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Incidence and time until the first traction or obstruction of the nasoenteral tube in hospitalized adults

Incidência e tempo até a primeira tração ou obstrução da sonda nasoenteral em adultos hospitalizados

Incidencia y tiempo hasta la primera tracción u obstrucción de la sonda nasoenteral en adultos hospitalizados

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ABSTRACT

Objective: To determine incidence and time until first traction or obstruction of nasoenteral tube in hospitalized adults.
Methods: Prospective double cohort study that included 494 adults who were users of nasoenteral tubes as inpatients in two clinical units and two surgical units in a teaching hospital. The occurrence of tube tractions and obstructions was monitored daily between 2017 and 2019. The Kaplan-Meier method was used to estimate time until the first event.
Results: Tube traction occurred in 33% of the sample, and the incidence of the event was higher on the first five days of tube use. Tube obstruction incidence was 3.4% and grew as tube use time increased.
Conclusion: Traction incidence was higher at the beginning of the period of use, whereas obstruction incidence grew as tube use time increased.
Keywords: Nursing care. Enteral nutrition. Intubation, gastrointestinal. Patient safety. Risk management. Patientcare management.

RESUMO

Objetivo: Determinar a incidência e o tempo até a primeira tração ou obstrução da sonda nasoenteral em adultos hospitalizados.
Método: Dupla coorte prospectiva que incluiu 494 adultos usuários de sonda nasoenteral, internados em duas unidades clínicas e duas cirúrgicas de um hospital universitário. Os pacientes foram acompanhados diariamente quanto à ocorrência de trações ou obstruções da sonda, entre 2017 e 2019. O método de Kaplan-Meier foi utilizado para a estimação do tempo até a ocorrência do primeiro evento.
Resultados: A tração de sonda ocorreu em 33% da amostra, e a incidência foi maior nos cinco primeiros dias de uso da sonda. A incidência de obstrução foi de 3,4%, e aumentou com otempo de uso da sonda.
Conclusão: A incidência de tração é maior no início do uso, enquanto a incidência de obstrução aumenta com o tempo de usoda sondanasoenteral.
Palavras-chave: Cuidados de enfermagem. Nutrição enteral. Intubação gastrointestinal. Segurança do paciente. Gestão de riscos. Administração dos cuidados ao paciente.

RESUMEN

Objetivo: Determinar la incidencia y el tiempo hasta la primera tracción u obstrucción de la sonda nasoenteral en adultos hospitalizados.
Método: Doble cohorte prospectiva incluyendo a 494 adultos usuarios de sonda nasoenteral, internados en dos servicios clínicos y dos servicios quirúrgicos de hospital universitario. Los pacientes fueron seguidos diariamente respecto de ocurrencia de tracciones u obstrucciones de sonda, entre 2017 y 2019. Se utilizó el método de Kaplan-Meier para estimar el tiempo hasta la ocurrencia del primer evento.
Resultados: El 33% de la muestra sufrió tracción de la sonda, la incidencia fue mayor en los cinco primeros días de uso de la misma. La incidencia de obstrucción fue del 3,4% y aumentó con el tiempo de uso de la sonda.
Conclusión: La incidencia de tracción es mayor hacia el inicio de su uso, mientras que la incidencia de la obstrucción aumenta con el tiempo de uso de la sonda nasoenteral.
Palabras clave: Atención de enfermería. Nutrición enteral. Intubacíon gastrointestinal. Seguridaddel paciente. Gestión de riesgos. Manejo de atención al paciente.

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INTRODUCTION

Most of the care provided to hospitalized patients who need feeding through a nasoenteral tube (NET) is performed by nursing teams[1–3]. This care ranges from inserting and maintaining the device, administering therapy (diet and/or medication), planning and prescribing care, to removing the device when patients resume oral feeding[1–4].

However, complications related to the NET may occur, which are obstacles to the overall treatment of the patient, such as delay in the administration of diet and/or medication and the consequent increase in fasting time[1–3]. Mechanical complications are even more feared by care teams, especially given their potential to cause serious harm[4–7]. These complications range from device traction and obstruction, which exposes the patient to the risks of a new insertion procedure, to inadequate positioning of the distal tip, nasal mucosa injuries, pneumothorax, among others[4–9].

Among the medical complications, the incidence of NET traction and obstruction are the most described[6–9], mainly because these are indicators of the quality of care[10]. The incidence of NET traction varies in the literature according to the patient's profile and the study design. In patients under intensive care (in prone position and on mechanical ventilation) this percentage is 6.1%[11],while it is 15.3% in patients treated in an emergency service[6] and 37.5% in patients admitted to wards[12].

The incidence of obstructions also varies in the literature between 4%[13] and 35%[8]. In a recently published study[13], the authors reviewed records of adult patients who used NET (12 French Dobhoff® type) in a private tertiary hospital in southeastern Brazil. Data were collected over two years to enable the identification of causes of device obstruction, as well as the time elapsed between the start of enteral nutrition (EN) and the occurrence of obstruction. The frequency of obstructions was 4% considering the onset of EN up to the first 40 days of tube use. When considering the entire period (two years of collection), this proportion doubled (8%).

Although the aforementioned study[13] evaluated the time elapsed until NET obstruction, no other studies were found that measured the times during hospitalization, or at the beginning of tube use, that traction and obstruction are more frequent. Therefore, knowing the frequency of these complications, and how they are distributed after the implementation of therapy, can help nursing teams to plan care and concentrate efforts according to the distribution of events over time. Thus, the study started from the hypothesis that the incidence and the time elapsed until the first traction or obstruction of the tube are unevenly distributed over the days of use of NETs. This article aimed to determine the incidence and time elapsed until the first traction or obstruction of the nasoenteral tube in hospitalized adults.

METHOD

Prospective double cohort study conducted according to the guidelines of Strengthening the Reporting of Observational Studies in Epidemiology STROBE[14], study that is part of a larger project registered through the Certificate of Presentation of Ethical Appreciation of Plataforma Brasil (CAAE: 63247916.5.0000.5327). Data were collected in two stages: between June and November 2017 (Cohort 1) and between May 2018 and May 2019 (Cohort 2). The same research procedures were used in both periods and the analyzes were performed in 2020. There was a break between the stages for further training of the team, to meet the objectives of the second stage and due to the arrival of new research assistants (RA).

The research team consisted of nine research assistants (RA), all undergraduate nursing students in the fourth to the eighth semesters, supervised by two nurses, doctoral students, responsible for the main project, both with more than five years of experience in care at the hospital where the study was conducted.

Prior to the beginning of each stage of the study, the research team was trained through manuals on data collection and insertion of the researcher on the study field. The purpose of these manuals was to standardize the approach to patients and obtain the Free and Informed Consent Form (FICF), review the electronic medical records and fill in the collection forms. The research institution also requires researchers to complete a series of online courses related to patient safety, adverse events and ethics, among others. Agreement between observers was tested as a way of standardizing the data collection stage. In this stage, the nurses who supervised the development of the study collected data independently from the research assistants (RA), sequentially the agreement of the collection instruments of the nurses and RA was tested with the Kappa Coefficient (an agreement of 0.80 to 0.99 was considered almost perfect and the agreement was perfect when the result obtained was 1).

The study setting was a large teaching hospital in southern Brazil certified by the Joint Commission International. The established inclusion criteria were inpatients over 18 years of age, admitted to two clinical units and two surgical units that provide health care exclusively under the Unified Health System (SUS). The units were chosen based on similar physical characteristics (45 beds in each unit) and staffing. Patients who were already using a nasoenteral tube (Dobhoff®, 12 French type) at the time of admission, or who

had the tubes inserted in the hospital, participated in the follow-up. Patients with gastrostomy or jejunostomy due to differences in care and possible complications, patients who were confused or unable to consent to their participation were excluded. Patients hospitalized more than once during the development of the study were also not included.

Patients were selected with the use of the patient management system that integrates the entire electronic medical records. Every day (also weekends and holidays), a research assistant identified potentially eligible patients. After being included in the study, patients were monitored daily, from the first day of tube use until its suspension, or transfer of the patient to another unit, replacement by gastrostomy or jejunostomy, implementation of exclusive Parenteral Nutrition, hospital discharge or death (variable called "reason for withdrawing from the study").

As this is a study derived from a main project, the sample was obtained by adding the results of Cohort 1 (n=188) and Cohort 2 (n=306), for this reason a sample estimate was not made *a priori*. However, as the incidences of tube traction and obstruction were obtained, it was possible to calculate the sample power later.

The study variables were recorded in electronic forms (Google Forms®) designed for the research. Sociodemographic data (gender, age and education) and clinical data (admission reason, purpose for insertion of a NET and the Charlson Comorbidity Index, responsible for calculating the risk of death of patients based on the clinical history, consisting of 19 different categories of comorbidity, each with a weight of one to six points). The outcomes (traction or obstruction) were identified through the medical records. NET traction was described as the partial or total displacement of the tube, caused by the patient or as a result of care such as changing fixation, bathing, changing position, or getting out of bed, for example. Obstruction was defined by the total occlusion of the tube lumen that resulted in the need to replace the device. The NETs removed due to obstruction were not accounted for in the incidence of traction. As an independent variable, the time between NET insertion and the first traction or obstruction was determined.

All data were analyzed using SPSS® (Statistical Package for Social Sciences) version 20.0. Descriptive data were presented according to their characteristics and distribution. Continuous variables and those with normal distribution were presented as mean and standard deviation, the others as median and interquartile range [25th percentile – 75th percentile]. Categorical variables were presented in absolute numbers and percentages. To assess the incidences of NET traction or obstruction, the cumulative incidence [(number of events/total patients at risk) * 100] was used. The Kaplan-Meier method was used to estimate the time elapsed until the occurrence of the first event of traction or obstruction of the NET.

All study participants signed the informed consent form. The research was approved according to no 16-0534. The research was also approved regarding its methodological and ethical aspects according to Protocol number: 63247916.5.0000.5327 and complies with Resolution 466/2012 of the National Health Council.

RESULTS

A total of 494 patients were included, for whom the incidence of tube traction was 33% (CI 95%: 28.9% – 37.2%) and that of obstruction was 3.4% (CI 95%: 2. 1% – 5.3%), which made it possible to calculate a sample size of 90%, margin of error of 5% and a level of confidence of 95%.

The minimum age of the patients was 18 years and the maximum age was 104 years, most were elderly (69.4% aged 60 years or older), whose most frequent previous comorbidities were Systemic Arterial Hypertension (SAH) (n = 223, 45.1%), smoking (n = 206, 41.7%) and neoplasias (n = 143, 33.8%). With regard to the patients with neoplasia, the most recurrent sites were structures in the mouth, pharynx, larynx and esophagus, stomach and intestines (n=108, 21.8%). The median of follow-up days for patients was 5 [P25:3; P75:10] days. The other characteristics of the patients are described in Table 1.

The time elapsed until the occurrence of the first traction or obstruction of the NET was described using Kaplan-Meier curves (Graphs 1 and 2). To facilitate visualization, Graph 1 was divided into Graph 1A, which shows the total follow-up time, and Graph 1B, cases were censored in the first 15 days of NET use, the period in which the highest number of complications is concentrated.

Chart 1 shows the first 15 days of follow-up, the number of NET tractions and exposed patients, as well as the incidence of tractions. There was a reduction in tractions over the days, especially after the fifth day. There was a higher concentration of tractions in the first seven days of use of the NET, but a peak was observed on the ninth day. From the twelfth day, there was only one traction on each of the days:13,15,16,17,20, 23 and 59.

Inversely to NET tractions, obstructions seem to have a greater incidence the longer the tube is used. Graph 2 shows full time follow-up, with a dotted line on the fifteenth day (2A). Graph 2B shows the first 15 days of use of the NET.

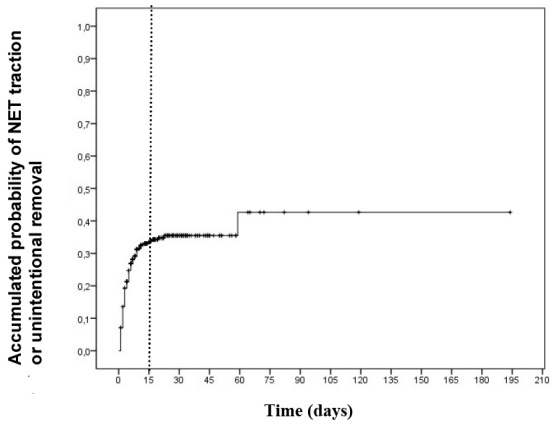
Table 1 – Characterization of the 494patients included. Porto Alegre, Rio Grande do Sul, Brazil, 2017-2019

Characteristics	Total sample (n=494; 100%)
Age (years)	65.1 ± 14.1
Male	277 (56.1)
Education	
Illiterate	73 (14.7)
Primary education (complete or not)	297 (60.1)
Secondary (complete or not)	103 (20.9)
High (complete or not)	21 (4.3)
Admission Reason	
Neoplasias	143 (28.9)
Neurolological	141 (28.5)
Gastrointestinal	75 (15.2)
Respiratory	62 (12.6)
Cardiovascular	23 (4.7)
Others	50 (10.1)
Inpatient unit	
Clinical	280 (56.7)
Surgical	214 (43.3)
Charlson Comorbidity Index	4 [3 – 6]
Reason for indication of NET	
Fall in sensorium	180 (36.4)
Dysphagia	91 (18.4)
Postoperative	83 (16.8)
Inappetence/ Malnutrition	77 (15.6)
GIT Obstruction	63 (12.8)
Reason for withdrawing from the study	
OR acceptance	312 (63.2)
Transfer	88 (17.8)
Hospital discharge	21 (4.3)
Gastrostomy/Jejunostomy	11 (2.2)
Death	38 (7.7)
Others	24 (4.9)

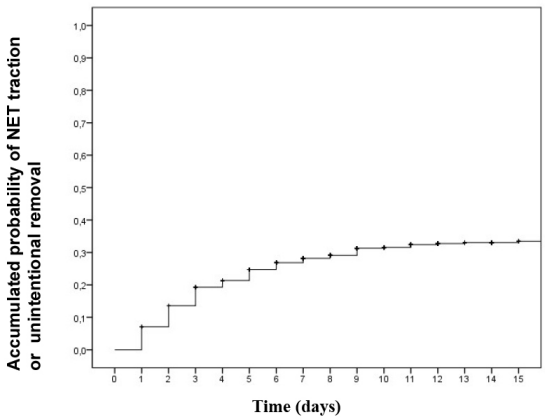
Source: Research data, 2017 – 2019.
NET – Nasoenteral Tube; GIT –Gastrointestinal Tract; OR – Oral Route

Chart 2 shows the first 15 days of follow-up, the number of NET obstructions and exposed patients, as well as the daily incidence. There was an increase in incidence over the days, especially after the tenth day of tube use. There were no obstructions in seven of the first 15 days of follow-up.

Graph 1A



Graph 1B



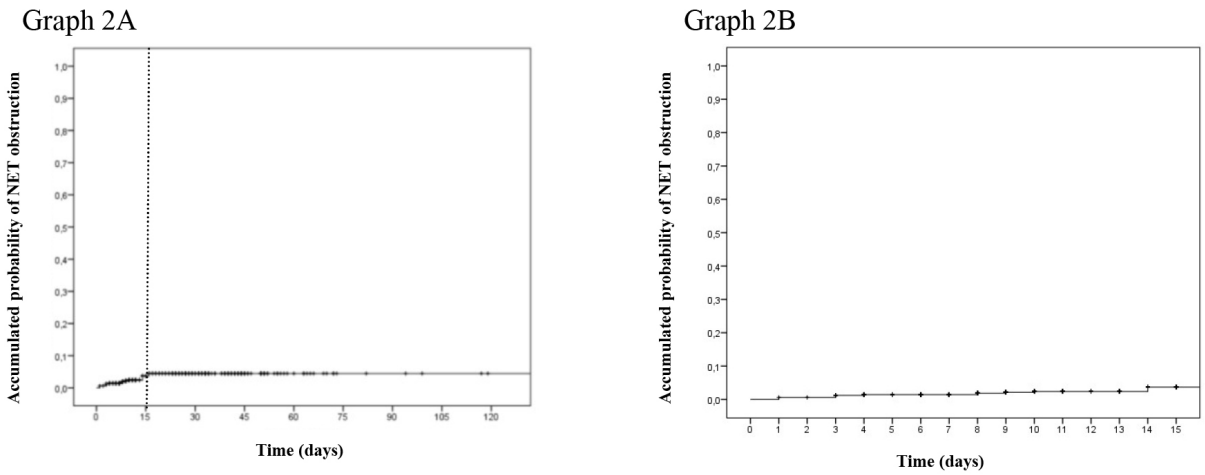
Graph 1 – Kaplan-Meier curve of the accumulated probability of Nasoenteral Tube traction in the follow-up period (1A) and in the first 15 days of follow-up (1B). Porto Alegre, Rio Grande do Sul, Brazil, 2017-2019
Source: Research data, 2017-2019.

Days of use of NET*	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	15th
Frequency of NET tractions*	36	32	28	10	16	10	6	4	9	1	3	1	1	1
Patients exposed	494	435	374	324	272	233	195	167	148	129	115	98	87	66
Daily incidence (*100)	7.9	7.4	7.5	3.1	5.9	4.3	3.1	2.4	6.1	0.8	2.6	1	1.1	1.5

Chart 1 – Incidence of tractions of the Nasoenteral Tube in the first 15 days of follow-up. Porto Alegre, Rio Grande do Sul, Brazil, 2017-2019
Source: Survey data, 2017-2019
*NET: Nasoenteral Tube

Days of use of Nasoenteral Tube	1st	3rd	4th	8th	9th	10th	14th	15th
Frequency of obstructions of NET	3	3	1	2	1	1	4	2
Patients exposed	494	374	324	167	159	140	84	67
Daily incidence(*100)	0.6	0.8	0.3	1.2	0.6	0.7	4.7	2.9

Chart 2 – Incidence of nasoenteral tube obstructions in the first 15 days of follow-up. Porto Alegre, Rio Grande do Sul, Brazil, 2017-2019
Source: Research data, 2017-2019.
* NET: Nasoenteral Tube



Graph 2 – Kaplan-Meier curve of the accumulated probability of Nasoenteral Tube obstruction in the follow-up period (2A) and in the first 15 days of follow-up (2B). Porto Alegre, Rio Grande do Sul, Brazil, 2017-2019.
Source: Research data, 2017-2019.

DISCUSSION

The present study evaluated the incidence and time elapsed until the first traction or obstruction of the NET in adults hospitalized in wards of a high-complexity hospital. The incidence of tractions and obstructions was unevenly distributed during the hospitalization period: while tractions occurred mainly in the first days of use of the nasoenteral tube, obstructions were more frequent the longer the device was used.

The occurrence of NET traction was demonstrated in a study[15] carried out in another teaching hospital, also in southern Brazil. The authors reported that 43.5% of the patients included inadvertently pulled the tube. When the patients were stratified according to the hospitalization units, in the wards, it was found that about 60% pulled the tube, while 31.6% of the patients assessed in the Intensive Care Unit (ICU) had this complication. It should be noted that the percentage of NET traction found in this study (33%) is much lower than that described in the other study (60%)[15], even though the patients' profile is similar.

On the other hand, a lower percentage of traction was identified in a study[6] conducted in the Emergency Service of the same hospital where this article is based. A total of 115 patients were monitored from the insertion of the NET until the first administration of diet and/or medication, and about 15% pulled the tube once (16.2% pulled it twice, and 5.6% pulled it three or more times) during the study period. This may partially explain that the differences between the findings of the present study (33%) and those of the aforementioned study (15%) refer to the context of the Emergency Service, in which there is greater control and constancy in the direct observation of patients. However, no studies were found to support this statement.

On the other hand, the incidence of obstructions in this study (3.4%) was lower than that found in most studies[8,13,16]. However, in a previously mentioned study[15], the authors identified a percentage of obstructions of 2.1% for a total of 46 patients monitored for about five months. It should be noted that 42.6% of all patients were in the ICU, an environment considered much more controlled than the wards. Still in the context of the ICU, in a private hospital in Rio de Janeiro, of the 169 patients monitored over a year, there were 141 occurrences of unplanned removal of the tube, 36% of which were caused by obstruction of the device[16].

In an unprecedented way, the findings of the present study included the demonstration that the occurrences of tube traction were more frequent in the first days of implementation of this therapy, while obstructions had a greater risk of occurrence from the tenth day of use of the NET. The originality of these findings makes it difficult to compare the results with other studies. In this context, studies that evaluate the time elapsed between hospitalization, or the implementation of some therapy, and the occurrence of related complications, are more common for other indicators of quality of care, such as catheter-related infections[17] or pressure ulcers[18], for example.

From clinical experience and speculatively, the tractions that occur in the first few days of tube use seem to be related to the fact that it is an unusual and uncomfortable device.

Regarding obstructions, risk was greater from the tenth day of use of the NET, which may be related to the diameter of the tube (Dobhoff®,12 French)(13,19), deposition of waste over the days of use, caused by the interaction of medication and diet with the inner wall of the tube[3,7,13,19].

Although the distribution of these complications is not linear throughout the hospitalization, the present study can help the nursing team to understand the behavior of traction and obstruction events of nasoenteral tubes. In addition, these findings may support the adoption of protocols[1–3,7] and training programs[20] that pay special attention to the increased risk of traction immediately after NET insertion, and to the risk of obstruction that increases with the longer time of use.

Recently, the publication of the Brazilian Society of Parenteral and Enteral Nutrition -BRASPEN Guideline for Nursing in Oral, Enteral and Parenteral Nutritional Therapy[3], compiled the best evidence of care for patients who require enteral or parenteral nutrition. In this document, intended for nurses, care and responsibilities related to all stages of Enteral Nutritional Therapy are described. The recommendations made include the adoption of care protocols for patients under this therapy, with different types of feeding tubes, preparation and administration of medication and diet, in addition to training teams for this care[1–3].

Therefore, it is emphasized that the present study was the first to identify the distribution of occurrences of traction and obstruction of nasoenteral tubes over the follow-up time. Knowing the frequency of these complications and their behavior according to the implementation of the therapy can help the nursing team to plan care and concentrate efforts according to the distribution of tube tractions and obstructions during hospitalization.

CONCLUSION

Both traction and obstruction of the nasoenteral tube can occur at any time after implementation. However, the number of days of use of the tube has opposite effects on these events. While the risk for traction is greater at the beginning of the tube use period, especially in the first week after insertion of the device, the risk for obstruction increases over time.

Although cohort studies, especially contemporary, are the best designs to monitor the occurrence of outcomes, a limitation of this study is the fact that some of the variables – exposure and outcomes – were obtained through the records of healthcare professionals, and thus may be biased, especially by underreporting. Nevertheless, hardly any of the events presented would not be recorded, mainly because the institution's safety culture favors the reporting of near misses, incidents and adverse events. Another possible limitation is the fact that the sample derives from two Cohort segments added together, for which the sample power was calculated later. However, the incidence of outcomes allowed this calculation to be performed, resulting in a high sample power.

An innovation brought about by this study is the evaluation of the distribution of incidence of NET traction and obstruction from the implementation of this therapy.Thus, one contribution of the present study to nursing care management is that it draws attention to the behavior of events of traction and obstruction of nasoenteral tubes, supporting care protocols and enabling the nursing team to program and intensify specific measures, in the course of the days.

Further studies on this subject, aimed to better elucidate the behavior of complications related to the nasoenteral tube, should be developed to support the conduct of nurses, nursing technicians, students and of the patients themselves and their families.

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