

# PERISTOMAL INFECTION AFTER PERCUTANEOUS ENDOSCOPIC GASTROSTOMY: a 7-year surveillance of 297 patients

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**ABSTRACT - Context** - Healthcare-associated infection represents the most frequent adverse event during care delivery. Medical advances like percutaneous endoscopic gastrostomy have brought improvement on quality of life to patients but an increased risk of healthcare-associated infection. Predictive risk factors for peristomal wound infection are largely unknown but evidence suggests that antibiotic prophylaxis and preventive strategies related to infection control may reduce infection rates. **Objectives** - The primary aim was to evaluate the global prevalence rate of peristomal infection. Secondary objectives were to characterise the positive culture results, to evaluate the prophylactic antibiotic protocol and to identify potential risk factors for peristomal infection. **Methods** - Retrospective study of 297 patients with percutaneous endoscopic gastrostomy performed at a general hospital between January 2004 and September 2010. Patients received prophylactic cefazolin before the endoscopic gastrostomy procedure. Medical records were reviewed for demographic data, underlying disease conditions to percutaneous endoscopic gastrostomy and patient potential intrinsic risk factors. Statistical analysis was made with the statistical program SPSS 17.0. **Results** - A total of 297 percutaneous endoscopic gastrostomy tubes were inserted. Wound infection occurred in 36 patients (12.1%). *Staphylococcus aureus* methicillin resistant was the most frequently isolated microorganism (33.3%) followed by *Pseudomonas aeruginosa* (30.6%). The incidence rate had been rising each year and differ from 4.65% in 2004/2007 to 17.9% in 2008/2010. This finding was consistent with the increasing of prevalence global infection rates of the hospital. Most of the infections (55.6%) were detected in the first 10 days post procedure. There was no significant difference in age, body mass index values, mean survival time and duration of percutaneous endoscopic gastrostomy feeding between patients with and without peristomal infection. Institutional factors, namely global prevalence infection rates and the endemic character of *Staphylococcus aureus* methicillin resistant, play an important role in peristomal infection rates. Traditional antibiotic prophylaxis with cefazolin is not adequate due to the prevalence of resistant organisms. **Conclusions** - Peristomal infection is a frequent problem with clinical impact in percutaneous endoscopic gastrostomy patients and should be considered a healthcare associated infection. The antimicrobial prophylaxis regimens using cephalosporins are not adequate and need to be reviewed due to the high prevalence of *Staphylococcus aureus* methicillin resistant and other resistant organisms in hospitals and nursing homes. **HEADINGS** - Gastrostomy. Endoscopy, gastrointestinal. Wound infection. *Staphylococcus aureus*. Antibiotic prophylaxis.

## INTRODUCTION

Healthcare-associated infection (HAI) is an infection which occurs during the patient's process of care in a hospital or other health care facility that is not present or incubating at time of admission<sup>(19)</sup>. HAI can appear after discharge and results in additional costs for health systems, increased resistance of microorganisms to antimicrobials and long term disability<sup>(5,10)</sup>.

The surgical site infection (SSI) is one of major types of HAI and, although endoscopic gastrostomy is not considered a surgery, an adaptation of the Centers for Disease Control (CDC) definitions for superficial surgical-site infection was been used to detect PEG-site infections<sup>(15,17)</sup>.

Peristomal infection should be considered a healthcare-associated infection, if it is detected within 30 days post-discharge, on account of being an invasive technique with a medical device that is left in place. The post discharge surveillance is essential because diagnose confined to the inpatient underestimates the rate of infection<sup>(8)</sup>.

Complications of percutaneous endoscopic gastrostomy (PEG) have been described in debilitated patients<sup>(6)</sup> and 30-day mortality rates of 4,1%-26% have been reported<sup>(1)</sup>. Rodriguez Ortega et al.<sup>(17)</sup>, in a Spanish study, found a 30-day-mortality of 8,69%.

Peristomal wound infection occurs in 5% to 39% of patients and is the most frequent PEG complication<sup>(13,21)</sup>.

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The increasing incidence of resistant organisms in hospitals and long term care facilities justifies, nowadays, the clinical impact of these infections<sup>(4, 14)</sup>. In a hospital endemic for methicillin-resistant *Staphylococcus aureus*, MRSA can be the most common organism associated with peristomal infection<sup>(17)</sup>. In 2011 The Infectious Diseases Society of America published the first guidelines for the treatment of MRSA infections in hospitals and ambulatory settings, which was an important step in the elaboration of new prophylactic and therapeutic protocols in health institutions<sup>(11)</sup>.

A cephalosporin-based prophylaxis is usually suggested to decrease peristomal infection after PEG insertion<sup>(2, 18)</sup> but these antibiotics are unlikely to be useful in the prevention of PEG-site infections caused by MRSA and resistant strains of *Pseudomonas aeruginosa*<sup>(9)</sup>. A recent paper in the British Medical Journal (BMJ) suggested the use of co-trimoxazol in the PEG prophylaxis<sup>(3)</sup>. This, however, is not a good option considering the rate of MRSA in our hospital (47%).

This complication is a public health issue and the use of targeted surveillance, with data collected locally, may have benefits which can result in improvements in the quality of medical care<sup>(10)</sup>.

### OBJECTIVES

The primary aim was to evaluate the global prevalence rate of peristomal infection between January 2004 and September 2010, and to characterise the microbiological characteristics of positive culture results. The secondary objectives were the evaluation of the prophylactic antibiotic protocol and study of potential risk factors (age, body mass index (BMI) values and length of time patients use PEG tubes) for peristomal infection.

### METHODS

Medical records of adult patients who underwent endoscopic gastrostomy at a general hospital between January 2004 and September 2010 were reviewed. After given informed consent, patients had the gastrostomy placed by pull-method (Kimberly-Clark® or Bard®). An intravenous

prophylactic cefazolin 1 g was given 1 hour prior to the procedure. If patients were under antibiotic therapy for other diseases, the cefazolin was not given.

The peristomal infection was defined as a purulent discharge with positive wound culture according to CDC definitions for superficial surgical site infections. All the cultures isolates from peristomal wounds were analysed for the antibiogram using the disc diffusion method.

The PEG wound was cared for once every day by sterile saline with coverage of dry gauze placed between the external fixing device and the skin.

A post-discharge surveillance was performed until the patients died or regained oral intake, with multidisciplinary follow-up visits at 1, 3, 6, 12 months post PEG.

The statistical analysis of data was made with the statistical software SPSS 17.0 for Windows. The significance level was set at 5%. Patients were classified in two groups according to the presence of peristomal infection. The comparison of the means for age, BMI and duration of PEG use between these groups was performed using the T-test for independent samples or Man-Whitney U test.

### RESULTS

Our study included 297 patients, 210 (70.7%) male and 87 (29.3%) female. Mean age was 62.06 ± 16.04 years, mean BMI was 20,24 ± 4,16 kg/m<sup>2</sup> and 37.3% of patients were malnourished (BMI < 18.5 kg/m<sup>2</sup>).

Dysphagia due to neurological disease was the most common indication with 160 (53.6%) patients. Oropharyngeal cancer in 109 (36.7%) patients, other malignant diseases in 21 (7.1%) patients and esophageal fistula in 7 (2.4%) patients were the other underlying diseases for PEG placement.

There was no mortality related to the PEG insertion. The mean survival time was 21,36 ± 2,13 months (IC 95%). According to survival analysis using the Kaplan-Meier method (Figure 1), the 30<sup>th</sup> day mortality rate was 12.45%. There was no significant difference between the median survival time of infected and non infected patients (P > 0.05).

Infections were mostly detected in the first 30 days post-procedure (86.1%) and 55.6% 10 days after PEG insertion.

The overall prevalence of peristomal infection was 12.1% (36/297 patients). A total of 41 microorganisms were isolated from these 36 patients (Figure 2). Five patients had

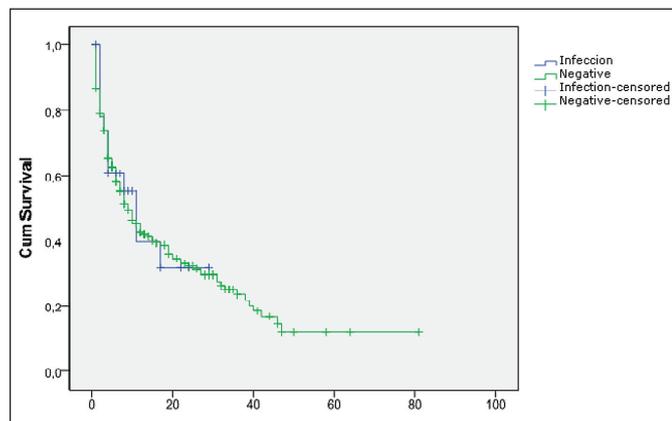


FIGURE 1. Kaplan-Meier survival curve

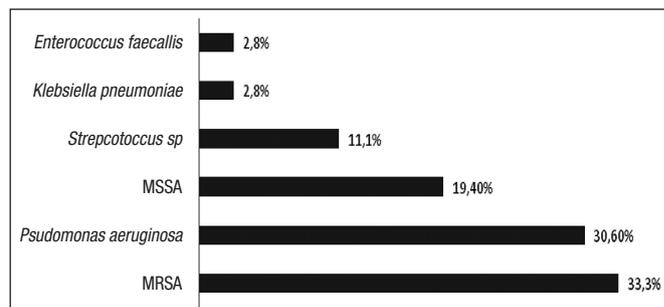


FIGURE 2. Prevalence of microorganisms isolated from wound culture between 2004 and 2010

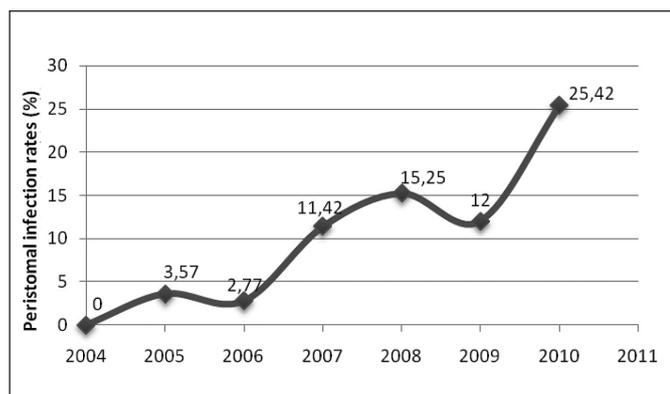


FIGURE 3. Prevalence of peristomal infection after PEG procedure

two organisms cultured. The PEG wound isolates included *Staphylococcus aureus* in 52.7% (19/36) of patients, from which 12 strains were MRSA (33.3% of global infections); *Pseudomonas aeruginosa* in 30.6% (11/36) patients; *Streptococcus β-haemolyticus* in 11.1% (4/36), *Klebsiella pneumoniae* in 2.8% (1/36) and *Enterococcus faecalis* in 2.8% (1/36).

The incidence rate rose each year, increasing from 4.65% in 2004/2007 to 17.9% in 2008/2010 (Figure 3). The increasing of peristomal infection rate was consistent with the overall prevalence of nosocomial infection rates in our institution (Figure 4).

There were no differences between PEG patients with or without peristomal infection respecting to age, BMI values and duration of PEG feeding ( $P > 0.05$ ).

## DISCUSSION

In our study the 30-day mortality rate was 12.5% lower than the reported in a large study in United States, in which all types of gastrostomy placement were included, the 30-day mortality was 23.9% and at 1 year was 63%<sup>(1)</sup>. This may reflect a careful selection of patients and the experience of the team.

In previous series the rate of wound infection may differ significantly between 5% and 39%<sup>(13, 14, 21)</sup>. In our study, the overall peristomal infection rate was 12.1%, an intermediate figure, but rising every year and over 25% in 2010. Nevertheless, our overall peristomal infection rate was rising every year, reaching 25% in 2010 and a sustained high prevalence is expectable for next years.

In this retrospective analysis we were not able to find any independent intrinsic patient's risk factor for peristomal infection due to the high prevalence of co-morbidities in this cohort. A prospective randomized study is now being conducted in order to evaluate predictive risk factors.

Three important results of our study support the idea that peristomal infection must be considered a serious problem of healthcare associated infection:

1. the prevalence of peristomal infection has been rising, and this parallels the rising of general nosocomial infections in our hospital;
2. most infections (55.6%) were detected in the first 10 days

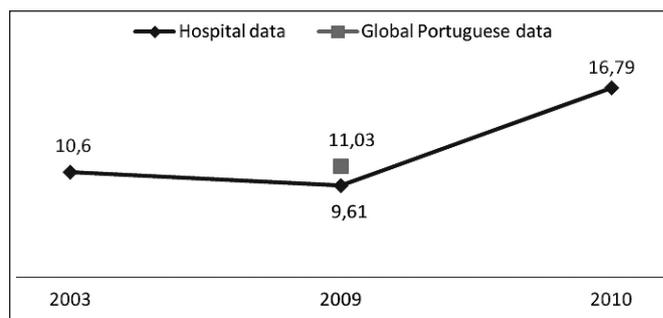


FIGURE 4. Prevalence of nosocomial infection rates between 2003 and 2010 (%)

after gastrostomy and 86.1% within 30 days post-procedure (86.1%). Globally, the large majority of peristomal infection occurred during the hospitalization period or shortly after discharge;

3. the microorganisms cultured from PEG wounds (MRSA, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Enterococcus faecalis*, for example) reflect the nosocomial agents in the hospital.

The high prevalence of multiresistant bacteria was one of the most important findings of the present study. As anticipated by previous reports, multiresistant bacteria, namely MRSA, became the dominant pathogens<sup>(7, 12, 20)</sup>. Most PEG patients have multiple hospitalization episodes prior to the gastrostomy procedure, multiplying the chances of becoming colonized by multiresistant organisms. The use of broad-spectrum antibiotics before PEG insertion<sup>(13)</sup> may also be an explanation for the high prevalence of *Pseudomonas aeruginosa* (30.6%). Taking into consideration the rising of nosocomial infection and multiresistant bacteria, namely MRSA, in hospitals worldwide, we believe that in the future these agents will become more and more important in peristomal infection.

In order to reduce infectious complications, prophylactic antibiotics were recommended<sup>(18)</sup>. However, the widespread routine of large broad antibiotics might increase the risk of emerging resistant organisms. Rao et al.<sup>(16)</sup> recommended the use of a glycopeptide prophylaxis based and a decontamination protocol before PEG insertion in order to reduce MRSA incidence rates in wound infections. Although the MRSA-colonization eradication therapy is not a good option due to the endemic character of the MRSA in the institution<sup>(11)</sup>, other MRSA infection-prevention strategies must be implemented, like pre-procedure antiseptic showering with chlorhexidine and hand hygiene by all clinical staff<sup>(15)</sup>. In our opinion, PEG procedure antibiotic prophylaxis should be adapted to the prevalence of founded causative organisms. In institutions with high prevalence of MRSA, such as our hospital, the use of a glycopeptides prophylaxis should be considered.

## CONCLUSIONS

In the present study, peristomal infection was a frequent and significant problem in PEG patients and should be

considered as a healthcare associated infection. We did not found any independent risk factor for this infection.

In our recent experience, there was a high prevalence of multiresistant bacteria. Looking to the rising prevalence of MRSA and other resistant organisms in ours and other hospitals, and also in nursing homes, the classical antimicrobial

prophylaxis regimens, such as those using cephalosporins, are not adequate anymore and need to be critically reviewed.

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**RESUMO - Contexto** - As infeções associadas aos cuidados de saúde constituem o mais frequente efeito adverso observado durante a prestação de cuidados de saúde. Os avanços clínicos como a gastrostomia endoscópica percutânea melhoraram a qualidade de vida dos doentes mas trouxeram um risco acrescido de infeções associadas aos cuidados de saúde. Os fatores de risco para a infeção peristomal são pouco conhecidos, mas a profilaxia antibiótica e outras estratégias profiláticas parecem reduzir a infeção peristomal. **Objetivos** - O objetivo primário foi a avaliação global da taxa de infeção peristomal e a caracterização microbiológica dos agentes infetantes. Foram objetivos secundários a avaliação do protocolo de profilaxia antibiótica utilizado e a identificação de potenciais fatores de risco para a infeção peristomal. **Método** - Estudo retrospectivo em doentes submetidos a gastrostomia endoscópica entre janeiro de 2004 e setembro de 2010. Os doentes receberam profilaxia antibiótica com cefazolina antes do procedimento. Os processos clínicos foram revistos obtendo-se os dados demográficos, diagnóstico da doença subjacente e potenciais fatores de risco para infeção. A análise estatística foi feita com recurso ao programa SPSS 17.0. **Resultados** - Foram gastrostomizados 297 doentes adultos. A infeção peristomal afetou 36 doentes (12,1%). O *Staphylococcus aureus* resistente à metacilina foi o micro-organismo mais frequentemente isolado (33,3%) seguido pela *Pseudomonas aeruginosa* (30,6%). A incidência de infeção peristomal aumentou progressivamente ao longo dos anos de 4,65% em 2004/2007 até 17,9% em 2008/2010. Este achado foi consistente com o crescimento global da infeção hospitalar. A maioria das infeções peristomais (55,6%) foi identificada nos primeiros 10 dias após a gastrostomia. Não encontramos diferenças significativas na prevalência da infeção peristomal relacionáveis com a idade, índice de massa corporal, sobrevida e duração da nutrição por gastrostomia endoscópica percutânea. Fatores institucionais, como a prevalência global da infeção hospitalar e o caráter endêmico do MRSA, são importantes na infeção peristomal e a profilaxia tradicional com cefazolina não é adequada num contexto de elevada prevalência de micro-organismos resistentes. **Conclusões** - A infeção peristomal é um problema frequente e clinicamente significativo que deve ser encarado como infeção associada aos cuidados de saúde. A profilaxia usando cefalosporinas pode não ser adequada e deve ser revista em hospitais e outras instituições com elevada prevalência de micro-organismos resistentes.

**DESCRITORES** – Gastrostomia. Endoscopia gastrointestinal. Infeção dos ferimentos. *Staphylococcus aureus*. Antibioticoprofilaxia.

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