REVIEW

Transnasal endoscopy: no gagging no panic!

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ABSTRACT

Background Transnasal endoscopy (TNE) is performed with an ultrathin scope via the nasal passages and is increasingly used. This review covers the technical characteristics, tolerability, safety and acceptability of TNE and also diagnostic accuracy, use as a screening tool and therapeutic applications. It includes practical advice from an ear, nose, throat (ENT) specialist to optimise TNE practice, identify ENT pathology and manage complications.

Methods A Medline search was performed using the terms "transnasal", "ultrathin", "small calibre", "endoscopy", "EGD" to identify relevant literature.

Results There is increasing evidence that TNE is better tolerated than standard endoscopy as measured using visual analogue scales, and the main area of discomfort is nasal during insertion of the TN endoscope, which seems remediable with adequate topical anaesthesia. The diagnostic yield has been found to be similar for detection of Barrett's oesophagus, gastric cancer and GORD-associated diseases. There are some potential issues regarding the accuracy of TNE in detecting small early gastric malignant lesions, especially those in the proximal stomach. TNE is feasible and safe in a primary care population and is ideal for screening for upper gastrointestinal pathology. It has an advantage as a diagnostic tool in the elderly and those with multiple comorbidities due to fewer adverse effects on the cardiovascular system. It has significant advantages for therapeutic procedures, especially negotiating upper oesophageal strictures and insertion of nasoenteric feeding tubes.

Conclusions TNE is well tolerated and a valuable diagnostic tool. Further evidence is required to establish its accuracy for the diagnosis of early and small gastric malignancies. There is an emerging role for TNE in therapeutic endoscopy, which needs further study.

A gastrointestinal (GI) endoscopic procedure is the first-line tool for detecting GI pathology. Traditionally oesophago-gastroduodenoscopy (OGD) is performed by the transoral route, often with the patient under conscious sedation; only 11% of procedures were performed without sedation in the a previous British Society of Gastroenterology (BSG) audit.[1] Compared with local pharyngeal anaesthesia, sedation is associated with substantial cost and requires additional monitoring, nursing staff and a recovery area. Sedation is also associated with some risk; the incidence of cardiopulmonary events is estimated at 0.6%.[2]

Transnasal endoscopy (TNE) is performed with an ultrathin (UT) endoscope inserted via the nasal passages and is becoming increasingly available. It is performed unsedated so avoids sedation-related complications and there is emerging evidence that it also causes less sympathetic stimulation leading to milder cardiovascular stress.[3] By virtue of its route it also reduces pharyngeal stimulation, which may be the reason for its superior tolerability and therefore patient satisfaction (see figure 1).

Thus, unsedated, TNE is an attractive diagnostic method as it offers efficient and accurate endoscopic assessment of the oesophagus, stomach and duodenum with less cost and fewer risks than sedated upper GI endoscopy.[4–14] Its use has dramatically increased in Japan since its introduction, but uptake has been much slower in Europe.[15]

In this review, we elucidate the technical characteristics, tolerability, safety, side effects and acceptability of this method of upper gastrointestinal (UGI) endoscopy. We will cover the diagnostic accuracy of TNE and its possible use as a screening tool as well as therapeutic applications and future developments. We also offer practical advice including tips
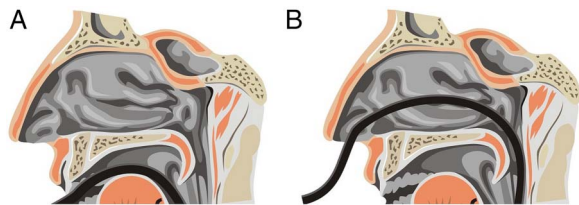
Figure 1 Differences in method of insertion between standard and transnasal approach (diagram courtesy of Dr S Inglis).

from an ear, nose, throat (ENT) specialist to optimise TNE practice.

TECHNICAL CHARACTERISTICS

UT endoscopes were initially designed for use in paediatrics and have a shaft diameter of 6 mm or less (range 4.9–6 mm), which allows them to be passed through the nose. They are similar in design to standard endoscopes, although the diameter of the accessory channel is only 2 mm (compared with 2.8 mm in a standard gastroscope) and the working length ranges from 1050 to 1100 mm. Some models, particularly those with the smallest shafts, have two-way (up and down) rather than conventional four-way tip deflection, but with the developments in CCD technology the latest models have not only conventional four-way tip deflection, but also a field of view of 120–140° and image enhancement (flexible spectral imaging colour enhancement (FICE)) capabilities. Due to a smaller working channel, the sizes of biopsy samples obtained with smaller diameter biopsy forceps are smaller (1.8 mm compared with 2.2 mm) but they are of comparable thickness; the smaller size has not been found to significantly affect their diagnostic performance.[16][17] The new generation of TNE scopes now available offers a 2.4 mm channel allowing the passage of standard biopsy forceps. There is some evidence that using small diameter biopsy forceps for rapid urease test results in significantly lower positive rates although this can be eliminated by taking two samples, thus increasing the amount of tissue to be tested.[17]

There are some technical limitations of the UT endoscope; its narrow diameter results in a more floppy scope that can limit advancement especially in patients with unusual or tortuous anatomy, although a complete endoscopy is achieved by experienced users in all but the most complex cases. A smaller working channel also can result in limited suction, less effective screen washing and fewer available endoscopic accessories.

PRETREATMENT TECHNIQUES

The technique of unsedated TNE involves the application of topical nasal anaesthesia and is performed with the patient in the upright seated or left lateral decubitus position (as for standard endoscopy). Once topical anaesthesia has been performed, the endoscope is lubricated and passed through the nasal cavity under direct visualisation into the posterior pharynx (see box 1). Once the instrument is beyond the upper oesophageal sphincter, endoscopy is performed in the standard fashion.

TNE is generally recognised as a less painful endoscopic procedure,[18–23] but the most commonly reported discomfort is during the nasal insertion phase of the procedure.[20][24] Appropriate pretreatment is therefore important, but there are limited data regarding the optimal regimen and technique for reducing discomfort. Shaker published the earliest report on the use of 2% lidocaine gel delivered by a cotton-tipped applicator to perform nasal anaesthesia.[25] Endoscopic-guided aerosolised spray (EGAS) has also been used, but in one study using 4% lidocaine nasal spray 33% of patients complained of nasal pain during the prolonged procedure.[26–28] Lee recently reported a cotton pledget method of nasal anaesthesia and compared this with EGAS with no significant difference in visual analogue scores for pain during nasal anaesthesia.[29] Pain scores during insertion were significantly lower in patients who received the cotton pledget method; they also experienced less throat pain after the examination, less gagging and had better overall tolerance. There were no cases of insertion failure, which may be due to more efficient turbinate shrinkage with this method.[30] Topical nasal anaesthesia with local anaesthetic (LA) spray plus LA stick in the nasal cavity plus pharyngeal anaesthesia has been found to cause significantly less pain during insertion of the endoscope.[31] There does not appear to be any additional benefit of adding a decongestant such as xylometazoline to topical anaesthetic to reduce discomfort, but does seem to improve nasal insertion and reduce procedure time, likely due to turbinate shrinkage.[32] Optimal pretreatment therefore appears to be nasal and pharyngeal anaesthesia plus use of decongestant, which should result in optimum

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Box 1   Ear, nose, throat tips for negotiating the nasopharynx

- ▶ Passage through the nose can be disorientating so it is wise to have a set method.
- ▶ Orientate the nasal passages vertically prior to starting.
- ▶ Slow and careful passage through the nose should be either below or above the inferior turbinate.
- ▶ Try and avoid contact with the nasal septum as this is the most sensitive part of the nose.
- ▶ Ask the patient to breathe through the nose; this will depress the soft palate opening up the nasopharynx and making the correct line of passage more obvious.

nasal anaesthesia and ease of endoscope passage, resulting in higher likelihood of successful transnasal examination (see boxes 2 and 3).

PATIENT TOLERABILITY, SIDE EFFECTS AND SAFETY

There are several studies comparing tolerance for unsedated TNE and conventional transoral OGD either with or without sedation. The majority of these found better patient tolerance rates in the TNE group based on patient tolerance questionnaires.[8 18 20 22 33–36] Patients have greater satisfaction and acceptability[4 8 9 20 34–36] and are to be more likely to undergo TNE in the future. They also report a significant reduction in gagging[20 37] and in some studies discomfort[22 34] (see table 1). One randomised study that reported better overall satisfaction with sedated conventional OGD also reported a significant level of pain during insertion of the endoscope during the transnasal procedure and also had a high failure rate of TNE procedure due to failure to pass through the nasal cavity at 22%.[38] One comparative study demonstrated good tolerance of both routes but again found significantly more pain on insertion (1% phenylephrine, 4% lidocaine nasal spray) with TN route.[39] Priess *et al*[20] also found significantly more pain on insertion but significantly less gagging and

significantly higher patient satisfaction. A recent study evaluating TNE in the elderly (>70 years) found it is safe and well accepted in this group.[37]

A recently published prospective randomised control trial has demonstrated that the high tolerance and acceptability reported mostly in trials from Southeast Asia is also applicable to the UK population.[40]

Due to the subjective nature of any assessment of patient tolerance and satisfaction, alternative methods for assessing safety and tolerability would be preferable. The assessment of cardiac function and oxygen saturation are both objective methods of evaluating safety and tolerability of endoscopic procedures. Previous studies have shown that TNE causes fewer adverse effects on cardiovascular function than transoral OGD.[36 40 41] It is also less stressful to the cardiovascular system with reduced elevation of systolic blood pressure and less sympathetic stimulation than the oral procedure.[41] This may well be an important factor as cardiovascular mortality has a significant relationship with autonomic nervous function.

As TNE is performed without sedation, this source of complications is eliminated. Rates of other complications are low and in the largest two series included self-limited epistaxis (0.85–2%) and vasovagal events (0.3%)[34 42] A single oesophageal perforation was reported.[39] The main difficulty in performing the procedure is the inability to pass the endoscope transnasally due to narrow nasal tracts or altered anatomy in 3–8% of patients,[20 34 42] for which there can be multiple reasons (see box 4).

No definitive guidelines exist for indications or contraindications, but it is not usually performed in those with previous nasal trauma or surgery (although unless this is recent and the introducer is passed without problems, TNE should be possible) or a significant coagulopathy. From an ENT point of view, a history of frequent and problematic epistaxis would be the most likely reason to avoid TNE. In particular, patients with hereditary haemorrhagic telangiectasia (HHT) have delicate nasal mucosa, which will bleed on contact. If the nasal cavity otherwise looks straightforward for TNE passage, there should be no reason to avoid it in patients taking anticoagulants. If epistaxis does occur, this is usually a straightforward complication to manage (see box 5).

COST EFFECTIVENESS

TNE has been shown to have shorter procedure times and lower procedure costs due to savings from avoiding sedation and minimising the patient observation period required post procedure.[4 43] A shorter procedure means more efficient flow of patients through the endoscopy unit maximising cost efficiency. When TNE is compared with endoscopy under pharyngeal anaesthesia (throat spray), it has higher acceptance, thus less likely for a TNE procedure to fail. Its good safety profile means TNE does not require the

Table 1 Tolerability of TNE versus conventional OGD

Study	Outcome measure used	Reported outcome
Dean et al[8]	VAS—choking, discomfort, acceptability	TNE more acceptable (p<0.05)
Campo et al[18]	VAS—discomfort, retching, pain, tolerance	TNE better tolerated (p<0.05)
Dumortier et al[21]	VAS—pain, nausea, choking	TNE less choking (p<0.05)
Garcia et al[4]	VAS—satisfaction	No significant difference
Preiss et al[20]	VAS—gagging, pain, tolerance	TNE less gagging (p<0.05)
Thota et al[33]	Tolerance score	No significant difference
Murata et al[22]	Pain score—tolerance, discomfort	TNE less discomfort (p=0.001) TNE better tolerated (p=0.002)
Trevisani et al[34]	VAS—pain, discomfort Tolerance score	TNE better tolerated
Zhang et al[37]	VAS—pain, discomfort, choking	No significant difference
Choe et al[67]	VAS—satisfaction and tolerance	TNE better tolerated (p=0.001)

OGD, oesophagogastroduodenoscopy; TNE, transnasal endoscopy; VAS, visual analogue scale.

presence of two nurses in the endoscopy room; the potential for fewer endoscopy nurses to support a TNE list reduces costs and increases the potential for out-of-hours lists increasing patient convenience and economic benefits resulting from a reduction in time taken out of work for patients.

With the increasing incidence of oesophageal adeno-carcinoma (increased sevenfold over the last 35 years)[49] and poor survival rates,[50] screening for BO has long been considered. Currently, screening of the general population in the UK is not recommended;[51 52]

DIAGNOSTIC CAPABILITY

The diagnostic accuracy of TNE compared with standard gastroscopy has been examined in a variety of scenarios. In previous literature, the diagnostic yield had been found to be similar for the detection of Barrett's oesophagus (BO) and gastric cancer.[5 44 45] It has been found to have better performance than oral OGD in the diagnosis of GORD-associated diseases in one paper.[46] There has been increasing focus recently on the use of TNE as a screening tool especially for BO and early gastric and oesophageal malignancies. It use is also increasing for screening patients with documented aerodigestive tract tumours for coexisting oesophageal squamous cell carcinomas (SCCs).[47 48]

Box 4   Reasons for failure of passage of the endoscope

▶ Severe septal deviation will prevent passage of the endoscope; however, the opposite side will almost always be patent.
▶ Nasal polyposis; this is relatively common. In gross disease, the patient will have obvious nasal obstruction and for less severe disease where polyps do not reach the nasal floor scope passage should be possible.
▶ There are some rare pathologies that may prevent passage of the endoscope, which include Wegener's granulomatosis, neoplasms, meningoencephalocoeles and choanal atresia.

Box 5   What to do if epistaxis occurs

▶ The most frequent site for epistaxis is at Little's area, which is the anterior nasal septum; direct pressure over the lower third of nose for at least 5 min should control the majority of minor bleeds caused by transnasal endoscopy trauma.
▶ For patients whose epistaxis does not settle with pressure, then either a tampon-type pack or a balloon-type pack should be inserted. The key is to insert it along the floor of the nose until the entire pack is within the nasal cavity. The tampon-type pack should be irrigated with 10 mL of water or saline to make it swell. The balloon-type pack should be inflated with air using the pilot balloon as a guide to its internal pressure. Packing can be performed bilaterally if unilateral packs do not control the bleeding.
▶ In the rare event that bleeding is severe, appropriate resuscitation and liaison with ear, nose, throat is indicated.
▶ For patients with minor epistaxis, controlled with pressure, the use of an antibiotic cream may prove beneficial. Naseptin cream (contains chlorhexidine and neomycin) is often prescribed for recurrent minor epistaxis and following nasal cauterisation. It should not be used in patients with peanut allergy. Other options include Bactroban or Vaseline. The cream should be sniffed off the patient's finger into the nostril and rubbed in by pressure from outside the nose. Patients should be warned from causing digital trauma.

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however, the emergence of endoscopic therapies for BO may alter the economic viability of screening. Most previous studies into accuracy of diagnosis of BO with TNE were performed with the aim of looking at the accuracy of detection of any upper GI lesions; they consisted of very small numbers and were inconclusive as to whether smaller endoscope size does limit diagnostic ability.[7 10 12 53 54] Only two studies used a randomised design and included BO as a randomised endpoint. Jobe et al[5] found only moderate agreement (κ score=0.591); however, a more recent study showed almost perfect agreement between TN and standard OGD (κ score 0.94; 95% CI 0.85 to 1.00).[45] It also found that dysplasia was detected by both modalities with similar accuracy.

GASTRIC CANCER
In Japan, up to 60% of gastric cancers are diagnosed as early cancers.[55] In Western countries, however, early disease is much less frequently detected accounting for between 10% and 20% of all gastric cancers.[56] This difference can be partly explained by the mass screening programme that exists in Japan. It is recognised that there is a miss rate for gastric cancer with standard endoscopy, and false negative rates have been reported to be between 10% and 19%.[57] It has also been shown that for those diagnosed with early gastric cancer endoscopically one out of six had had an endoscopy within the previous three years.[58] In the UK, a recent abstract suggests that 14% of subjects with gastric cancer have had an endoscopy in the three years prior to their diagnosis.[59] Early gastric cancer is not recognised on endoscopy with appearances being thought to be due to benign diagnoses such as inflammation with cancer being found on histology. It is also recognised that fewer years of endoscopic experience had an impact on the diagnosis of early gastric cancer and that early cancers in the gastric cardia, especially the lesser curve or posterior wall, are more likely to be overlooked.[60]

Various methods have been studied to attempt to improve accuracy of endoscopic diagnosis of gastric cancer with standard endoscopy. Magnifying endoscopy with narrow-band imaging (M-NBI) used in combination with conventional white-light endoscopy results in significantly enhanced performance in diagnostic yield of early gastric cancer when compared with white-light endoscopy alone. M-NBI is especially useful in making an accurate diagnosis from endoscopic findings alone even for small depressed gastric mucosa cancers.[61]

With regard to the use of TNE for the diagnosis of gastric cancer, the literature has raised some potential concerns especially relating to the accuracy of TNE in detecting small or superficial, gastric malignant lesions.[5 34 50] An initial paper comparing the detection rate of early gastric cancer and adenoma with TNE and transoral endoscopy found no significant differences in diagnosis.[44]

Subsequent publications have revealed opposing findings. One paper[62] looking at the performance of UT endoscopy for the diagnosis of superficial gastric neoplasia shows that the diagnostic accuracy for superficial gastric neoplasia is significantly lower for UT endoscopy than for high-resolution standard endoscopy with 25% of gastric neoplasia being missed by UT endoscopy.

A second paper looking at use of TNE in screening for early gastric cancer[63] suggested that the diagnostic utility of UT endoscopy was inadequate for the diagnosis of early gastric cancer lesions (<20 mm), especially those located in the upper third of the stomach; the suggested explanation for this was lower resolution and lower light intensity of the UT scope. The authors also suggested that the diagnostic utility of UT endoscopy can be improved by indigo carmine dye spraying. Both trials included small numbers of patients, but both indicate that the location of pathology is important, with UT endoscopy being more likely to miss early pathology in the proximal stomach but no significant difference in the pick-up rate for pathology in the distal stomach. These studies only studied UT endoscopy with white light. In contrast, excellent detection rates for oesophageal and gastric cancers have previously been reported when using UT endoscopy in combination with chromoendoscopy using indigo carmine and iodine.[64] It has also been suggested that if image enhancing techniques such as NBI (or FICE) can be applied through a UT endoscope, this may be useful in improving the detection of oesophageal premalignant lesions.[65] This is now possible with the latest series of UT scopes.

In Asian populations, there have been two studies looking at the use of TNE to screen patients with head and neck cancers for oesophageal SCCs. One study looked at the yield of this procedure and found that 10% of patients had oesophageal SCC diagnosed by TNE and 7.3% had lesions with high-grade dysplasia. They used both NBI and Lugol chromoendoscopy and showed an increased pick-up rate when both NBI and Lugol chromoendoscopy were used compared with white light alone. Aiming for lesions that appeared brownish under NBI or unstained under Lugol chromoendoscopy had the highest sensitivity.[47]

A study on a similar patient population but comparing white endoscopy with FICE and Lugol staining did not show a significant difference between the two methods and diagnosed 12.5% of patients with oesophageal SCC.[48]

OESOPHAGEAL VARICES
TNE has been used to screen for oesophageal varices in patients with cirrhosis, the detection and grading of varices being equivalent to standard OGD in two papers[66 67] Saeian et al[66] included only 15 patients, those with a platelet count of <50 000 mm^3 were excluded and epistaxis rate was 6%. Choe et al[67]
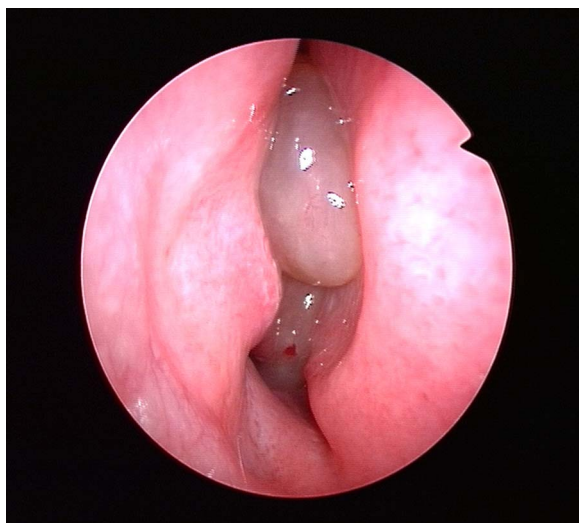
randomised 89 patients and had excellent concordance rates (κ score=0.87). They reported an epistaxis rate of 6%, and 28 patients had an international normalised ratio of 1.7–2.3 and platelets between 20 000 and 50 000 mm^3; this group had an epistaxis rate of 14%. Concerns exist about performing TNE in patients with a coagulopathy, and this may be one of the reasons why TNE has not been adequately assessed as a screening tool for varices.
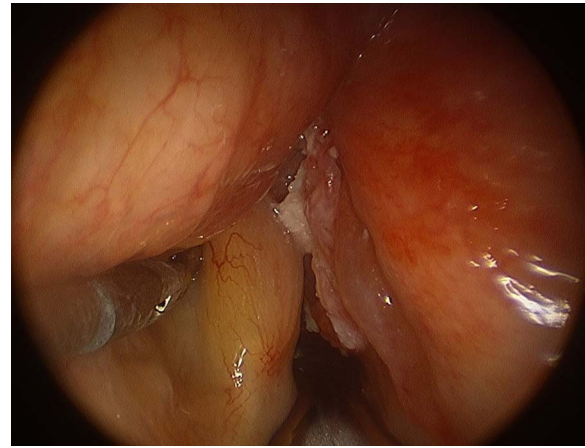
DIAGNOSIS OF ENT PATHOLOGY

Infrequently, coincidental pathology may be noted within the upper aerodigestive system, so it is reasonable to expect TNE practitioners to have some knowledge of common ENT pathologies and pathways of management. Findings such as simple nasal polyps (see figure 2) would be appropriate to bring to the attention of the patient and inform them to consult their general practitioner. Suspected malignancies would require urgent referral to ENT. Common sites for aerodigestive tumours to be found with TNE are within the nose, larynx and hypopharynx (see figures 3 and 4); however, due to the swallowing motion required to aid passage of the TN scope, TNE is not an appropriate investigation for these areas as small pathology is likely to be missed. Also, tumours within the oropharynx are unlikely to be visualised. Nasal masses that look anything other than benign polyps warrant urgent ENT referral and likewise any suspicion of laryngeal and hypopharyngeal tumours. Laryngeal pathology is varied but is likely to ultimately require biopsy to confirm a diagnosis.

FEASIBILITY AND SAFETY IN THE PRIMARY CARE POPULATION

A recent paper from 2012 demonstrated the feasibility and safety of TNE in a primary care population, achieving short procedure times, a high diagnostic


Figure 3 Right-sided glottic squamous carcinoma (viewed under general anaesthesia with rigid laryngoscope).

yield and minimal anxiety. The findings suggested that TNE has a similar ability to standard OGD to identify upper GI pathology in this population, strengthening argument for its consideration for use as screening tool in the primary care population.[68] The significant improvement of optics and field of view (from 120° to 140° similar to standard endoscopes) (see figures 5 and 6) of newer TNE endoscopes will most certainly reduce the probability of missing pathology compared with standard endoscopy, although comparative studies are necessary to confirm this in the future.

THERAPEUTIC APPLICATIONS OF TNE

There is increasing literature on the use of UT scopes for various therapeutic indications including, most commonly, the insertion of feeding tubes. More recently, UT scopes have been used in the treatment of GI strictures (where the small diameter of the scope aids in the placement of a wire across the stricture) and to assist advanced endoscopic techniques such as endoscopic submucosal dissection (ESD) and endoscopic retrograde cholangiopancreatography (ERCP).

Figure 2 Rigid endoscope showing benign polyps within the right nasal cavity.
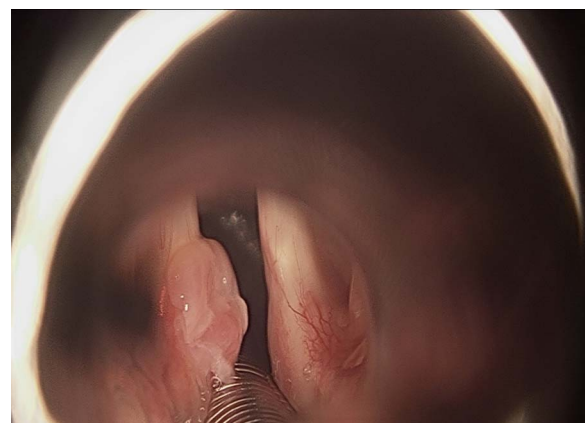
Figure 4 Left-sided glottic granuloma (viewed under general anaesthesia with rigid laryngoscope).
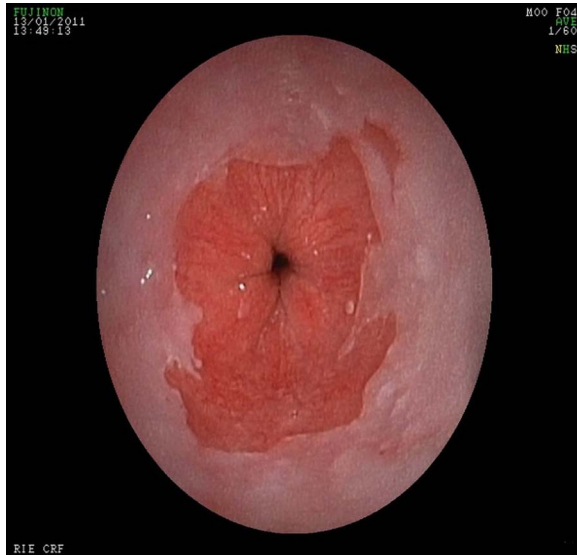
Figure 5 View of oesophagogastric junction for transnasal endoscopy.

Insertion of NET/PEG tubes

TNE is ideal for the placement of nasoenteral feeding tubes (NET), especially nasojejunal (NJ) tubes (see box 6). It was first used to place NET in critically ill patients;[69] its main benefits in this group are no requirement for additional sedation, ability to perform the procedure at the bedside and no radiation exposure compared with fluoroscopy-assisted insertions. In direct comparison to transoral endoscopic placement, TN placement is significantly faster and causes fewer cardiorespiratory complications.[69]

When compared with fluoroscopic insertion in critically ill or severe pancreatitis patients, TN placement has equal success rates with a significantly shorter procedure time and less patient discomfort.[70 71] It has been shown that using an endoscope with a longer

working length 92 vs 133 cm significantly improves success rates of insertion of NET.[72] TNE is very helpful in the placement of NET in a range of upper GI diseases such as malignant strictures, gastric outlet obstruction and gastroparesis,[73] as well as nasogastric tube placement in patients with oesophageal cancer.[74]

TNE has also been used successfully for the insertion of percutaneous endoscopic gastrostomy (PEG) tubes (the bumper is compressed and then passed through the nose) and has a potentially important role due to less sedation requirements and less cardiovascular stress in patients likely to have significant comorbidities. However, further studies are necessary to establish its role and potential advantages over transoral PEG placement.[75] Currently, TNE-assisted PEG insertions have been reserved for patients whom conventional PEG placement is difficult such as in cases of GI strictures or trismus (inability to fully open mouth).[76]

Management of upper GI strictures

UT scopes have been used in patients with upper GI strictures and can successfully traverse >80% of such strictures, resulting in higher endoscopy completion rates in such patients and enabling full characterisation of the stricture (diameter, length and enabling biopsies for histological diagnosis). Dilatation of such strictures can be done safely as endoscopic placement of a guidewire is possible in most cases via an UT endoscope even in tight strictures without the need for fluoroscopy.[77] This is in line with the BSG guidelines that recommend using a wire-guided technique for performing oesophageal dilatations.[78] Using the UT scope to place the wire reduces the numbers of repeat procedures and reduces the need for radiology support, therefore potentially reducing costs, and so on.

ESD is increasingly used for the treatment of early gastric cancer; however, difficulties can be encountered due to the location of the lesion. TNE has been
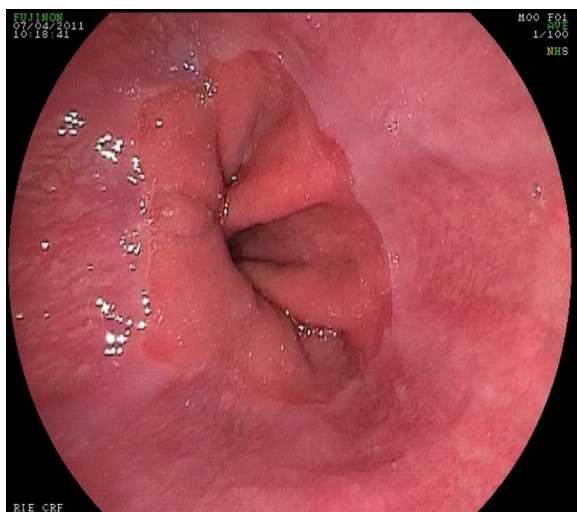
Figure 6 View of oesophagogastric junction for standard endoscopy.

Box 6 Insertion of nasojejunal (NJ) tube with transnasal endoscopy (TNE)

▶ TNE is performed in the usual manner.
▶ A guidewire is then inserted under direct vision into the duodenum and advanced as far as possible into the small bowel as with standard technique for insertion of NJ tubes.
▶ The endoscope is withdrawn, leaving the wire in situ and the NJ tube placed over the wire. In our experience, this makes the technique simpler with no awkward fiddling with the wire at the back of the mouth.
▶ Post-pyloric placement of the feeding tube is then confirmed endoscopically. A thinner endoscope also seems to reduce the likelihood of pulling the feeding tube back as the endoscope is withdrawn.

used to enable easier access to lesions extending into the antrum/pylorus or duodenal bulb wherein the TN scope is used as an assistant scope to enable adequate retraction of tissue to allow en bloc resection.[79 80] Transnasal scopes have also been used to perform ERCP; however, biliary cannulation has been found to be more difficult and the size of the channel will limit the availability of therapeutic accessories.[81]

Limitations of TNE

The thinner diameter of the TNE scope also produces limitations as well as benefits; it is more likely to be damaged than a standard endoscope. Due to its narrower channel and lesser washing and suction, there are limits to both visibility and available therapeutic accessories, which means its use is limited as a therapeutic tool, especially in the context of upper GI bleeding.

CONCLUSION

Although TNE has been available for more than a decade, the technique is widely used in Japan, but its use is variable in Europe and there are very little data on the extent of its use in the UK. It has been suggested from a previous European survey that reasons for reluctance in use are concerns about diagnostic accuracy and histological sampling as well as lack of training.[82] There is an increasing body of evidence that TNE is a better tolerated procedure compared with standard endoscopy per os, and the main area of discomfort is nasal pain during insertion of the TNE endoscope, which seems remediable with adequate nasal and pharyngeal topical anaesthesia.

There are three areas where TNE has clear advantage compared with standard OGD:

▶ its use as a screening tool for GI pathology;
▶ first-line use as a diagnostic tool in the elderly and those with multiple comorbidities especially cardiovascular disease;
▶ therapeutic procedures especially negotiating upper oesophageal strictures and for the insertion of nasoenteric feeding tubes.

The tolerability and cost effectiveness in comparison to oral OGD in a primary care population have been demonstrated. TNE is an ideal tool for screening and surveillance for UGI pathology such as Barrett's (in the Western world) or gastric cancer (in the East).

As discussed previously, there are miss rates for early gastric cancer with standard endoscopy and certainly there have been concerns raised from the literature about the use of TNE, especially in the diagnosis of early gastric cancer.

There are ways in which the technique of TNE may be enhanced to improve the pick-up of early gastric cancer. Adequate preparation of the gastric mucosa to ensure views are not impaired by mucus especially in TNE where views can potentially be a problem due to reduced suction; asking patients to drink a mucolytic and defoaming agent may be of use to improve views. During the procedure, meticulous examination of the gastric mucosa is required. Adequate insufflation is vital to ensure that all the gastric mucosa can be adequately visualised. To ensure all of the mucosa has been examined especially in the 'high-risk' miss areas, that is, the proximal stomach, the introduction of a technique to 'map' the entire stomach as has been developed in Japan[83] may be helpful. This includes photomapping and requires multiple photographs to be taken; however, a variation of this from the European Society of Gastrointestinal Endoscopy requires only eight photographs and may be a more practical approach to adopt.[84] There should be consideration given to procedure time as it has been established that endoscopists who have longer procedure times and take more than four pictures detect more pathology than those with shorter procedure times who take fewer pictures.[85] Perhaps the consideration of a withdrawal time as for colonoscopy should be considered. That TNE is better tolerated makes it an ideal tool to ensure meticulous examination as longer procedures will be better tolerated. When abnormal areas are discovered, the use of indigo carmine and NBI may be helpful in characterising them. Many of the ways in which pick-up rates of early gastric cancer may be improved can be applied to both TNE and conventional upper GI endoscopy.

Further evidence is still required to establish the accuracy for TNE for the diagnosis of early and small gastric malignancies and ideally these would be studies performed in Western populations. Another factor that needs to be considered is the continuing evolution of technology with the availability of new endoscopes. These endoscopes now have an increased field of view at 140°, superior image quality and the routine use of image enhancing techniques such as NBI or FICE, as well as chromoendoscopy. They also have better suction and water jet and an increased size of biopsy channel. These technical improvements as well as changes in technique of examination should almost certainly help to improve the diagnostic accuracy of TNE for early gastric malignancies.

TNE can certainly be used in the diagnosis of oesophageal varices, although there are limited studies at present. Given the increasing incidence of chronic liver disease, TNE is a useful modality for variceal screening. More guidance regarding absolute contraindications with regard to levels of coagulopathy acceptable for performing TNE is currently lacking; it would be seen from ENT practice (although the ENT scope is thinner) that unless there is a history of recurrent epistaxis or HHT there is no reason for anticoagulation to be an absolute contraindication to TNE.

TNE has benefit in terms of cardiovascular stress, which translates to great advantages in patients with multiple comorbidities, particularly pre-existing cardiorespiratory disease, and in the elderly. There is also

an emerging role for TNE in therapeutic endoscopy. Such use needs further study and development of appropriate accessories to increase its therapeutic potential. It is expected that the latest generation of TNE scopes in addition to better image definition and colour enhancement may also accommodate a larger biopsy channel (2.2 mm), which will increase the therapeutic ability of such scopes.

The reason for preventing widespread use of TNE may be the lack of formal training and accreditation for this technique in the UK, which may also contribute to the reluctance to use this technique.[86] This raises the question of how endoscopists should be trained in the use of TNE. The authors would suggest the development of dedicated TNE training as part of existing upper GI basic skills courses or as a stand-alone course. ENT specialists should be involved to emphasise the important aspects of the anatomy of the nasopharynx and recognition of common but significant nasopharyngeal pathology, and finally, to advise on how to achieve successful nasal intubation as well as guidance on managing nasal complications. Guidelines for training and accreditation, as exist for standard endoscopy, should be developed for TNE.

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