

Role of nasogastric tube in preventing aspiration pneumonia in patients with dysphagia

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ABSTRACT

Introduction: Every year, a large number of patients with dysphagia are placed on feeding tubes to prevent aspiration pneumonia. This prospective study was planned to compare the incidence of aspiration pneumonia and death in patients with dysphagia who were either fed orally or through a nasogastric tube.

Methods: All patients aged 65 years or older, at the point of discharge from the geriatric medicine ward of a hospital, were recruited over a six-month period with a two-month follow-up. Patients diagnosed with dysphagia by the speech therapist were recommended to have either oral feeding with modified diet or nasogastric tube feeding. The incidence of aspiration pneumonia and death among patients on oral feeding, nasogastric tube feeding and patients who refused nasogastric tube feeding were compared.

Results: A total of 122 patients completed the study. The rate of aspiration pneumonia and death were, respectively, 31.2 percent in nasogastric tube-fed patients and 10.3 percent in orally-fed patients (Fisher's exact test, p-value equals 0.007). Multivariate analysis showed that the mode of feeding predicted outcome (p-value equals 0.03). The rate of aspiration pneumonia and death were 31.2 percent in those who refused nasogastric tube feeding (Fisher's exact test, p-value equals 0.064). Nasogastric tube-fed patients were more cognitively- and functionally-impaired compared to those on oral feeding.

Conclusion: In our study, patients on nasogastric tube feeding did not have a better outcome against aspiration pneumonia and mortality when compared to those who were on oral feeding. The poorer outcome of nasogastric tube-fed patients could be attributed to their worse cognitive and functional statuses. Larger studies are needed to refute or confirm the usefulness of nasogastric tube in elderly patients with dysphagia.

Keywords: aspiration pneumonia, elderly patients, enteral nutrition, nasogastric tube feeding, pneumonia

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INTRODUCTION

Dysphagia is a common complaint in the elderly. Up to 10% of individuals 50 years and above reported troublesome dysphagia⁽¹⁾. In older people, dysphagia has been found to be associated with increased morbidity and mortality. Nursing home residents with dysphagia were found to have significantly higher six-month mortality⁽²⁾. Patients with dysphagia are at risk of aspiration from food and saliva. Pulmonary aspiration was found to be an important cause of serious illness and death among residents of nursing homes and in hospitalised patients^(3,4).

The most common causes of dysphagia in the elderly are dementia and stroke⁽⁵⁾. In stroke patients, the prevalence of dysphagia ranged from 40% to 70%⁽⁶⁻⁹⁾. Many of these patients had silent aspiration⁽¹⁰⁾. Among stroke patients, pneumonia was seven times more likely to develop in those in whom aspiration could be confirmed than in those who did not aspirate^(7,11). Mitchell et al⁽¹²⁾ showed that advanced age and significant cognitive impairment increased the risk of aspiration. In one study, aspiration pneumonia was diagnosed in 44% of the tube-fed patients with acute stroke⁽¹³⁾. Other studies showed incidence of aspiration pneumonia vary from 7%-62% in patients fed by feeding tube⁽¹⁴⁾. Nakajoh et al observed that rate of aspiration in tube-fed bed-bound patients was 64.3%⁽¹⁵⁾.

Tube feeding cannot be expected to prevent aspiration of oral secretion, and no data show that it can reduce the risk from regurgitated gastric contents. One study in animal models⁽¹⁶⁾ and another study in children⁽¹⁷⁾ showed that gastrostomy tube placement may reduce lower oesophageal sphincter pressure and increase the risk of gastrooesophageal reflux, with a change in the gastrooesophageal angle as the suspected mechanism. No comparable study has been

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reported in the elderly. Although aspiration of saliva is not a rare phenomenon, the presence of pathogenic organisms, especially gram-negative bacteria, increases the risk of pneumonia^(18,19). Physiologically, oropharyngeal colonisation by pathogenic organisms is prevented by the mechanical clearance provided by chewing and swallowing⁽²⁰⁾. However, in tube-fed patients, the oropharynx is devoid of this protective effect. Moreover, Leibovitz et al found that there is a high prevalence of oropharyngeal colonisation with gram-negative bacteria in patients with tube feeding (both nasogastric and PEG tube) compared to orally-fed patients⁽²¹⁾.

Non-oral feeding is believed to prevent aspiration pneumonia, improve function, promote physical comfort and prolong life. However, the evidence does not support (or refute) these assumptions^(14,22,23). Nasogastric tube is widely used to feed patients with dysphagia, especially when the percutaneous endoscopic gastrostomy (PEG) tube is not a suitable option. Though easy to place and reversible, nasogastric tube has been associated with physical discomfort leading to restraining of patients with its psychological and social implications. To date, few studies have been done to determine the role of feeding tubes in preventing aspiration pneumonia in patients with dysphagia. In this study, we compared the incidence of aspiration pneumonia and death in patients with dysphagia who were either fed orally or through a nasogastric tube.

METHODS

Over a period of six months, all patients who were admitted to the geriatric ward of our hospital were assessed for dysphagia by speech therapists. Patients who had dysphagia at the time of discharge from the hospital were enrolled in the study. Randomisation was not done on ethical grounds. Patients were enrolled into the study and assigned to a group only after they (or their next-of-kin) have decided on the mode of feeding. The speech therapists made recommendations regarding the mode of feeding for these patients, which were either oral feeding (with modified diet) or nasogastric tube feeding. Thus, patients were divided into three broad categories: those on oral feeding who needed a modified diet; those on nasogastric tube who were recommended non-oral feeding; and those on oral feeding because they (or their next-of-kin) refused nasogastric tube feeding recommended by the speech therapist. Training was provided to the designated caregivers of all patients who were on modified diet or on nasogastric tube, and who were discharged to their own homes or to the community hospitals.

The patients were given a two-month follow-up at the geriatric clinic. Telephone interviews were conducted for patients who missed their clinic appointments. The patient (or the next-of-kin) was asked about any incidence of aspiration pneumonia and change in feeding method during the two-month follow-up period. When indicated, medical records review was done to verify the information after obtaining consent from the patient (or the next-of-kin). Patients admitted to the hospital for reasons other than aspiration pneumonia were allowed to complete the follow-up period. Cause of death was determined from the hospital records for patients who died during the follow-up period. No restrictions were placed on changing the mode of feeding in the follow-up period. Patients who changed the mode of feeding, from oral to nasogastric tube or vice-versa, during the follow-up period were excluded from the study. The duration of follow-up was limited to two months as a high rate of changes in the mode of feeding was anticipated.

The patients' demographical information recorded were age, sex, race, functional status, cognitive status, caregiver information and discharge destination. Cause of dysphagia, patient's feeding option and their (or their next-of-kin's) preferences were recorded. There were four endpoints in the study: completion of the two-month follow-up period without any aspiration pneumonia or mortality, aspiration pneumonia, and possible aspiration pneumonia and death (from both aspiration and non-aspiration-related causes). Aspiration pneumonia was defined as new pulmonary infiltrate on the chest radiograph with chest symptoms (e.g. history of choking, new cough, worsening of the previous cough, shortness of breath, bronchospasm) and fever or raised white blood cells. Possible aspiration pneumonia was defined as the presence of all signs/symptoms of aspiration pneumonia without pulmonary infiltrate on the chest radiograph. Data of patients on oral and nasogastric tube feeding were compared for incidence of aspiration pneumonia, probable aspiration pneumonia and death. The Statistical Package for Social Sciences (SPSS) version 10.0 (Chicago, IL, USA) was used for data analysis.

RESULTS

A total of 131 patients were recruited for the study. Nine patients were excluded due to change in the mode of feeding during the follow-up period. 21 patients failed to keep their appointments at the end of the follow-up period. Of these, 17 had no aspiration pneumonia or death. Four patients died from non-aspiration-related causes.

Table I. Characteristics of patients on nasogastric tube feeding and oral feeding.

Variable	Nasogastric tube feeding (n=64)	Oral feeding (n=58)	p-value (NGT vs oral feeding)
Mean age (years)	85.5 (68-98)	85.5 (69-102)	0.977*
Mean Barthel's score	2.17 (0-20)	7.19 (0-20)	<0.001**
Mean AMT score	0.5 (0-6)	2.12 (0-10)	<0.001**
Total outcome	20 (31.2%)	6 (10.3%)	0.007**
Aspiration pneumonia	12 (18.8%)	2 (3.4%)	0.04***
Possible aspiration pneumonia	7 (10.9%)	0	0.04***
Death from aspiration	5 (7.8%)	0	0.10***
Death from other causes	1 (1.6%)	4 (6.9%)	0.33***

*Student's t-test; **Fisher's exact test; *** chi-square test; AMT: abbreviated mental test; NGT: nasogastric tube.

Table II. Characteristics of patients on nasogastric tube feeding and those who refused nasogastric tube feeding.

Variable	Nasogastric tube feeding (n=64)	Refused non-oral feeding (n=26)	p-value (NGT vs refused NGT)
Mean age (years)	85.5 (68-98)	86.38 (69-102)	0.588*
Mean Barthel's score	2.17 (0-20)	6.12 (0-20)	0.007*
Mean AMT score	0.5 (0-6)	2.23 (0-9)	0.008*
Total outcome	20 (31.2%)	3 (11.5%)	0.064**
Aspiration pneumonia	12 (18.8%)	2 (7.7%)	0.41***
Possible aspiration pneumonia	7 (10.9%)	0	0.22***
Death from aspiration	5 (7.8%)	0	0.37***
Death from other causes	1 (1.6%)	1 (3.8%)	0.89***

*Student's t-test; **Fisher's exact test; *** chi-square test; AMT: abbreviated mental test; NGT: nasogastric tube.

Table III. Characteristics of patients on nasogastric tube feeding and those recommended for oral feeding by a speech therapist.

Variable	Nasogastric tube feeding (n=64)	Recommended oral feeding (n=32)	p-value (NGT vs ROF)
Mean age (years)	85.5 (68-98)	84.8 (70-95)	0.63*
Mean Barthel's score	2.17 (0-20)	8.06 (0-20)	<0.001*
Mean AMT score	0.5 (0-6)	2.03 (0-10)	0.001*
Total outcome	20 (31%)	3 (9.4%)	0.10**
Aspiration pneumonia	12 (18.8%)	0	0.04***
Possible aspiration pneumonia	7 (10.9%)	0	0.16***
Death from aspiration	5 (7.8%)	0	0.29***
Death from other causes	1 (1.6%)	3 (9.4%)	0.24***

*Student's t-test; **Fisher's exact test; *** chi-square test; AMT: abbreviated mental test; NGT: nasogastric tube; ROF: recommended oral feeding.

The most common reason for dysphagia was stroke, which was seen in 91 (74.6%) patients, followed by dementia in 28 (22.9%) patients. Two patients had dysphagia from Parkinson's disease and one had dysphagia from Bell's palsy. 92 patients had oropharyngeal dysphagia, 28 patients had dysphagia due to severe cognitive impairments, and two patients had pharyngeal dysphagia.

Videofluoroscopic study of swallowing (VFSS) was done for seven (5.7%) patients as recommended by the speech therapists. Of the 90 patients recommended by the speech therapists for non-oral feeding, 64 agreed while 26 patients (or their next-of-kin) refused non-oral feeding and were discharged on oral feeding. At the time of discharge, 64 (52.5%) patients were on nasogastric tube feeding and 58 (47.5%) were on oral feeding, including the 26 patients who refused non-oral feeding.

68 (55.7%) patients were discharged to their own homes, 49 (40.2%) patients were discharged to nursing homes and five (4.1%) patients were discharged to community hospitals. When outcomes between those who went to nursing homes and those went home were compared, no statistically significant difference was noted ($p=0.116$, Fisher's exact test). Institutions, live-in domestic helpers, children and spouses were the main care providers for 54 (44.3%), 38 (31.1%), 22 (18%) and 6 (4.9%) patients, respectively.

At the end of the two-month follow-up period, 14 (11.5%) patients had aspiration pneumonia, seven (5.7%) had probable aspiration pneumonia, 96 (78.7%) patients had no aspiration. Five (4.1%) patients died from non-aspiration-related causes, four were on oral feeding and one on nasogastric tube feeding. Out of these five patients who died, three died of ischaemic heart disease, one died of stroke and one died of urinary tract infection. Five of the 14 patients who had aspiration pneumonia died from it, four were on nasogastric tube feeding and one was on oral feeding. Comparison between tube-fed and all orally-fed patients is shown in Table I. Similar comparison between tube-fed patients and those who refused tube feeding is shown in Table II. Table III compares the patients who were tube-fed with those on oral feeding as recommended by the speech therapist. When the patients who refused non-oral feeding was compared with those recommended for oral feeding, no significant difference was noted (Table IV).

Multivariate analysis showed that the mode of feeding predicted outcome ($p=0.032$), while age, sex, Barthel's score and abbreviated mental test (AMT) score did not predict outcome. After excluding death from the outcome, multivariate analysis still revealed

that only the mode of feeding predicted outcome and not age, sex, AMT and Barthel score ($p=0.012$).

DISCUSSION

Several strategies have been proposed to prevent aspiration pneumonia in patients with dysphagia. One study conducted in nursing home residents showed a reduction in the rate of pneumonia in residents who had oral care after each meal⁽²⁴⁾. Use of thickened liquids is frequently recommended for oropharyngeal dysphagia. Reduced incidence of aspiration pneumonia was noted in a study where the participants were randomised to a soft mechanical diet and thickened liquids⁽²⁵⁾. Various positioning strategies are often recommended to prevent aspiration. These may include chin tuck position, upright position during and after meals, and semi-recumbent position of the bed. But a study done by DePippo et al did not demonstrate significant difference in the incidence of aspiration pneumonia to patients assigned to various positioning strategies⁽²⁶⁾. Two trials showed beneficial effects of amantadine and cilostazol to prevent aspiration pneumonia^(27,28), but the adverse effects of these medications prevented wider use in clinical practice.

The feeding method is important for patients diagnosed with dysphagia. In stroke patients, maintenance of nutrition and prevention of aspiration are the two most commonly-cited reasons for nasogastric tube placement. Despite data suggesting that refusal of food and water in terminal illness is not painful⁽²⁹⁾ and the common observation of aversive feeding behaviours in advanced dementia, inadequate intake of food and water is often thought to lead to distressing hunger, thirst and death. Multiple observational studies showed high short-term mortality rates and lack of survival advantage to tube feeding of advanced dementia^(12,30). Nevertheless, feeding tubes are often placed for patients with advanced dementia. No significant difference in aspiration pneumonia was observed with intragastric or post-pyloric placement nasogastric tube⁽³¹⁾. Continuous or intermittent feeding through nasogastric tube did not make any difference in the rate of aspiration pneumonia⁽³²⁾.

Nakajoh et al⁽¹⁵⁾ found that the incidence of pneumonia was significantly higher in post-stroke patients on oral feeding than in those with nasogastric tube feeding during a one-year follow-up period (54.3% versus 13.2%, $p<0.001$). They also reported that bedridden patients on nasogastric tube feeding had the highest incidence of pneumonia (64.3%). On the contrary, our study showed a higher incidence of aspiration pneumonia and lack of survival benefit in patients on nasogastric tube feeding compared to

Table IV. Characteristics of patients who refused non-oral feeding and those recommended for oral feeding by a speech therapist.

Variable	Refused non-oral feeding (n=26)	Recommended oral feeding (n=32)	p-value (refused NGT vs ROF)
Mean age (in years)	86.38 (69-102)	84.8 (70-95)	0.37*
Mean Barthel's score	6.12 (0-20)	8.06 (0-20)	0.28*
Mean AMT score	2.23 (0-9)	2.03 (0-10)	0.80*
Total outcome	3 (11%)	3 (9.4%)	0.21**
Aspiration pneumonia	2 (7.7%)	0	0.67***
Possible aspiration pneumonia	0	0	Not applicable
Death from aspiration	0	0	Not applicable
Death from other causes	1 (3.8%)	3 (9.4%)	0.80***

*Student's t-test; **Fisher's exact test; *** chi-square test; AMT = abbreviated mental test; NGT = nasogastric tube; ROF: recommended oral feeding.

those on oral feeding.

Three factors could have contributed to the better outcome in the oral feeding group, namely, functional status, cognitive status and severity of dysphagia. Patients who were on oral feeding had higher mean Barthel's (2.17 versus 7.19, $p<0.001$) and AMT (0.5 versus 2.12, $p<0.001$) scores. However, multivariate analysis showed that only mode of feeding, and not Barthel's score nor AMT score, predicted outcome. Dysphagia in the oral feeding group was probably less severe because 32 out of 58 patients in this group were deemed safe to have oral feeding with a modified diet. Thus, we deduce that the severity of dysphagia was the main contributor to the better outcome in the oral feeding group.

Next, we compared two subgroups of patients who probably had dysphagia of similar severity. Patients on nasogastric tube feeding and those who refused nasogastric tube feeding were probably similar as both groups were deemed to be unsafe for oral feeding. Again, it is interesting to note that those who refused nasogastric tube feeding had better outcome when compared with patients on nasogastric tube feeding (11.5% versus 31.2%). However, the difference was not statistically significant (Fisher's exact test, $p=0.064$). When only patients on tube feeding and those who refused tube feeding were considered, multivariate analysis revealed that age, sex, Barthel's score, AMT score and mode of feeding did not predict outcome. It was also noted that those on nasogastric tube-feeding were more cognitively and functionally impaired compared to those who refused nasogastric tube-feeding.

Our study had several limitations. The number of patients enrolled into the study was small. No

active randomisation could ethically be done, and the decision on mode of feeding rested on the patients (or their next-of-kin). Patients with more functional or cognitive impairments were probably more likely to be placed on non-oral feeding by their families. The duration of follow-up was kept at two months to reduce the likelihood of change in the mode of feeding. Even within this short period, nine patients were excluded from the study because of change in the mode of feeding.

In our study, patients on nasogastric tube feeding did not have a better outcome against aspiration pneumonia and mortality when compared to those who were on oral feeding. The poorer outcome of nasogastric tube-fed patients could be attributed to their worse cognitive and functional statuses. Larger studies are needed to refute or confirm the usefulness of nasogastric tube in elderly patients with dysphagia.

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