Is it safe to perform percutaneous endoscopic gastrostomy in neurological patients?

É realmente seguro fazer gastrostomia endoscópica percutânea nos pacientes neurológicos?

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ABSTRACT

Purpose: Percutaneous Endoscopic Gastrostomy (PEG) has been the method of choice to provide enteral access for patients in need of nutrition for a long term. Although considered safe, the insertion of gastrostomy catheters may be associated with some complications. **Objectives**: The aim of this study was to analyze the immediate, technical and infectious complications of PEG in neurological patients, conducted by a reference team. **Methods**: We conducted a follow-up of 171 patients who underwent PEG between 2000 and 2011 at the Department of Digestive Surgery (Gastronutri) Hospital São Lucas, Natal / Brazil. **Results**: Of the 172 cases of PEG, there were 03 deaths until the 30th day after surgery, but none directly related to the procedure. The overall complication rate was 14.6%, among which 8.2% of patients had minor complications and only 6.4% major complications. Patients above 81 years old had lower odds of postoperative pneumonia ($p = 0.004$). By discriminating the time of use of a nasogastric catheter is greater or less than 06 weeks duration, it was found that the prolonged use is associated with increased incidence of postoperative pneumonia ($p<0.05$). Finally, if we consider malnutrition as independent correlate, malnourished patients are more likely to develop complications and pneumonia ($p<0.05$). **Conclusion**: The complication rates of PEG in our service are consistent with the literature, confirming the efficacy and safety of PEG enteral nutritional support in the neurological patients, however, not free from serious complications.

Keywords: Enteral nutrition. Percutaneous endoscopic gastrostomy. Complications. Neurological disease.

RESUMO

Introdução: A gastrostomia endoscópica percutânea (GEP) tem sido a modalidade de escolha para fornecer acesso enteral aos pacientes que necessitam de nutrição por longo prazo. Apesar de considerada segura, a inserção dos cateteres de gastrostomia pode estar associada com algumas complicações. **Objetivos:** O objetivo desse estudo foi realizar uma análise das complicações imediatas, técnicas e infecciosas da GEP, realizadas por uma equipe de referência, em pacientes neurológicos. **Métodos:** Realizamos um follow-up com 171 pacientes que realizaram GEP entre 2000 e 2011, no Serviço de Cirurgia Digestiva (Gastronutri) da Casa de Saúde São Lucas, Natal/Brasil. **Resultados:** Dos 172 casos de GEP, houve 03 mortes até o 30º dia de pós-operatório, mas nenhuma diretamente relacionada ao procedimento. A prevalência de complicações foi 14,6%, dentre os quais 8,2% dos pacientes apresentaram complicações menores e apenas 6,4% complicações maiores. Os pacientes acima de 81 anos tiveram menor chance de pneumonia no pós-operatório (p=0,004). Ao se descriminar o tempo de uso do cateter nasoenteral, se maior ou menor que 06 semanas de duração, verificou-se que o seu uso prolongado está associado com o aumento da incidência de pneumonia no pós-operatório (p<0,05). Considerando a desnutrição como variável independente a correlacionarmos com o índice geral de complicações e a prevalência de pneumonia pós-operatória, destacam-se correlações significativas para ambas as situações, de modo que o paciente desnutrido tem maior chance de desenvolver complicações e pneumonias (p<0,05 para ambos os cruzamentos). **Conclusão:** As taxas de complicações da GEP no nosso serviço são condizentes com a literatura, confirmando a eficácia e seguridade da GEP no suporte nutricional enteral dos pacientes neurológicos, entretanto, não isento de complicações graves.

Descritores: Nutrição enteral. Gastrostomia endoscópica percutânea. Complicações. Doença neurológica.

INTRODUCTION

Malnutrition is a common problem that affects about 40% of hospitalized patients and is a cause of morbidity and mortality in trauma patients, surgical patients, and patients with cardiovascular and cerebrovascular problems. Low nutrient intake for a prolonged period causes weight loss, fatigue and malnutrition.[1] Malnutrition can lead to a worse prognosis and is essential for enteral feeding catheter to meet the nutritional needs of patients.[2]

The most suitable and safe method for long-term enteral feeding is the use of percutaneous endoscopic gastrostomy,[3] and there is the option to perform it surgically or by interventional radiology. The first description of Percutaneous Endoscopic Gastrostomy (PEG) was taken in 1980 by Gauderer et al.[4] Since then, this has been the procedure of choice for surgical obtaining a route of enteral access to patients requiring long-term enteral nutrition through. Usually the most used technique is the traction (pull technique), whose effectiveness has been proven in several controlled studies. Approximately 100.000-125.000 PEGs are performed annually in USA.[5] The indication of the PEG should be directed to patients who are unable to meet the metabolic demands of necessary nutrients, including those that have swallowing problems associated with neurological conditions, oropharyngeal malignancies and craniofacial trauma.[6] There is no evidence to

indicate PEG in cases of dementia, cause approximately 30% of all procedures.[7] Although generally considered safe insertion of catheters may be associated with gastrostomy some complications.[8]

The aim of this study was to analyze the immediate, technical and infectious complications of PEG in the period from 2000 to 2011, conducted by a reference team in neurological patients.

METHODS

This is a prospective study. 172 patients underwent PEG through Gastronutri LTDA Clinic between January 2000 and October 2011, in the service of Gastric Home Health San Lucas, CSSL, Natal / Brazil. 100% of the procedures were performed by the same surgeon. Inclusion criteria were progressive weight loss requiring long-term enteral access; the exclusion criteria were infection (fever) in anticipation of the procedure, peritoneal dialysis, ascites, previous gastrectomy and insufficient information in the records. Of the patients, three were found inconsistent with the study criteria and were excluded. As independent variables our study included age, presence and duration of nasoenteral catheter (NEC) and the presence of malnutrition. Dependent variables were general complications, postoperative pneumonia and malnutrition. As for age, patients were divided into groups according to the median of the study, so a group was composed of patients even before the 81 years and the other with patients from this age. Regarding the duration of enteral nutrition catheter, were based on the study of Kirby et al., The American Gastroenterological Association, which states that one way permanent nutrition should be obtained after the use of nasoenteric catheters for more than 4 to 5 weeks[9]. Thus, the length of the nasogastric tube was divided in groups of up to 5 weeks, and another from 6 weeks of use.

Among the dependent variables considered as procedure-related complications a set of major and minor complications was the following: surgical site infection, leakage pericatheter, local bleeding, gastric ulcer, skin ulcer, pneumoperitoneum, temporary ileus, pyloric obstruction, necrotizing fasciitis, buried bumper syndrome, fistulas, accidental removal of the catheter, cardio-respiratory arrest. The presence of malnutrition was determined by subjective global assessment. The impasse is due to the diagnostic definition of pneumonia since the consensus of hospital-acquired pneumonia, ventilator-associated and related to health care of the American Thoracic Society 2005 pneumonia does not set specific criteria for the diagnosis of these disorders. Thus, we suspected pneumonia acquired in the hospital, following the recommendations of the aforesaid directive that patient during the study showed a new or progressive infiltrate on chest X-ray as well as fever, purulent sputum, leukocytosis, and declining oxygen saturation[10].

The surgical procedure of PEG was performed by the traction technique (pull technique) of Gauderer et al[4]. In all PEG catheters MIC-PEG 24 Ballard ® were used and resumed feeding via gastrostomy catheter after 18 hours of PEG. Initially to 21 ml/h, progressing on the 2nd postoperative day for 42ml/h as acceptance is increasing up to the total calories value. Antibiotic prophylaxis was established in all procedures with ampicillin and sulbactam - Unasyn ®, IV (single dose) except for those who were already using antimicrobial therapy. Patients underwent a clinical evaluation in the first and 30th day after surgery. The family, answered a questionnaire addressing the variables intended for the study on the 30th follow-up day.

For analysis of qualitative variables we used descriptive statistics (percentage and mean±standard deviation). For quantitative variables, we used univariate analysis and chi-

square test to determine the association between the independent variables and the outcome. A confidence interval of 95% was considered significant, therefore, the values of $p<0.05$. For statistical analysis the "Statistic Package for Social Sciences (SPSS) for Windows", version 13.0 was used.

RESULTS

In our review of 172 cases of PEG, there were 03 deaths until the 30th day after surgery, but none directly related to the procedure. The overall complication rate was 14.6%, among which 8.2% of patients had minor complications and only 6.4% had major complications. The principal minor complication was surgical site infection, with 05 cases; the most prevalent early complication was accidentally removed along with Buried Bumper Syndrome, both cases 04. The characterization of the sample is shown in Table 1. Table 2 highlights the statistically proven risk factors for neurological patients undergoing PEG. The mean age of the study population was 79.43±11.66 years, with a minimum of 34 and maximum of 99 years. Most patients who had complications had more than 81 years, predominantly women with neurodegenerative diseases, malnourished, with recurrent pneumonia before the procedure and with previous use of a nasogastric catheter.

Patients above 81 years had no significant association with malnutrition, but with less chance of postoperative pneumonia (odds ratio = 0.975 95% CI. 0.442 to 2.152), as well as less chance of general complications after the procedure (table 2).

When considering the time of previous use of a nasogastric catheter greater or less than 06 weeks duration, it was found that the prolonged use was associated with increased incidence of postoperative pneumonia. Compared with those who have little time using nasogastric catheter, patients using previous nasogastric catheter for more than 5 weeks seemed to increase the chance of developing pneumonia after gastrostomy in approximately 9.5%. However, the same could not be said with respect to the rate of general complications and the malnutrition of the patients, since there was no statistically significant correlation. Finally, if we consider malnutrition as independent correlate with the overall complication rate and a variable rate of postoperative pneumonia stand out significant correlations for both situations. So that malnourished patients were more likely to develop complications and pneumonia with an increased chance 8.8% and 4.3%, respectively.

Table 1 – Descritives study data.

Variable		N	%
Age			
	≤ 81 yrs	87	53,0
	> 81 yrs	77	47,0
Gender			
	Female	100	58,1
	Male	72	41,9
Primary Disease			
	Degenerative Chronic Disease	66	38,4
	Cerebral Vascular Disease	97	56,4
	Cancer of CNS	9	5,2
Presence of NEC			
	Yes	112	84,2
	< 06 weeks	58	59,8
	≥ 06 weeks	39	40,2
	No	21	15,8
Nutritional Status			
	Malnourished	59	51,3
	Eutrophic	56	48,7
Recurrente Pneumonia			
	No	64	58,7
	Yes	45	41,3
Postoperative Complications			
	Yes	25	14,6
	No	146	85,4

Table 2 – Statistical Results

Variable	Complications			Postoperative Pneumonia			Malnutrition		
	Yes (%)	No (%)	*P / OR / IC*	Yes (%)	No (%)	*P / OR / IC*	Yes (%)	No (%)	*P / OR / IC*
Age									
> 81 yrs	11 (14.5)	65 (85.5)	*0.007*[1] *0.963*[2] *(0.404-2.298)*	19 (38.8)	30 (61.2)	*0.004*[1] *0.975*[2] *(0.442-2.152)*[3]	27 (54.0)	23 (46.0)	*0.06*
≤ 81 yrs	13 (14.9)	74 (85.1)		21 (38.2)	34 (61.8)		31 (51.7)	29 (48.3)	
Presence of NEC									
≥ 06 weeks	4 (10.3)	35 (89.7)	*1.843*[1]	12 (40.0)	18 (60.0)	*0.033*[1] *1.095*[2] *(0.408-2.940)*[3]	16 (53.3)	14 (46.7)	*0.542*
< 06 weeks	12 (20.7)	46 (79.3)		14 (37.8)	23 (62.2)		15 (44.1)	19 (55.9)	
Malnutrition									
Sim	10 (17.2)	48 (82.8)	*0.028*[1] *1.088*[2] *(0.406-2.917)*[3]	17 (39.5)	26 (60.5)	*0.008*[1] *1.043*[2] *(0.425-2.557)*[3]	-	-	-
Não	9 (16.1)	47 (83.9)		15 (40.5)	22 (59.5)		-	-	

1 – p-value Chi-square; 2 – OR; 3 – IC 95%

DISCUSSION

The clinical comorbidities of the patient are vital to determine the indication and timing for performing insertion of gastrostomy. It is important to recognize that some patients are too fragile to sedation required for endoscopy. particularly in those patients with severe respiratory failure. An absolute contraindication of PEG is the inability to close the anterior wall of the stomach to the abdominal wall. Prior gastric resection. ascites. hepatomegaly and obesity are some conditions that may prevent gastric transillumination and placement of catheters. Feeding gastrostomy catheter should not be used when there is gastrointestinal obstruction. Relative contraindications include tumors. infiltrative and inflammatory diseases of the stomach and abdominal walls[6].

A percutaneous endoscopic gastrostomy (PEG) has established itself as an effective technique in getting an access to enteral nutrition. containing a low complication rate. if it be done through proper technique and appropriate infection control measures. with selection appropriate and adequate patient follow-up. Its complications are more likely to occur in elderly patients with comorbidities. particularly those with an infectious or who have a history of bronchoaspiration process[11]. according to most studies. Complications of PEG are divided into minor complications - surgical site infection. pericatheter leakage. local bleeding. gastric ulcer or skin. pneumoperitoneum. temporary ileus. pyloric obstruction - and larger - necrotizing fasciitis. buried bumper syndrome. fistulas. accidental removal of catheter. cardio-respiratory arrest.

In our study. early gastrostomy catheter insertion was not associated with complications of the procedure. but the presence or duration of nasogastric catheter had no prior association with any of our patients malnutrition.

According to a recent American study. early gastrostomy catheter insertion did not alter the number of hospitalizations due to nutritional causes. However it points out that the performance of PEG early significantly reduces the percentage of weight loss.[12] We found that prolonged use of the nasoenteral catheter is significantly associated with an increased chance of postoperative pneumonia. possibly a consequence not of the procedure directly. but the greater chance of microaspirations in dysphagic patient for a sufficient period of time to pneumonia occurs. regardless of the procedure.

Shorten nasoenteral use of catheters can be an alternative for reducing the incidence of pneumonia. as seen in an interesting study from Korea where PEG decreased gastroesophageal reflux patients. attenuating one of the microaspiration pathophysiology.[13] besides controlling weighs weight. which prolongs the effectiveness of the immune system. Malnutrition interferes directly on patient outcomes. and in our work. both increased the odds of pneumonia postoperatively. as complications in general. Malnutrition is such an important factor that can influence the risk of death. as analyzed a Swedish-London group. where low values of serum albumin. mainly associated with high levels of C-reactive protein were independently associated with increased risk of mortality in 30 days after PEG.[14]

The rates of minor and major complications found in our study are similar to those found in the literature. In a report of 314 patients. it was found that 13% of patients had minor complications. which may include surgical site infection. cateter dislocation. and pericatheter leakage. In the same study 3% of patients had major complications. including gastric perforation. gastric bleeding and development of hematoma.[15] In other study. major complications have emerged in 3% to 4%. while the minor complications which were more common. occured in 7% to 20% of patients.[16] demonstrating compatibility with our data.

Regarding Buried Bumper Syndrome. we had lower rates than the Eastern literature. which obtained 8.8% of prevalence[17]. For surgical site infection (SSI). this is more likely to occur when the gastrostomy catheter is placed through a field contaminated with the wrong procedure or technique in debilitated patients and in those who did not receive antibiotic prophylaxis[18]. The resistant strains of *Staphylococcus aureus* have emerged as an important cause of SSI in some centers[19]. However. in our study strains of *Pseudomonas aeruginosa* were the most prevalent. Fungal infectious complications related to PEG may occur. although much less common than bacterial infectious complications. These include fungi peristomal cellulitis. abscesses and peritonitis caused by intra-abdominal Candida.[20]

When the accidental removal of the catheter gastrostomy occurs. which is a common complication that usually happens in aggressive or confused patient who occasionally pulls the catheter. Catheters removed in the first four weeks after the procedure. should not be returned blindly at the bedside. because the surgical site may not have matured sufficiently between the abdominal wall and gastric wall. leaving an ostium of the gastric wall. If accidental early withdrawal occurs. the patient should be taken back to the operating room to perform endoscopy and new catheter passing through the same ostium.

The rare buried bumper syndrome is a result of excessive long-term compression of the outer plunger of the catheter gastrostomy abdominal wall.[21] The internal piston causes erosion of the gastric wall. pain and disability. The diagnosis can be confirmed by endoscopy. which will show the internal bumper "buried" in the gastric mucosa. In our patients. buried bumper syndrome occurred in four cases of major complications. all with successful therapy.

Another interesting finding of our analysis was the rate of death at 30 days (1.75%) compared to other references. We saw that it had lower values than the 10% seen in a recent article[22] or 5% found in other study (n = 931)[23] or compatible with other studies which showed 2% rate.[24] There is no direct relation of mortality with the use of PEG. but with the presence of co-morbidities of patients.[25]

However. the deficiency in capturing data on the variables of this study was a limiting factor. since there is a significant lack of information recorded in the medical records. The incidence of postoperative pneumonia was the variable with less information. losing 36.6% of data. Still. the lack of information regarding nutritional status was 33.1%. as expected by the national and South American literature. where IBRANUTRI shows only 18.8% of patients nutritionally[26] and ELAN under 25% of cases.[27] The largest number of records in our study was probably due to the fact that our team is specialized in therapeutic nutrition.

CONCLUSION

The number of patients operated by a single team and analyzed in our study (n = 172) was one of the largest found in the international literature. We conclude that the complication rates of PEG in our service are consistent with the literature. confirming the efficacy and safety of PEG in enteral nutritional support of patients. The presence of malnutrition increased the risk of developing complications. while the previous use of a nasogastric catheter nutrition for more than 05 weeks increased the risk of postoperative pneumonia.

REFERENCES

1. Rio A. Ellis C. Shaw C. Willey E. et al. Nutritional factors associated with survival following enteral tube feeding in patients w-ith motor neurone disease. J Hum Nutr Diet. 2010; 23: 408-15.
2. Nugent B. Lewis S. O'Sullivan JM. Enteral feeding methods for nutritional management in patients with head and neck cancers being treated with radiotherapy and/or chemotherapy. Cochrane Database of Systematic Reviews 2010. Issue 3. Art. No.: CD007904. DOI: 10.1002/14651858.CD007904.pub2.
3. ASGE Standards of Practice Committee. Jain R. Maple JT. Anderson MA. Appalaneni V. Ben-Menachem T. Decker GA. Fanelli RD. Fisher L. Fukami N.Ikenberry SO. Jue T. Khan K. Krinsky ML. Malpas P. Sharaf RN. Dominitz JA. The role of endoscopy in enteral feeding. Gastrointest Endosc. 2011;74:7-12.
4. Gauderer MW. Ponsky JL. Izant RJ Jr. Gastrostomy without laparotomy: a percutaneous endoscopic technique. J Pediatr Surg. 1980;15:872-5.
5. Duszak R Jr. Mabry MR. National trends in gastrointestinal access procedures: an analysis of Medicare services provided by radiologists and other specialists. J Vasc Interv Radiol. 2003;14:1031-6.
6. Nicholson FB. Korman MG. Richardson MA. Percutaneous endoscopic gastrostomy: a review of indications. complications and outcome. J Gastroenterol Hepatol. 2000;15:21-5.
7. Janes SE. Price CS. Khan S. Percutaneous endoscopic gastrostomy: 30-day mortality trends and risk factors. J Postgrad Med. 2005;51:23-8.
8. Schrag SP. Sharma R. Jaik NP. Seamon MJ. Lukaszczyk JJ. Martin ND. Hoey BA. Stawicki SP. Complications related to percutaneous endoscopic gastrostomy (PEG) tubes. A comprehensive clinical review. J Gastrointest Liver Dis. 2007;16:407-18.
9. Kirby DF. Delegge MH. Fleming CR. American Gastroenterological Association technical review on tube feeding for enteral nutrition. Gastroenterology. 1995;108:1282-301.
10. American Thoracic Society; Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired. ventilator-associated. and healthcare-associated pneumonia. Am J Respir Crit Care Med. 2005;171:388-416.
11. Raha SK. Woodhouse K. The use of percutaneous endoscopic gastrostomy (PEG) in 161 consecutive elderly patients. Age Ageing. 1994;23:162-3.
12. Rutter CE. Yovino S. Taylor R. Wolf J. Cullen KJ. Ord R. Athas M. Zimrin A. Strome S. Suntharalingam M. Impact of early percutaneous endoscopic gastrostomy tube placement on nutritional status and hospitalization in patients with head and neck cancer receiving definitive chemoradiation therapy. Head Neck. 2011;33:1441-7.
13. Jung SH. Dong SH. Lee JY. Kim NH. Jang JY. Kim HJ. Kim BH. Chang YW. Chang R. Percutaneous endoscopic gastrostomy prevents gastroesophagal reflux in patients with nasogastric tube feeding: a prospective study with 24-Hour pH Monitoring. Gut Liver. 2011;5:288-92.
14. Blomberg J. Lagergren P. Martin L. Mattsson F. Lagergren J. Albumin and C reactive protein levels predict short term mortality after percutaneous endoscopic gastrostomy in a porspective cohort study. Gastrointest Endosc. 2011;73:29-36.

15. Larson DE. Burton DD. Schroeder KW. DiMagno EP. Percutaneous endoscopic gastrostomy. Indications. success. complications. and mortality in 314 consecutive patients. Gastroenterology. 1987;93:48-52.
16. Robinson DY. Hamilton AV. The missing percutaneous endoscopic gastrostomy tube. West J Emerg Med. 2010;11:108-9.
17. Lee TH. Lin JT. Clinical manifestations and management of buried bumper syndrome in patients with percutaneous endoscopic gastrostomy. Gastrointest Endosc. 2008;68:580-4.
18. Jafri NS. Mahid SS. Minor KS. Idstein SR. Hornung CA. Galandiuk S. Meta-analysis: antibiotic prophylaxis to prevent peristomal infection following percutaneous endoscopic gastrostomy. Aliment Pharmacol Ther. 2007;25:647-56.
19. Chaudhary KA. Smith OJ. Cuddy PG. Clarkston WK. PEG site infections: the emergence of methicillin resistant Staphylococcus aureus as a major pathogen. Am J Gastroenterol. 2002;97:1713-6.
20. Alkhatib A. Kawji AS. Adler DG. First reported case of a Candida glabrata perihepatic abscess as a complication of percutaneous endoscopic gastrostomy tube placement. J Clin Gastroenterol. 2007;41:335-6.
21. Klein S. Heare BR. Soloway RD. The "buried bumper syndrome": a complication of percutaneous endoscopic gastrostomy. Am J Gastroenterol. 1990;85:448-51.
22. Schneider AS1. Schettler A. et al. Complication and mortality rate after percutaneous endoscopic gastrostomy are low and indication-dependent. Scand J Gastroenterol. 2014;49:891-8.
23. Suzuki Y. Tamez S. Murakami A. Taira A. Mizuhara A. Horiuchi A Survival of geriatric patients after percutaneous endoscopic gastrostomy in Japan. World J Gastroenterol. 2010;16:5084-91.
24. Zissin R. Konikoff F. Gayer G. CT findings of latrogenic complications following gastrointestinal endoluminal procedures. Semin Ultrasound CT MR. 2006;27:126-38.
25. Longcroft-Wheaton G. Marden P. Colleypriest B. Gavin D. Taylor G. Farrant M. Understanding why patients die after gastrostomy tube insertion: a retrospective analysis of mortality. JPEN J Parenter Enteral Nutr. 2009;33:375-9.
26. Waitzberg DL. Caiaffa WT. Correia MI. Hospital malnutrition: the Brazilian national survey (IBRANUTRI): a study of 4000 patients. Nutrition. 2001;17:573-80.
27. Correia MI. Campos AC; ELAN Cooperative Study. Prevalence of hospital malnutrition in Latin America: the multicenter ELAN study. Nutrition. 2003;19:823-5.