



# Feasibility of complete nasogastric tube omission in esophagectomy patients

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**Abstract:** Routine nasogastric tube (NGT) placement is a common practice in esophagectomy patients. However, its continued application has been controversial in recent years. In this review, we will discuss the potential risks and benefits, including anastomosis leak, pneumonia, NGT reinsertion, patients' discomfort and hospital length of stay, to evaluate the feasibility of complete NGT omission in esophagectomy patients.

**Keywords:** Esophagectomy; nasogastric tube (NGT); perioperative care

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## Introduction

Esophageal cancer is currently the 7<sup>th</sup> most commonly seen cancer with the 6<sup>th</sup> highest cancer mortality rate in the world (1). Esophagectomy, as the most definitive treatment in early stage esophageal cancer, is unfortunately associated with relatively high perioperative morbidity. Concerted efforts on perioperative care have strived to improve survival while preventing complications in esophagectomy patients.

Nasogastric tube (NGT) has been one of the most controversial issues in the perioperative care of esophagectomy. Historically, NGT was widely applied in postoperative decompression and drainage to decrease the risk of pulmonary and anastomotic complications. However, current evidences have strongly indicated that routine NGT placement failed to achieve the intended benefits while adding unnecessary risks (2,3). Therefore, most other gastrointestinal surgeries have abolished its routine placement.

Nevertheless, routine NGT placement is still a common

practice in esophagectomy patients. Proponents of routine NGT placement believe that as the reconstructed gastric tube and anastomosis site lie proximally to the NGT tip, the clinical effect of NGT in esophagectomy patients may improve compared to other gastrointestinal surgeries. Conversely, opponents argue that routine NGT placement not only fails to achieve the presumed clinical effects, but instead gives rise to significant discomfort and lengthens patients' hospital stay.

Multiple studies have been conducted to settle this issue. And a meta-analysis demonstrated that early or preoperative removal of NGT did not increase the risk of adverse events including anastomosis leak and pulmonary complications, implying that NGT may be removed early (4). However, as far as we know, no review has further discussed the clinical effect and safety of complete NGT omission in esophagectomy patients. We believe if early or preoperative removal of NGT was safe and beneficial to esophagectomy patients, then theoretically, complete omission of NGT should also be safe and bear greater benefits. In this review, we attempt to evaluate the feasibility of complete NGT

omission in esophagectomy patients.

### NGT and anastomosis leak

Anastomosis leak, as one of the most serious complications in esophagectomy, develops in 8–11% patients postoperatively (5-7). Theoretically, bilateral vagotomy during esophagectomy inevitably impairs the propulsion function of the gastric tube, making patients susceptible to gastric distension. Consequently, tension rises at the anastomotic site, increasing the risk of anastomotic leak. Considering the risk and grave consequence of anastomosis leak, most thoracic surgeons are reluctant to give up routine NGT placement.

However, to our best knowledge, we haven't been able to find any evidence in recent 20 years to substantiate this theory. Instead, multiple studies demonstrated that no significant difference of anastomosis leak rate existed between routine NGT and NGT omission group (8-11). One randomized controlled trial with 40 patients even found that the anastomosis leak risk was significantly higher in routine NGT group than NGT omission group (12). The authors inferred that the anastomosis site is susceptible to the poke or suction of NGT, thus increasing the risk of anastomosis leak. In addition, NGT omission group received metoclopramide, suggesting that prokinetics might be a better alternative compared to routine NGT placement. However, it should be noted that the conclusion from the study may be limited by small sample size and the surgical techniques in a single institution.

In fact, a research based on The Society of Thoracic Surgeons Database demonstrated that cervical anastomosis was significantly more susceptible to anastomosis leak than intrathoracic anastomosis due to longer distance from the vascular supply origin (5,6). Moreover, a retrospective study in Mayo Clinic including 432 patients found that linear stapled anastomosis technique can decrease not only anastomosis leak rate, but also stricture rate compared to hand-sewn technique (6). Other factors, including diabetes, smoking, congestive heart failure, hypertension and peripheral vascular disease, were identified to be associated with higher anastomosis leak rate (5). All these factors might compromise the microvascular supply of the anastomosis site, which is widely believed to be the most important pathogenesis of anastomosis leak. The risk of anastomosis leak in complete NGT omission patients may possibly be neutralized if the factors mentioned above are appropriately handled.

Regarding the treatment of anastomosis leak, NGT is indeed indicated in the conservative treatment of contained anastomosis leak. Two retrospective studies even proposed placing the NGT through the leak for better drainage (13,14). This aggressive drainage method still needs further randomized controlled trial to evaluate its clinical effect and safety.

In sum, as suggested by most of the available evidences, we believe NGT placement does not increase or decrease the risk of anastomosis leak in esophagectomy patients. Therefore, complete omission of NGT should not be thwarted based on the concern of increased anastomosis leak risk.

### NGT and pneumonia

Pneumonia is the commonest complication following esophagectomy with an incidence rate of 20–35% (15-17). Esophagectomy patients are susceptible to aspiration due to gastric distention, which would eventually lead to pneumonia if left untreated. Proponents of NGT routine placement believe that NGT may prevent aspiration and further pneumonia via continuous decompression. A 2006 randomized controlled trial with 34 patients found that routine NGT drainage managed to decrease tracheal acid aspiration and respiratory complication (8). However, the result should be interpreted with caution due to several limitations of the study: (I) insufficient perioperative nutrition support as only crystalloid solution was provided; (II) no proton-pump inhibitor, prokinetics or pyloric intervention was administered to control gastric distention and acid aspiration; (III) percutaneous tracheal pH probe may affect expectoration and pulmonary hygiene, thus increasing the risk of respiratory complications; (IV) small sample size, *post hoc* analysis.

On the other hand, several studies demonstrated that there was no statistically significant difference in respiratory tract infection rate between routine NGT group and NGT omission group (10-12). These studies believed the omission of NGT in esophagectomy patients was safe in regard to postoperative pneumonia. A retrospective study comparing routine NGT placement and gastrostomy decompression even argued that routine NGT placement hindered effective coughing and compromised pulmonary hygiene, therefore increasing the risk of pneumonia (18). Although the conclusion was based on the comparison between routine NGT and gastrostomy, NGT was shown to be a potential threat of pneumonia in esophagectomy

patients.

Also, it should be noted that NGT is not the only factor affecting the pneumonia risk in esophagectomy patients. Other strategies to reduce the postoperative pneumonia rate include smoking cessation, appropriate management of chronic obstructive pulmonary disease, preoperative pulmonary rehabilitation, minimizing surgery duration, lung-protective low tidal volume ventilation, postoperative lung expansion, early mobilization, pain control, comprehensive swallowing function evaluation before oral intake, etc. Therefore, further randomized controlled trial should consider all factors involved and develop an optimized, comprehensive strategy to lower postoperative pneumonia risk in esophagectomy patients.

In short, it has been shown that complete omission of NGT does not always increase the risk of aspiration pneumonia, and we believe aspiration can be better managed by other available methods. Therefore, complete omission of NGT is possible without necessarily increasing the risk of pneumonia in esophagectomy patients.

### **NGT and reinsertion**

Complete omission of NGT does carry the risk of postoperative NGT insertion due to repeated vomiting, gastric conduit distention and anastomosis leak. The incidence rate of NGT postoperative insertion in NGT omission group has been controversial. One randomized controlled trial reported that 7 out of 12 patients in NGT omission group required NGT postoperative insertion while none in NGT routine group did (8). However, the incidence rate in other studies were relatively low (<10%) and routine NGT placement does not always eliminate the risk of NGT reinsertion (9,11,12). As different studies administered different indication of postoperative NGT insertion or reinsertion, results from different studies are barely comparable due to heterogeneity. Nevertheless, even if NGT reinsertion is indeed indicated, a randomized controlled trial comparing early and late removal of NGT showed that all NGT reinsertions could be safely done by surgical residents without any specialized radiologic or endoscopic guidance (19). This study demonstrated that NGT postoperative insertion or reinsertion can be done conveniently and safely. And to our best knowledge, complications of NGT reinsertion have never been reported. Therefore, postoperative NGT insertion in NGT omission group or reinsertion in routine NGT group should be considered safe until proven otherwise. This

undoubtedly puts a safety net under the complete omission of NGT in esophagectomy patients.

### **NGT and patients' discomfort**

The discomfort of esophagectomy patients during perioperative period arises from many reasons. On one hand, retention of NGT causes direct irritation to the nasal and nasopharyngeal area, which leads to pain, nausea and discomfort. On the other hand, complete omission of NGT may also cause patients' discomfort due to gastric distention. Patients' discomfort from different studies may vary greatly as patients' discomfort is a subjective measure. And to our best knowledge, no standard score or questionnaire has been proposed to measure the discomfort of esophagectomy patients. Only 2 studies have measured patients' discomfort as pharyngalgia and discomfort due to NGT in esophagectomy patients respectively (11,19). These 2 studies both demonstrated that routine NGT placement caused significantly higher discomfort. However, both of them seemed to focus on the discomfort caused by NGT but neglect the overall satisfaction of the patients, as omission of NGT might also lead to discomfort including abdominal distention and vomiting. Nevertheless, even if gastric distention occurs, other available therapies including prokinetics and endoscopic pyloric balloon dilatation have been shown to be effective in handling the situation in esophagectomy patients (20,21).

Overall, complete omission of NGT can possibly alleviate patients' discomfort, which may further improve patients' recovery and compliance. NGT may not be the optimal method to manage gastric distention.

### **NGT and hospital length of stay**

Hospital length of stay is an important index of postoperative recovery and hospital turnover rate. Proponents of NGT omission believe NGT omission enables early oral intake, which expedites the recovery of bowel function and ultimately shortens hospital length of stay. This should be a win-win situation as it not only serves to reduce patients' suffering and cost, but also manages to save the valuable medical resources. Two retrospective studies in China demonstrated that compared to routine NGT patients, NGT omission patients have faster bowel function recovery and shorter hospital length of stay (10,11). However, the other 2 randomized controlled trials reported no significant difference on hospital length of stay between routine NGT

and NGT omission group (8,12). We should bear in mind that these conflicting results may possibly result from different discharge criteria instead of the effect of NGT.

Generally, hospital length of stay is a secondary outcome as it is closely related to the complications of the surgery and patients' baseline characteristics besides the recovery of bowel function. It is nearly impossible to unify discharge criteria in different institutions due to different medical policies and surgeons' experience. However, the facilitation of bowel function recovery is surely worth the effort and we believe the complete omission of NGT may help to achieve that.

### Conclusions

In this literature review, we discuss the risk of anastomosis leak, pneumonia and postoperative insertion in complete omission of NGT in esophagectomy patients. We find that the omission of NGT does not increase the risk of anastomosis leak and pneumonia. And even if postoperative NGT insertion is required, it can be done safely and conveniently. We also discuss the potential benefits of NGT omission and we believe the omission may possibly alleviate patients' discomfort and shorten hospital length of stay. Therefore, we conclude that the complete omission of NGT is feasible in esophagectomy patients.

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### Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

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