Clinical Nutrition ESPEN 29 (2019) 133–136

Contents lists available at ScienceDirect

Clinical Nutrition ESPEN

journal homepage: http://www.clinicalnutritionespen.com

Original article

Cortrak® duodenal tube placements: A solution for more patients? A preliminary survey to the introduction of electromagnetic-guided placement of naso-duodenal feeding tubes

W. Arjaans [a, b, *], M. Ouwehand [a, b], G. Bouma [c], T. van der Meulen [c], M.A.E. de van der Schueren [b, d]

[a] Nutrition Support Team, Amsterdam UMC/Vrije Universiteit, Amsterdam, the Netherlands
[b] Department of Nutrition and Dietetics, Amsterdam UMC/Vrije Universiteit, Amsterdam, the Netherlands
[c] Department of Gastroenterology, Amsterdam UMC/Vrije Universiteit, Amsterdam, the Netherlands
[d] Department of Nutrition and Health, HAN University of Applied Sciences, Nijmegen, the Netherlands

ARTICLE INFO

Article history:
Received 2 November 2018
Accepted 6 November 2018

Keywords:
Duodenal feeding tube
Cortrak
Nasoenteral tubes
Electromagnetic guidance
Tube feeding
Nasoenteral tubes

SUMMARY

Rationale: The Cortrak® feeding tube, an electromagnetic (EM) guided feeding tube which is placed by a trained nurse at the patient's bedside, is reported to be a safe, patient friendly and cost effective answer to the disadvantages of endoscopic placement of naso-duodenal feeding tubes. However, this procedure requires a learning curve and regular practice. This study aims to evaluate whether introducing Cortrak® feeding tube placement would be profitable in a tertiary referral academic hospital.
Methods: We re-evaluated all endoscopically placed post-pyloric feeding tubes in the years 2012–2013. Taking into consideration training for nurses to learn how to place Cortrak® feeding tubes, strict inclusion criteria were formulated for the initial retrospective analysis: age 18 years or older, normal GI anatomy and non-ICU admitted patients. As a secondary analysis we also evaluated ICU patients (age >18 and normal upper GI tract).
Results: Patient records of 487 duodenal feeding tube placements in 331 patients were evaluated; 125 non-ICU placements (in 90 patients) and 84 ICU placements (in 75 ICU patients) fulfilled the inclusion criteria. Main reasons for exclusion were: abnormalities of the upper GI tract (n = 176) and endoscopy for diagnostic reasons (n = 74). Main indications for placements were gastroparesis (37%) or insufficient food intake (20%). For secondary analysis, 84 placements in 75 ICU patients were re-evaluated, with main indication gastroparesis (62%).
Conclusion: In our hospital, at least one quarter of the duodenal tube placements would qualify for Cortrak® placement in the initial phase. Once routine has been built up and also ICU patients could be considered, half or more patients requiring a naso-duodenal feeding tube would qualify for Cortrak® placement, adding up to 3 placements per week. The findings of this study may help to decide on the profitability of introducing this method in our own hospital. The next step will be to perform a cost-benefit analysis to study whether implementing Cortrak® in practice is cost-effective and feasible.

1. Introduction

Nutritional support has now been widely accepted as an equal part of high standard medical treatment, with enteral feeding being the first choice whenever the gut works and is accessible. The standard for tube feeding is naso-gastric tube feeding. In a variety of cases, when naso-gastric feeding is not possible because of delayed gastric emptying, gastroparesis or obstructions in the upper gastrointestinal tract, post pyloric feeding is a safe and well

* Corresponding author. Nutrition Support Team, Department of Nutrition and Dietetics, Amsterdam UMC, Vrije Universiteit, PO Box 7057, 1007 MB Amsterdam, the Netherlands.
E-mail address: W.Arjaans@vumc.nl (W. Arjaans).

https://doi.org/10.1016/j.clnesp.2018.11.006
2405-4577/

tolerated alternative. However, endoscopic placement of a feeding tube however is a costly intervention that may put a significant burden on a (critically) ill patient. For many patients tube placement is a distressing and upsetting procedure and therefore anything that can minimize the level of discomfort and anxiety that accompanies it is of benefit [1].

The Cortrak® feeding tube, an electromagnetic-guided (EM-guided) feeding tube which is placed by a trained nurse at the patient's bedside, is reported to be a safe, patient friendly and cost effective answer to the disadvantages of endoscopic placement of naso-duodenal feeding tubes [2–6]. The patient does not require sedation besides a local anesthetic, which is not different from positioning a nasogastric feeding tube. The Cortrak® tube has a diameter of 8, 10 or 12 charrier and a length of 109–140 cm (comparable to other duodenal feeding tubes) and contains an electromagnetic transmitter. When positioning a Cortrak® feeding tube, the patient is lying in supine position and a light weighted smartphone is placed on the patients belly at the height of the diaphragm [7]. On a monitor, the nurse follows the path of the tube through the nose, throat, esophagus and stomach and further on to the pylorus, duodenal and the jejunum. Placement of a Cortrak® tube requires on average less than 15 min [4].

However, not all patients who require naso-duodenal feeding are potential candidates for a Cortrak® feeding tube. Contra-indications are, for example, abnormalities in the anatomy of the upper gastrointestinal tract, face injury, or basilar skull fracture. To be able to make an informed decision on introduction of the Cortrak® feeding tube as a new, patient-friendly and safe alternative for enteral duodenal access in our hospital, we decided to first retrospectively evaluate the eligibility of patients for placement of this kind of tube.

2. Patients and methods

In this two year retrospective survey, patient records of 487 consecutive endoscopically placed duodenal feeding tubes in 331 patients were re-evaluated to determine whether or not these placements would have met the criteria for possible Cortrak® duodenal tube placement. Included were all in- and outpatients who were referred for duodenal feeding tube placement in the years 2012 and 2013 and who fulfilled our inclusion criteria. The medical ethical review committee approved the study protocol for this retrospective analyses.

Strict inclusion criteria for possible Cortrak® placement were determined, taking into consideration that training is needed to learn how to place a Cortrak® feeding tube:

- Age >18 years
- Normal anatomy of the upper gastrointestinal tract
- Goal of endoscopy: feeding tube placement

Excluded were patients with 6 or more duodenal feeding tube placements, being not representative for the total population, and patients who had undergone an endoscopy for diagnostic reasons only (i.e. no feeding tube placement).

For the initial analysis, patients admitted to the ICU were excluded. As a secondary analysis, patients admitted to the ICU were evaluated as well, as practice in other hospitals has learned that Cortrak® feeding tube placement is feasible for (unconscious) ICU patients once nurses have been trained well enough in conscious patients.

2.1. Data collection

For all 487 placements, the following data were collected: medical specialism (GI surgery, gastro-enterology, oncology, neurology, neurosurgery, urology, hematology, other), age, gender, reason for endoscopy, ward of admission, and anatomy of the upper GI tract (normal or abnormal).

For patients fulfilling the inclusion criteria the following data were collected:

1. Indication for duodenal tube placement (categorized into 7 main categories: gastroparesis, malnutrition or insufficient food intake, miscellaneous/paralytic ileus, luxation of a prior placed duodenal tube, dysphagia, bile re-infusion, Duodopa® treatment for patients with Parkinson's disease).
2. SNAQ® malnutrition risk score (not at risk, at risk, or at high risk of malnutrition),
3. Sedation (Lidocaine 10% as an anesthetic for the throat, Midazolam in individualized dosing for patients, or Propofol/general anesthesia),
4. Side effects of a) sedation (paradoxical effects, brief apnea, hypotension, cardiac or respiratory arrest, aspiration or hypoxia) or b) the endoscopic procedure (perforation, bleeding, pressure ulcer of the nose and sore throat).

Descriptive statistics were used to report the results of this retrospective survey.

3. Results

In total 487 placements were evaluated (flowchart, Fig. 1). Twenty seven placements in 22 children were excluded. A further 461 placements (in 331 patients) were examined, 58% male (42% female), mean age 60 (SD 16). Reasons for exclusion are shown in the flowchart. Some placements had more than one reason for not being eligible for Cortrak®placement.

In the end, 209 placements would have fulfilled the criteria for Cortrak® placement. Out of these, 125 placements (90 patients), i.e. approximately one quarter of placements, would have fulfilled the inclusion criteria for Cortrak® placement during the introductory period. Another 84 placements (75 patients) from ICU patients would have qualified in second instance. Taking into account the ICU patients as well, approximately half of all naso-duodenal feeding tube placements, i.e. two to three placements per week, would qualify for the Cortrak® procedure.

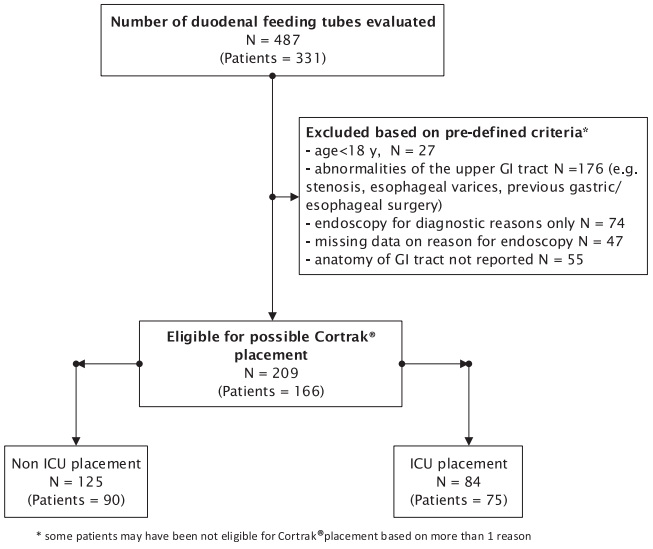

Fig. 1. Flowchart of eligible possible Cortrak® placements.

Table 1 shows the duodenal feeding tube-placements in the general and in the ICU population. For the general wards the main referring specialisms were gastro-intestinal surgery (35%), gastro-enterology (13%) and oncology (19%). The main reasons for duodenal tube placements were gastroparesis (37%) and insufficient food intake (20%). Fourteen percent of tubes were placed for other reasons than nutritional therapy (i.e. bile reinfusion or Duodopa® test). For the ICU placements referring specialisms were miscellaneous and the main reason for placement was gastroparesis (62%). On regular wards Midazolam was the mostly used sedative in 48% of patients, on the ICU this was Propofol infusion in 50%. Complication rates of the endoscopic procedure during and after the procedure were low in both groups (<5%).

4. Discussion

This retrospective survey was executed to re-evaluate in which patients an endoscopic procedure could have been replaced by the Cortrak® technology. A total of 209 placements (43%) would have been eligible for a Cortrak® tube: 125 in non-ICU patients and 84 in ICU patients.

Based on strict inclusion criteria (adult, normal anatomy of the gastrointestinal tract and no admission to ICU) this study showed that at least one-fourth of patients referred for duodenal tube placement would have been a possible candidate for Cortrak® placement at our institute. If also ICU patients would have been included this would add up to approximately 50% of endoscopic tube placements being eligible for electromagnetic-guided placements, i.e. two to three placements per week. This is a conservative estimate as 102 (47 + 55) tube placements were not included in this analyses, due to missing data. If all of these patients would have been eligible for Cortrak® placement this would increase the amount of tube placements.

Based on the literature and experiences from other hospitals electromagnetic tube placement is known to be a safe and efficient alternative for endoscopic feeding tube placement. A study including 256 Cortrak® placements [7] showed a success rate of 74% for nurses on general wards and of 72–89% for nurses working at the ICU. This study also describes a clear learning curve and suggests that regular practice is necessary to guarantee successful placements.

A recent systematic review [4] concludes that bedside electromagnetic-guided placement of nasoenteral feeding tubes appears to be as safe and effective as fluoroscopic or endoscopic placement. The review suggests that EM-guided tube placement by nurses may be preferred over more costly procedures performed by

Table 1
Characteristics of patients who would have been eligible for a Cortrak® feeding tube placement; column 1 representing non-ICU patients, and column 2 ICU patients.

	Inpatients (non-ICU) and outpatients	Patients admitted to ICU	Total
Patients	90	75	165
Number of placements	125	84	209
Age (years)	60 ± 14,4	56 ± 18	59 ± 16
Sex:			
Male	44 (49%)	53 (70%)	97 (58%)
Female	46 (51%)	22 (30%)	68 (42%)
Total number of placements:	125	84	209
Single placement (once per patient)	68	67	
Repeated placements:			
2 per patient	13	7	
3 per patient	7	1	
5 per patient	2	–	
Referring specialism[a]	125	84	209
Gastro-intestinal surgery	44 (35%)	10 (12%)	
Gastroenterology	16 (13%)	2 (2%)	
Neurology	10 (8%)	10 (12%)	
Neurosurgery	3 (2%)	13 (15%)	
Traumatology	2 (2%)	7 (8%)	
Hematology	10 (8%)	13 (16%)	
Oncology	23 (18%)	–	
Other specialisms[b]	17 (14%)	29 (35%)	
Reasons for placement			
Gastroparesis	46 (37%)	52 (62%)	
Insufficient food intake	25 (20%)	10 (12%)	
Luxation of previous tube	18 (14%)	5 (6%)	
Miscellaneous/paralytic ileus	18 (14%)	15 (18%)	
Other (bile reinfusion, Duodopa® test treatment in M. Parkinson, dysphagia)	18 (14%)	2 (2%)	
Sedation			
Midazolam	60 (48%)	4 (5%)	
Propofol	–	42 (50%)	
Throat anesthesia	5 (4%)		
None	9 (7,2%)	4 (5%)	
Missing	51 (40,8%)	34 (40%)	
Complications during placement			
None	115 (92%)	60 (72%)	
Light	6 (4,8%)	–	
Missing data	4 (3,2%)	24 (28%)	
SNAQ® malnutrition score			
Not at risk	53 (42,4%)	16 (19%)	
At risk of malnutrition	7 (5,6%)	2 (2%)	
At high risk of malnutrition	32 (25,6%)	10 (12%)	
Missing data	33 (26,4%)	56 (67%)	

[a] Percentage may exceed 100% due to rounding off of numbers.
[b] Cardiology, vascular surgery, internal medicine, nephrology, cardiac surgery, pulmonology, otolaryngology, urology.

endoscopists or radiologists, but concludes that randomized studies are lacking so far. In contrast, a review by Metheny and co-workers questions the ability of clinicians to place feeding tubes correctly using an electromagnetic tube placement device. They suggest that "it may be reasonable to question the wisdom of eliminating radiographic confirmation of tube position before starting feedings" [8]. Their findings are supportive for use by a single, trained discipline, e.g. trained nurses.

Initial selection criteria were strict, as suggested in the literature, i.e. not including ICU patients and not including patients with a changed anatomy of the gastrointestinal tract. In hospitals with broad experience with this method, wider inclusion criteria are applied once nurses have built up experience. A recent study reports on EM-guided tube feeding in patients after pancreaticoduodenectomy [3] with an equal success rate for endoscopic placements vs EM-guided bed sided placement by a trained nurse. In another study success rates for surgical patients were significantly lower in the EM-guided group (58%) versus endoscopic tube placement (86%) [9].

In ICU patients, several groups have reported high success rates for EM-guided post pyloric tube placements [6,10,11], which is why we performed a secondary evaluation ICU patients who would have been eligible for such a procedure. The first randomized controlled trial comparing EM guided feeding tube placed to an endoscopic procedure has not yet been published; the CORE trial aims to study effectiveness and cost-effectiveness of EM-guided tube placements [12].

A major shortcoming of this study was that it was performed as a retrospective evaluation. Unfortunately we faced missing data on GI anatomy and reason for endoscopy in a quarter of the patients evaluated. As the hospital switched from paper charts to electronic charts, we were unable to obtain further data on these missing patients. We need to consider that very likely more patients would have been eligible for EM-guided tube placement than based on this most conservative evaluation.

Due to the electromagnetic-guiding, the company advises not to use the device in patients with implanted medical devices, such as pacemakers. In previous clinical studies though [9], this was not regarded a contra-indication. We have omitted to record the presence of implanted medical devices in this retrospective survey, but we do not expect that this will have much impact on the data described in this manuscript.

The present study was designed to be able to decide on the profitability of introducing this method in our own hospital. Introducing this new method would require training to develop competencies, organizational changes and possible investments. The cost-benefits of introducing this new method will need to be discussed based on the present data. In addition, important aspects such as comfort and logistic procedures need to be taken into account when making an informed decision on introducing the EM-guided tube placement procedure. These aspects were not evaluated in this retrospective survey.

5. Conclusion

This study shows that, at our institute, at least one quarter of patients referred for duodenal tube placement would have been a possible candidate for Cortrak® placement. This would add up to one to two placements per week. Based on the literature and experiences in other centres this method is known to be a safe and efficient alternative for endoscopic feeding tube placement. Once routine has been built up and Cortrak® placements at the ICU could also be considered, this would add up to three placements per week (i.e. half of the patients requiring a naso-duodenal feeding tube), and possibly more as missing data may have led to an underestimation. The findings of this study may help to decide on the profitability of introducing this method in our own hospital as still two-thirds of patient require traditional endoscopic treatment. The cost-benefit of introducing this new method will need to be discussed based on the present data.

Conflicts of interest

None declared.

Author contributions

WA and MO designed the study, collected, analyzed and interpreted the data, and drafted the manuscript.

MdvdS contributed to data-analysis and drafting of the manuscript.

All authors critically revised the manuscript and finally approved its contents.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.clnesp.2018.11.006.

References

[1] NICE (National Institute of Health and Care Excellence). CORTRAK 2 Enteral Access System for placing nasoenteral feeding tubes [Internet]. Updated December 2016; cited 2018 October 11. Medtech innovation briefing [MIB48]]. Available from: https://www.nice.org.uk/advice/mib48/chapter/Summary.

[2] Gerritsen A, de Rooij T, Dijkgraaf MG, Busch OR, Bergman JJ, Ubbink DT, et al. Electromagnetic-guided bedside placement of nasoenteral feeding tubes by nurses is non-inferior to endoscopic placement by gastroenterologists: a multicenter randomized controlled trial. Am J Gastroenterol 2016;111(8):1123–32.

[3] Gerritsen A, Duflou A, Ramali M, Busch OR, Gouma DJ, van Gulik TM, et al. Electromagnetic-guided versus endoscopic placement of nasojejunal feeding tubes after pancreatoduodenectomy: a prospective pilot study. Pancreas 2016;45(2):254–9.

[4] Gerritsen A, van der Poel MJ, de Rooij T, Molenaar IQ, Bergman JJ, Busch OR, et al. Systematic review on bedside electromagnetic-guided, endoscopic, and fluoroscopic placement of nasoenteral feeding tubes. Gastrointest Endosc 2015;81(4):836–847 e2.

[5] Rao MM, Kallam R, Flindall I, Gatt M, Macfie J. Use of Cortrak–an electromagnetic sensing device in placement of enteral feeding tubes. Proc Nutr Soc 2008;67(OCE):E109.

[6] Sekino M, Yoshitomi O, Nakamura T, Makita T, Sumikawa K. A new technique for post-pyloric feeding tube placement by palpation in lean critically ill patients. Anaesth Intensive Care 2012;40(1):154–8.

[7] Mathus-Vliegen EM, Duflou A, Spanier MB, Fockens P. Nasoenteral feeding tube placement by nurses using an electromagnetic guidance system (with video). Gastrointest Endosc 2010;71(4):728–36.

[8] Metheny NA, Meert KL. Effectiveness of an electromagnetic feeding tube placement device in detecting inadvertent respiratory placement. Am J Crit Care – Offic Publ Am Assoc Crit Care Nurses 2014;23(3):240–7. quiz 8.

[9] Gerritsen A, de Rooij T, van der Poel MJ, Dijkgraaf MG, Bemelman WA, Busch OR, et al. Endoscopic versus bedside electromagnetic-guided placement of nasoenteral feeding tubes in surgical patients. J Gastrointest Surg 2014;18(9):1664–72.

[10] Wang X, Zhang L, Wu C, Li N, Li J. The application of electromagnetically guided post-pyloric feeding tube placement in critically ill patients. J Invest Surg 2014;27(1):21–6.

[11] Kaffarnik MF, Lock JF, Wassilew G, Neuhaus P. The use of bedside electromagnetically guided nasointestinal tube for jejunal feeding of critical ill surgical patients. Technol Health Care 2013;21(1):1–8.

[12] Gerritsen A, de Rooij T, Dijkgraaf MG, Busch OR, Bergman JJ, Ubbink DT, et al. Electromagnetic guided bedside or endoscopic placement of nasoenteral feeding tubes in surgical patients (CORE trial): study protocol for a randomized controlled trial. Trials 2015;16:119.