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**A critical appraisal of indications for endoscopic placement of naso-jejunal feeding tubes**

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|                               |  |



1 **A critical appraisal of indications for endoscopic placement of naso-jejunal feeding**  
2 **tubes**

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4

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12 **Short title:** Evaluation of indications for feeding tubes

13

14 **Abbreviations:** ENFT: endoscopically placed naso-jejunal feeding tube

15

ICU: intensive care unit

16

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20

21 **Abstract**

22

23 Postpyloric feeding is indicated whenever nutritional intake is compromised because of  
24 impaired gastric emptying. Although guidelines concerning this feeding modality are  
25 available it remains unclear, however, whether these are applied in clinical practice. We  
26 therefore evaluated *the indications provided by applicants for* endoscopic placement of naso-  
27 jejunal feeding tubes at our centre.

28 A prospective study was conducted in patients who were referred for endoscopic nasojejunal-  
29 feeding tube placement in a 950-bed Dutch university hospital. State-of-the-art criteria for  
30 naso-jejunal tube placement comprised severe gastro-oesophageal reflux, gastroparesis  
31 leading to aspiration, gastric stasis not responding to prokinetics, gastroduodenal obstruction  
32 or proximal enteric fistulae. The study endpoint was met in case the feeding tube was no  
33 longer needed or had to be replaced, or in case the patient was discharged from the hospital or  
34 succumbed.

35 During a four-month observation period, 131 patients were enrolled, of whom 57% came  
36 from intensive care units. In only 59% of all cases, tube placement met at least one of the  
37 mentioned criteria *in the hospital protocol*, while in intensive care patients a lower proportion  
38 was observed (50%,  $p < 0.05$ ). In the latter group, in 35% of all cases no increased gastric  
39 residues had been measured at all.

40 Although directives are at hand that provide clear indications for endoscopic placement of  
41 naso-jejunal feeding tubes, our data show that these guidelines are frequently not followed in  
42 clinical practice. These findings suggest that supervised implementation of established  
43 guidelines might reduce the strain on both patients and hospital's resources.

44

45 **Key words:** artificial nutrition; postpyloric feeding; feeding tube; endoscopy; intensive care

46

## 47 **Introduction**

48 Postpyloric feeding is indicated when the digestive tract functions normally, but patients  
49 cannot meet their nutritional or fluid requirements due to a passage problem at the gastric  
50 level. This situation is most frequently encountered in the (early) postoperative setting (1-7).  
51 In general, there is consensus on the indications to initiate artificial nutrition, be it by the  
52 enteral or by the parenteral route (1-12). Especially the European Society for Parenteral and  
53 Enteral Nutrition, the American Society for Parenteral and Enteral Nutrition, the American  
54 Gastroenterological Association and the British Society for Gastroenterologists have provided  
55 comprehensive guidelines on enteral and parenteral nutrition that represent the current state of  
56 the art (7,8,10-12).

57 Several studies have compared gastric and postpyloric feeding with regard to indications and  
58 complications (1-6, 7-12). However, none of these focused on endoscopically placed naso-  
59 jejunal feeding tubes (ENFTs). Although a few studies (13-22) have described tube survival  
60 rates, placement- and tube-associated complications, as well as the logistics regarding ENFTs,  
61 most of these investigations were too small to provide adequately assessable data from the  
62 statistical point of view.

63 This lack of information urged us to perform the present study. A small pilot survey in 10  
64 ICU patients who had ENFTs placed because of supposedly impaired gastric emptying  
65 revealed only one patient with significant gastric retention according to our local protocol (2  
66 times > 100 ml residue within 4 hours). The reason for the discrepancies in the registration of  
67 gastric residues remained unclear and provided another indication for the present  
68 investigation. Here, we critically evaluated relevant issues concerning ENFT placement, with  
69 special emphasis on such critical issues as the correctness of the indications for tube  
70 placement, placement success and complications. For practical purposes, radiographically  
71 placed nasojejunal feeding tubes were not included in this evaluation due to significant  
72 logistic differences between the endoscopic and radiological procedures.

## 73 **Methods and Materials**

74

### 75 *Study population*

76 One hundred and thirty one consecutive patients who were referred for ENFT placement were  
77 enrolled in the study protocol. The local Committee on Research Involving Human Subjects  
78 approved the study. Because this work concerns a strictly observational study, informed  
79 consent was not mandatory. Eligible for enrolment were adult patients ( $\geq 16$  years) in whom  
80 endoscopical placement of an ENFT was requested.

81 The study was conducted at the Radboud University Nijmegen Medical Centre (RUNMC) in  
82 Nijmegen, The Netherlands, an academic hospital where approximately 300 naso-jejunal  
83 feeding tubes are placed on an annual basis, of which 220 by means of endoscopy and 80 via  
84 radiological procedures.

85

### 86 *Procedure*

87 All requested ENFTs were made by means of an application form or by phone. The mobile  
88 endoscopy team placed ENFTs on the ICU wards. All other ENFTs were placed at the  
89 Endoscopy ward. Following cannulation of the horizontal part of the duodenum, a Vygon  
90 Charriere 10 polyurethane feeding tube was placed under direct vision through the biopsy  
91 channel and passed for at least 50 cm beyond the pylorus. All procedures were performed by  
92 gastroenterologists and fellows (94) or by a nurse practitioner (10).

93

### 94 *State-of-the-art criteria*

95 The state of the art criteria for ENFT placement, according to various sources (1-7, 10, 14, 15)  
96 are:

- 97 I. Proven severe gastro-esophageal reflux, atonic stomach or gastroparesis leading to  
98 aspiration.
- 99 II. Delayed gastric emptying with residues two times  $> 100$  ml within four hours and not  
100 responding to propulsion improving measures.
- 101 III. Intolerance of oral feeding due to gastroduodenal inflammation, postprandial pain or  
102 passage disorder due to swelling or outside pressure onto the duodenum (pancreatitis or  
103 tumour).
- 104 IV. Proximal (duodenum and first part jejunum) enteric fistula.

105

106 *Data*

107 The study endpoint was met whenever the presence of an ENFT was no longer indicated, the  
108 ENFT had to be replaced, whenever the study period exceeded the observation period of four  
109 months, or in case the patient was discharged from the hospital or succumbed. All relevant  
110 data concerning indications and placement of the ENFT, hospital stay, complications and  
111 length of survival of the ENFT were recorded from the patients' medical files.

112

113 *Statistical Analyses*

114 Primary endpoint of the study was the percentage of ENFTs that were correctly placed  
115 according to the state-of-the-art criteria. Given the lack of available data, and based on expert  
116 opinions, we assumed with an accuracy of 10%- that about 60% of the requests for an ENFT  
117 would fulfil these criteria. Based on power analysis, an inclusion of 102 ENFTs thus was  
118 expected to permit adequate statistical analysis.

119 Descriptive statistics and comparisons of categorical variables between groups were evaluated  
120 using the Statistical Program for Social Sciences (SPSS) version 12.1 (SPSS Corporation,  
121 Chicago, Il, USA). Tube survival was assessed by means of Kaplan-Meier's analysis and log-  
122 rank testing.

## 123 **Results**

124 Between February and June 2005, 131 adult patients who completed the study were enrolled,  
125 with a male-female ratio of 84:47 and a mean age of 60 years (range 17-87, SD=14.9).  
126 Outpatients (n=13) and patients with an observation period of less than one week (n=7) were  
127 excluded from the ENFT survival analysis. Most patients suffered from gastroenterological  
128 (41%) and cardiac (24%) problems. Overall, 57% of all patients had been admitted to the ICU  
129 at the moment the ENFT was requested.

130

### 131 *State of the art criteria*

132 In 59% of all patients ENFT placement was found to fulfil one of the state of the art criteria  
133 (Figure 1). At ICUs this proportion was significantly lower (50%,  $p=0.01$ ). Of note, in ICU  
134 patients, in 35% of all cases (n=74) no valid indication for ENFT placement was present since  
135 increased gastric residues had not been measured.

136

### 137 *Withdrawn requests for ENFTs placement*

138 Of the initially requested ENFTs, 27% originating from the ICUs (n=74) and 5% from other  
139 wards (n= 57) were cancelled before actual placement (table 1). A significantly higher  
140 number of withdrawals was observed for ICU requests ( $p\leq 0.001$ ).

141 Cancellation in 89% of all cases (n=23) took place within 48 hours after the request. Except  
142 for one ICU patient, all withdrawals were reported to be the consequence of recovered gastric  
143 motility. Remarkably, 21 out of these 23 were initially requested because of reported  
144 significant gastric retention volumes.

145

### 146 *Accidental findings during ENFT placement*

147 During all endoscopic procedures (n=104) only one significant finding was reported in the  
148 form of a suspected peri-papillary lesion in the duodenum for which an appropriate analysis  
149 was initiated. Biopsies taken during this procedure were consistent with a duodenal adenoma.  
150 Small mucosal erosions, most likely due to the presence of feeding tubes were seen on a  
151 regular basis in the gastric corpus and antrum. None of these gave rise to significant bleeding  
152 or required endoscopic intervention during the study period.

153

### 154 *Time interval between request and ENFT placement*



155 Most (30%) of the ENFTs (n=103) were placed on Friday. Probably because of the  
156 upcoming weekend (no ENFT placements are planned on a regular basis during the weekends  
157 in our hospital) there probably was an increase of requests on this day. It proved that 51% of  
158 all requests were carried out the same day and 79% within 48 hours.

159

#### 160 *Procedure-related complications*

161 During endoscopic ENFT placement (n=104) no significant complications occurred. One  
162 procedure was aborted due to excessive vomiting. This patient developed no clinical  
163 symptoms related to aspiration.

164

#### 165 *Complications and survival of ENFTs in the clinical setting*

166 Twenty six % of all clinically inserted ENFTs became non-functional within the first week  
167 after placement (n=83). Overall, almost 29% of the clinically placed ENFTs eventually no  
168 longer functioned due to dislocation (either iatrogenic, or related to vomiting or agitation) and  
169 about 4% due to tube clogging. No statistically different (p=0.1124) survival rates were  
170 observed for ENFTs from ICUs when compared with other wards.

171 **Discussion**

172 The most striking finding in the present study is that in a large academic institution in a very  
173 high proportion (41%) of patients, despite the presence of well-established guidelines, ENFTs  
174 are not placed in accordance with these directives. At the ICUs this proportion seems to be  
175 even higher (50%). *Although this is a single-centre investigation, we have no indications why*  
176 *our facility would not be representative for other teaching centres in the Netherlands.*

177 ENFTs that were placed according to the guidelines (59%) mainly concerned ICU patients  
178 (approximately 25%) who fulfilled criterium II (delayed gastric emptying with residues two  
179 times > 100 ml within four hours and not responding to propulsion improving measures). For  
180 the other wards (surgical and internal medicine) criterium III (intolerance of oral feeding due  
181 to gastro duodenal inflammation, postprandial pain or passage disorder due to swelling or  
182 outside pressure onto the duodenum (pancreatitis or tumour)) was seen most frequently  
183 (21%). The indication for nearly all of these latter requests was (chronic) pancreatitis.

184 The criteria for ENFT placement were clearly described by the physician and confirmed by  
185 checking the medical record immediately before actual placement of the ENFT.

186 It remains unclear from our study why many (41%) ENFTs were not placed according to the  
187 available guidelines. *Our impression was that while these directives were known by heart by*  
188 *most physicians and nurses, they tend to rather act on their "clinical instinct". However,*  
189 *since only the state of the art criteria are evidence-based, it appears prudent that we should*  
190 *strongly adhere to their implementation.*

191 The state of the art criteria are based on expert reviews and guidelines. Although according to  
192 many surgeons peroperative nutritional support is an indication for the placement of a  
193 duodenal FT in major bowel surgery (2-4, 17, 18, 20) not one single ENFT was requested for  
194 this indication. This might be explained by the fact that in our hospital a (needle) jejunostomy  
195 is most frequently placed in this situation (on 37 occasions over the year 2006).

196 Another remarkable finding in this study was the high percentage (27%) of requested ENFTs  
197 by ICUs that were withdrawn within 48 hours. Although this in part probably reflects the  
198 clinical course of patients with recovered gastric emptying within this time frame, although  
199 another explanation is that in a number of cases the judgement of gastric residues may have  
200 been incorrect.

201 The low number of coincidental findings during ENFT placements in this study has to be  
202 related to the fact that endoscopic visibility during the procedure is limited because tube  
203 feeding is only shortly interrupted before the procedure.

204 Some 26% of all ENFTs became non-functional within the first week after placement, mostly  
205 due to dislocation and clogging. This finding corroborates previous findings in the literature  
206 (8, 23).

207 We conclude that, at least in our institution, the guidelines that are at hand for ENFT  
208 placement are frequently not followed in clinical practice. Increased and persistent attention  
209 for practical nutrition-related issues in teaching programs might well provide a solution in this  
210 regard.

211

#### 212 **Acknowledgements**

213 GB, TvA and GW provided the idea for this study. GB performed the study, which was  
214 supervised by TvA and GW. GB wrote the manuscript together with GW. TvA critically  
215 reviewed the manuscript.

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282 **Figure legends**

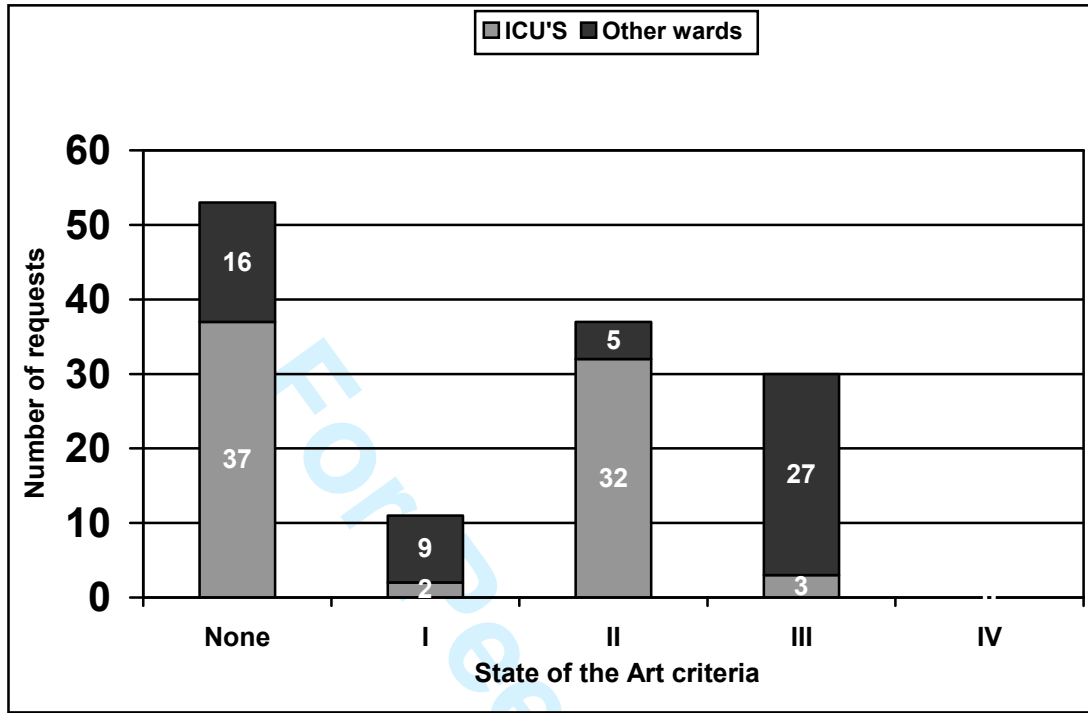
283 Figure 1. Numbers of requested ENFTs that did or did not (“none”) fulfil state of the art  
284 criteria (I-IV)

285

For Peer Review

286 **Figures**

287



288

289 **Figure 1**

290 **Tables**

291

292 Table 1. Details on ENFT placements in relation to state of the art criteria

| <b>ENFT's</b>       | <b>Fulfilled<br/>criteria</b> | <b>Did not<br/>fulfill<br/>criteria</b> | <b>Total</b> |
|---------------------|-------------------------------|---|--------------|
| Actual placement    | 75                            | 28                                      | 103          |
| Withdrawn placement | 2                             | 25                                      | 27           |
| Failed placement    | 1                             | 0                                       | 1            |
| <b>Total</b>        | <b>78</b>                     | <b>53</b>                               | <b>131</b>   |

293

294

295 Table 2: Departments requesting ENFTs

296

| <b>Department</b>      | <b>Number</b> | <b>% of total</b> |
|------------------------|---------------|-------------------|
| ICU Cardio-thoracic    | 30            | 23                |
| ICU Neurology / trauma | 19            | 14                |
| ICU General            | 25            | 19                |
| Gastroenterology       | 18            | 13                |
| Centrale endoscopie    | 11            | 8                 |
| Surgery                | 8             | 6                 |
| Hematology             | 8             | 6                 |
| Internal Medicine      | 4             | 3                 |
| Cardiology             | 2             | 2                 |
| Nephrology             | 2             | 2                 |
| Medium Care (Surgery)  | 1             | 1                 |
| Oncology               | 1             | 1                 |
| ENT                    | 1             | 1                 |
| Radiotherapy           | 1             | 1                 |
| <b>Total</b>           | <b>131</b>    | <b>100</b>        |

297

298 Underlying diseases comprised gastro-intestinal (41%), cardiologic (24%), trauma (10%) and

299 neurologic disorders (9%). Gastro-intestinal disorders mainly (47%) concerned acute and chronic

300 pancreatitis.