for atypical reflux symptoms.

Epistaxis represents the most frequent side-effect of T-EGD, but it is self-limited in most

cases. Thinner endoscopes were shown to be associated with lower epistaxis rates as compared to models with a diameter >5.3 mm (mean incidence, 3% [0–12%] vs 5% [0–43%], respectively) [4, 6–19, 21–27, 30–34, 38–40]. Epistaxis is usually mild and self-limited; it may require tamponade with a cotton swab in up to 6% of cases [17]. Requirement for more advanced therapeutic measures (e.g., nasal packing with dedicated nasal tampons/air-inflated balloons or local cautery using an endoscope) has, to our knowledge, not been reported. Newer, thinner (4.9-mm in-diameter), endoscopes have been shown to allow successful transnasal insertion while avoiding epistaxis in virtually 100% of patients [7, 26]. Patients with a severe bleeding diathesis (platelet count < 50000/mm^3, prothrombin rate <50%) were usually excluded from studies [16, 26], so that there is no data in the literature about the incidence of epistaxis in such conditions. It seems therefore reasonable to avoid performance of T-EGD in case of severe bleeding diathesis.

Four out of five prospective randomised controlled trials that have evaluated overall patient tolerance using self-reported visual analogue scales have concluded that UT-EGD was better tolerated than unsedated C-EGD [6, 9, 12, 14, 27]. Symptoms that were best prevented with the transnasal vs the peroral approach included nausea and choking, probably because the posterior part of the tongue is not touched by the endoscope when it is introduced transnasally [15]. Improved patient tolerance and acceptance of UT-EGD compared to unsedated C-EGD was confirmed in prospective studies by other data, including (i) a higher proportion of patients willing to repeat the same procedure if medically indicated (mean proportions, 82% vs 60%, UT-EGD vs unsedated C-EGD, respectively) [6, 9, 12, 27, 44], (ii) the preference of UT-EGD over C-EGD as reported by 57–100% of patients who had undergone both procedures [8, 17, 19, 23–26, 28, 34, 39, 45], (iii) a less important degree of variation in cardiovascular parameters during the endoscopy (e.g., maximal heart rate increase, 6–12% vs 9–19%, UT-EGD vs unsedated C-EGD, respectively) [11, 21, 22, 27, 36].

Studies that have compared UT-EGD vs sedated C-EGD have yielded discordant results [16, 22, 24, 33, 35, 38].

Diagnostic applications

When compared to C-EGD as a gold standard for the evaluation of common upper gastrointestinal symptoms (e.g., pyrosis, dyspepsia, epigastric pain, dysphagia), EGD performed using small-diameter endoscopes presents excellent diagnostic yields (sensitivity, 89–100%; specificity, 97–100%) [22, 35, 46, 47]. As some of these studies were limited by the heterogeneity of endoscopic findings and the use of the peroral route with small-diameter endoscopes [46, 47], tandem cross-over studies have compared UT-EGD vs C-EGD in specific indications. These studies have confirmed the excellent diagnostic accuracy of UT-EGD for the detection of clinically relevant oesophageal varices as well as the detection or surveillance of Barrett's oesophagus (a pre-malignant condition characterised by the presence of intestinal metaplasia in the oesophagus) [16, 33, 38]. Unsedated T-EGD might be particularly attractive in such patients who need repeat screening examinations, due to its good performance in terms of accuracy and patient willingness to repeat the examination. Capsule endoscopy has also been proposed to reduce patient discomfort in these indications, but hopes with this non-invasive technique have not yet been fulfilled. Mean sensitivity for the detection of oesophageal varices with capsule endoscopy was 84% in five studies that totalled 382 patients [48], and it was only 63% and 78% for the detection of those requiring treatment (i.e., varices of medium or large size) in two recent prospective studies [49, 50]. Therefore, capsule endoscopy has currently been recommended for the detection of oesophageal varices only in patients unable or unwilling to undergo EGD [51]. A second generation of oesophageal capsule and a modified examination technique could improve these results and should be compared with T-EGD in terms of accuracy and patient willingness to repeat the examination [52].

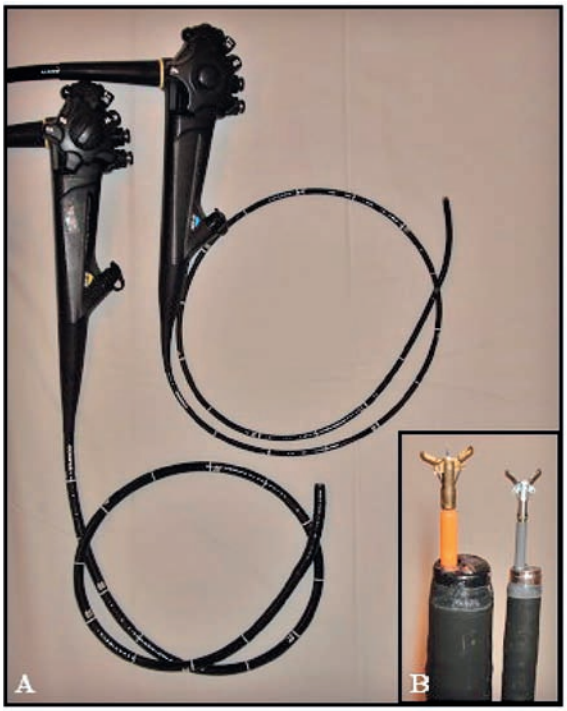

Figure 2

Conventional and small-diameter endoscopes.

A. Two current models from the same manufacturer (Olympus, Tokyo, Japan). Left, conventional, 8.8-mm diameter, diagnostic endoscope (GIF-Q180, 2.8-mm working channel); right, small-diameter, 4.9-mm, endoscope (GIF-N180, 2.0-mm working channel).

B. Biopsy forceps passed through the working channel of the two endoscopes presented in (A). Left, biopsy forceps of 2.2-mm diameter (Radial Jaw 3, 1537, Boston Scientific, Natick, Mass.); right, biopsy forceps of 1.8-mm diameter (EndoJaw, FB-231K, Olympus).

For the diagnosis of Barrett's oesophagus, capsule endoscopy has proven to be less sensitive (16–67% sensitivity for the detection of "endoscopically suspected oesophageal metaplasia" in three recent studies) [53–55]. Inability to obtain tissue biopsies is a major limitation of capsules currently used for endoscopy because the diagnosis of Barrett's esophagus requires demonstration of intestinal metaplasia at microscopic examination of biopsy samples.

As the final diagnostic yield of EGD relies not only on the endoscopic visualisation of the mucosa but also on the quality of biopsy specimens, this topic has been thoroughly evaluated. Working channels of small-diameter endoscopes are thinner than those of conventional endoscopes (diameter, 2.0 vs 2.8 mm, respectively) (fig. 2) and, as a result, biopsy samples collected using small-diameter endoscopes are smaller. However, the smaller size of biopsy samples does not affect their depth, as assessed by the presence of muscularis mucosae (similar proportions of biopsy samples collected using small-diameter or conventional endoscopes contain muscularis mucosae) [15, 56]. Prospective studies have demonstrated that the efficacy of targeted biopsy sampling for pathological diagnosis was globally similar with both types of endoscopes [33, 38, 56]. *Helicobacter pylori* detection with biopsy samples collected using 1.8 mm biopsy forceps has been specifically studied in two prospective studies because *H. pylori* status assessment is a common EGD indication [37, 57]. Both studies found that the accuracy of *H. pylori* detection on small biopsy specimens was in excess of 90% (gold standard for *H. pylori* detection, either urea breath test or histopathological examination plus CLO test on biopsy specimens collected using a jumbo biopsy forceps).

In conclusion, UT-EGD allows accurate endoscopic assessment of the upper gastrointestinal tract in standard indications. However, further studies are needed to compare UT-EGD and C-EGD in more difficult-to-assess lesions, such as tiny gastric cancers (UT-EGD is used in screening programs for gastric cancer) or biopsy sampling in areas that are more difficult to target (e.g., lesser curvature of the stomach).

Therapeutic applications

As digestive endoscopy is more and more often performed with a therapeutic intent, ultrathin ancillary material that can pass through the working channel of small-diameter endoscopes is being developed. This has recently allowed performing therapeutic interventions under UT-EGD with adequate patient tolerance. Currently, two main indications have emerged for therapeutic UT-EGD, (i) nasoenteral feeding tube placement and (ii) percutaneous endoscopic gastrostomy (PEG). Other more sophisticated procedures are being investigated, including cholangioscopy and biliary drainage in septic patients [58].

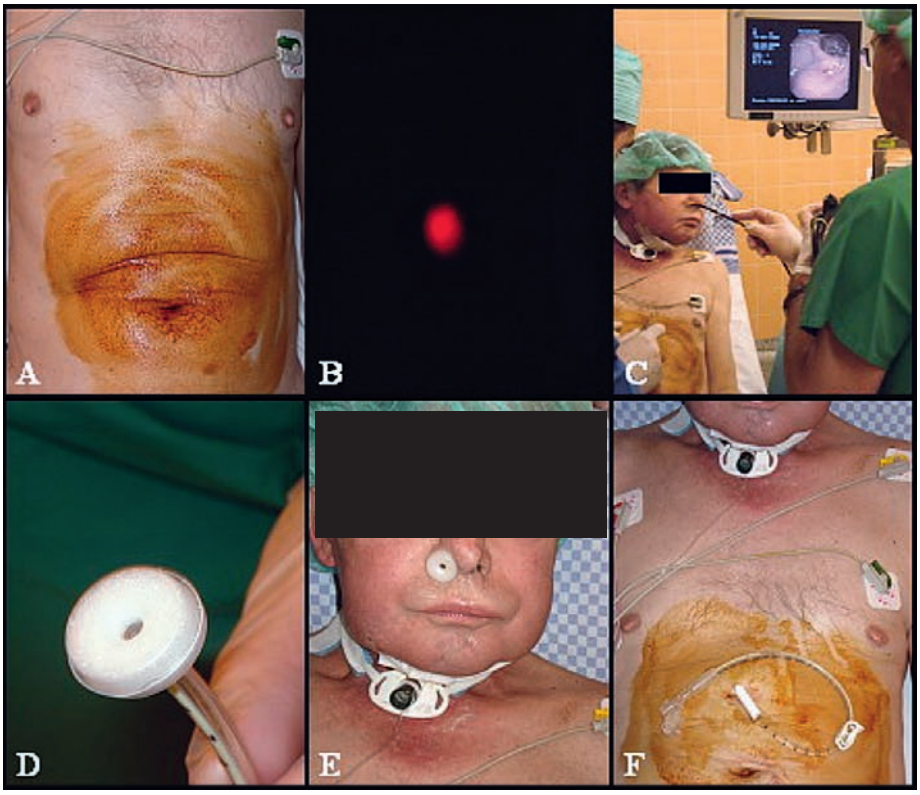

Figure 3

Unsedated "pull" PEG placement using transnasal-EGD. Publication with consent of the patient.

A. Abdominal wall disinfection;
B. Skin transillumination from the stomach to localise the site of PEG placement.
C. Gastric puncture through the abdominal wall, followed by introduction of a soft guidewire that is grasped with biopsy forceps and withdrawn with the endoscope through the nostril.
D. Collapsible bumper of the Corflo PEG tube (Merck Serono Gastroenterology, Feltham, United Kingdom).
E. Feeding tube pulled through the nose by manual traction of the guidewire attached to it.
F. PEG in place.

Enteral nutrition is the preferred route for nutritional support in many settings (e.g., critically ill patients, severe acute pancreatitis) because, compared to total parenteral nutrition, it presents lower costs and risks (e.g., infection, hepatotoxicity) and it better contributes to maintaining gut barrier integrity [59, 60]. Numerous studies have demonstrated that UT-EGD presents a good (74–99%) success rates for the placement of naso-gastric or naso-enteral feeding tubes [61–69]. Specific advantages of the transnasal approach over standard techniques include expediency, mildness of cardiopulmonary side-effects and the absence of radiation exposure (in particular for the placement of post-pyloric feeding tubes). Practical reasons may also dictate the use of the transnasal approach: many patients referred for feeding tube placement are at high risk for sedation, or they may present digestive strictures that cannot be traversed by standard endoscopes without dilation.

When the anticipated duration of enteral feeding is >1 month, PEG is preferred over nasogastric tubes because a significantly higher proportion of the prescribed feed may be administered via this route (with, in one randomised controlled trial, a lower mortality rate) [70]. The PEG procedure can be performed transnasally using the "pull" technique if a gastrostomy tube with a soft bumper is used (fig. 3) [71–73]. Again, the use of a transnasal approach is frequently motivated by the poor condition of patients referred for PEG, making sedation risky. In patients with a malignant oesophageal stricture, the "push" PEG technique under UT-EGD is often preferred to avoid malignant seeding at the PEG site (the feeding tube is not passed through the oesophagus, but it is directly inserted into the stomach after localisation of the puncture site using endoscopic transillumination) [74].

Cost

As already emphasised, sedation is not required for most T-EGD procedures. This abolishes the need for surveillance in a recovery room, which accounts for 70% of the total procedure time [24, 75, 76]. This, together with the suppression of any sedation-related morbidity allows significant direct cost reduction. The two studies that have analysed this topic concluded that unsedated small-diameter EGD allows a 20–36% cost reduction as compared to sedated C-EGD (mainly related to savings in staff and physical resources after the procedure) [75, 76].

As this issue may have a great economic impact, we have calculated the potential direct cost savings related to the replacement of sedated C-EGD by UT-EGD for two European countries (France and Switzerland), as examples. Calculations were based on cost savings per procedure of 151–202 CHF and an annual number of sedated, diagnostic, EGD procedures of 777 867 and 91 849 (in France and Switzerland, respectively) [1, 75–77]. If all diagnostic EGDs were performed using UT-EGD in these countries, direct cost savings would have ranged between 117–152 and 13–19 million CHF per year in France and Switzerland, respectively. Further studies are needed to precisely assess the importance of total cost savings, because indirect costs (e.g., less time off work and no need for a driver with, possibly, additional lost work day) might be even more important.

Conclusion

Unsedated T-EGD is becoming more popular for routine diagnostic EGD, due to improved patient tolerance and decreased costs compared to C-EGD. The diagnostic yield of UT-EGD, including that of biopsy samples, was similar to that of C-EGD in most indications that have been studied, but further comparisons would be required in particular contexts. Specific advantages of UT-EGD have leaded to the emergence of "niche" therapeutic applications for UT-EGD, of which the placement of feeding tubes has become the most popular amongst endoscopists who have small-diameter endoscopes available.

Correspondence:
Massimo Maffei, M.D.
Division of Gastroenterology and Hepatology
Geneva University Hospitals
Micheli-du-Crest Street, 24
CH-1205 Geneva
Switzerland
E-Mail: massimo.maffei@hcuge.ch

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