Oral Hygiene of Patients with Cancer in the Intensive Care Unit

Higiene Bucal de Pacientes com Câncer em Unidade de Terapia Intensiva

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Abstract

Dental care in Intensive Care Units - ICU, plays an important role in maintaining the health and well-being of critically ill patients. Although infection is a frequent manifestation in Intensive Care Unit (ICU) patients, the risk of infection by the oral cavity should also be considered. The immune response of this patient may be compromised, and consequently latent infections may intensify. The mouth is considered an ideal microbial incubator because of its characteristic of pH, presence of nutrients and hard surfaces. The relationship between periodontal disease and systemic conditions, including lung infections, is being explored. This study had the purpose of evaluating the odontology conditions in hospitalized patients with cancer in an intensive care unit at the Cancer Hospital of Londrina - Paraná, Brasil, quantifying the oral microbiota and evaluating bacterial resistance. Inclusion criteria involved critical patients of both sexes, two male and two female, ranging from 40 to 80 years old, submitted to mechanical endotracheal breathing. The presence of visible biofilm and xerostomia were the most prevalent. The results obtained are three patients who presented *Klebsiella pneumoniae* producer of Carbapenemase, due to the oral hygiene deficiency in patients hospitalized in the ICU, which are responsible for major systemic complications, increasing hospitalization time.

Keywords: Intensive Care Units. *Klebsiella pneumoniae*. Oral Health.

Resumo

O atendimento odontológico nas Unidades de Terapia Intensiva - UTI, tem papel importante na manutenção da saúde e bem-estar dos pacientes criticamente doentes. Embora a infecção seja uma manifestação frequente em pacientes de Unidade de Terapia Intensiva (UTI), o risco de infecção pela cavidade bucal também deve ser considerado. A resposta imune desse paciente pode ser comprometida e consequentemente infecções latentes podem intensificar. A boca é considerada uma incubadora microbiana ideal devido à sua característica de pH, presença de nutrientes e superfícies duras. A relação entre doença periodontal e condições sistêmicas, incluindo infecções pulmonares, está sendo explorada. Este estudo teve a finalidade de avaliar as condições odontológicas em pacientes com câncer internados em unidade de terapia intensiva do Hospital do Câncer de Londrina estado do Paraná, Brasil, quantificando a microbiota bucal e avaliando a resistência bacteriana. Os critérios de Inclusão envolveram pacientes críticos de ambos sexos, dois masculinos e dois femininos com idade variando dos 40 aos 80 anos, submetidos à respiração mecânica endotraqueal. A presença de biofilme visível e xerostomia foram a alteração mais prevalente. Nos resultados obtidos encontrou-se três pacientes que apresentaram Klebsiella pneumoniae produtoras de Carbapenemase, pela deficiência de higienização bucal nos pacientes internados na UTI, que são responsáveis por grandes complicações sistêmicas, aumentando o tempo de internamento.

Palavras-chave: *Unidades de Terapia Intensiva. Klebsiella pneumoniae. Saúde Bucal.*

1 Introduction

Cancer is fundamentally a genetic disease that alters cellular information, invading tissues and different organs[1].

Patients hospitalized with cancer have a compromised clinical status, presenting changes in the immune system, exposure to invasive procedures, therapeutic dehydration, which leads to xerostomia. Self-care impossibility favors the oral hygiene precariousness, leading to imbalance of the resident microbiota, with consequent increase in the possibility of acquiring several infectious diseases, compromising the patient's overall health[2].

The Intensive Care Unit - ICU is a suitable environment for patients with severe condition with survival chances, who require constant monitoring (24 hours) and much more complex care than other patients. However, this place is subject to infections, mainly respiratory infections, intubated and ventilated patients are at high risk of infectious complications in this context[3].

In patients hospitalized with mechanical ventilation, the endotracheal tube is an essential interface between the patient and ventilation apparatus, but inadvertently also it facilitates the development of ventilator-associated pneumonia - VAP due to presenting the pulmonary host defenses. As eries of investigations suggest that bacteria that colonize the oral

cavity may be important in the VAP etiology[4].

Hospital dentistry is a dental specialty that aims to perform care and oral procedures in a hospital environment. The first dental services established in a hospital took place in 1901, at the General Hospital of Philadelphia, and had as function the patients' dental care and the students' training of the area[5].

The development of Hospital Dentistry emerged in America, from the mid-nineteenth century onwards with the commitment of the Doctors Simon Hullihen and James Garrestson. A major effort was needed so that the Hospital Dentistry could berecognized. Hospital dentistry encompasses actions that go beyond the imagined and attributed proportions by the population, since the procedures performed do not only concern surgical interventions, but one should keep in mind the patient's approach as a whole and not only in the aspects related to the Care of the oral cavity. Oral health, as a state of harmony, normality or the mouth hygiene, has meaning only when accompanied, to a reasonable degree, by the individual's general health[6].

Hospital dentistry can be defined as a practice that aims to care for oral disorders that require procedures of multidisciplinary teams of high complexity to the patient, promoting preventive, diagnostic, therapeutic and palliative actions in oral health performed in a hospital environment in harmony with the hospital mission and inserted in the context of the multidisciplinary team[7]. Integrated dentistry at the hospital allows a better performance in the commitment to patient care where the dentist's participation at the ambulatory level has the objective of collaborating, offering and adding more strength to what characterizes the new hospital identity[2].

In 2008, the Law nº 2776/2008, presented by Neilton Mulim Costa, obtained a favorable opinion both by the Social and Family Safety Committee in 2012, as well as by the Constitution and Justice and Citizenship Committee. This law required the presence of the dental surgeon in the Intensive Care Units - ICU and also in clinics or public and private hospitals in which patients are hospitalized, so that they can receive oral health care[8].

Microorganisms found in the oral cavity in hospital environment are the group *streptococci viridans*, *Staphylococus aureus*, *Pseudomonas aeruginosa*, *Enterococcus spp.*, *Klebsiella pneumoniae*, and *Candida spp*[9].

Pneumonia associated with mechanical ventilation - PAMV is a pulmonary infection that occurs 48 to 72 hours after endotracheal intubation and the institution of invasive mechanical ventilation, which may cause increased morbidity, mortality, length of stay and costs[10].

Among the main measures to reduce the incidence of PAMV, prevention through oral hygiene associated with the use of chlorhexidine 0.12% mouthwashes is recommended[11]. The use of chlorhexidine 0.12% is the standard protocol of oral hygiene used in an ICU, being a microbial agent of wide spectrum presenting activities against gram-negative bacteria

and has no side effects for patients[12].

Implementation of oral health care protocols to reduce risks of systemic diseases and hospital infections is of great importance for public and private health. Simple measures such as brushing patients' teeth twice a day and using oral antiseptics show a reduction in the patients' mortality and morbidity in ICUs, however, the patient should be distinguished according to his / her clinical condition so that the appropriate protocol is used. Conscious or intubated patients differ both in the microbial colonization type of the buccal cavity and in the therapy to be used[13].

The objective of the present study is to address the dental conditions in cancer patients admitted to the intensive care unit by quantifying the oral microbiota and evaluating bacterial resistance.

2 Material and Methods

2.1 Inclusion criteria

The project was subjected and approved by the Research Ethics Committee with Human Beings, of Unopar (Process nº. 82/2015).

Inclusion criteria included critical patients of both sexes (two males and two females) ranging in age from 40 to 80 years, submitted to mechanical endotracheal respiration and systemic disease, hospitalized in the Intensive Care Unit of the Cancer Hospital of the municipality of Londrina (HCL), Paraná. The participants were subdivided into two groups: 1 edentulous (total) and 3 dentate (with at least 3 teeth).
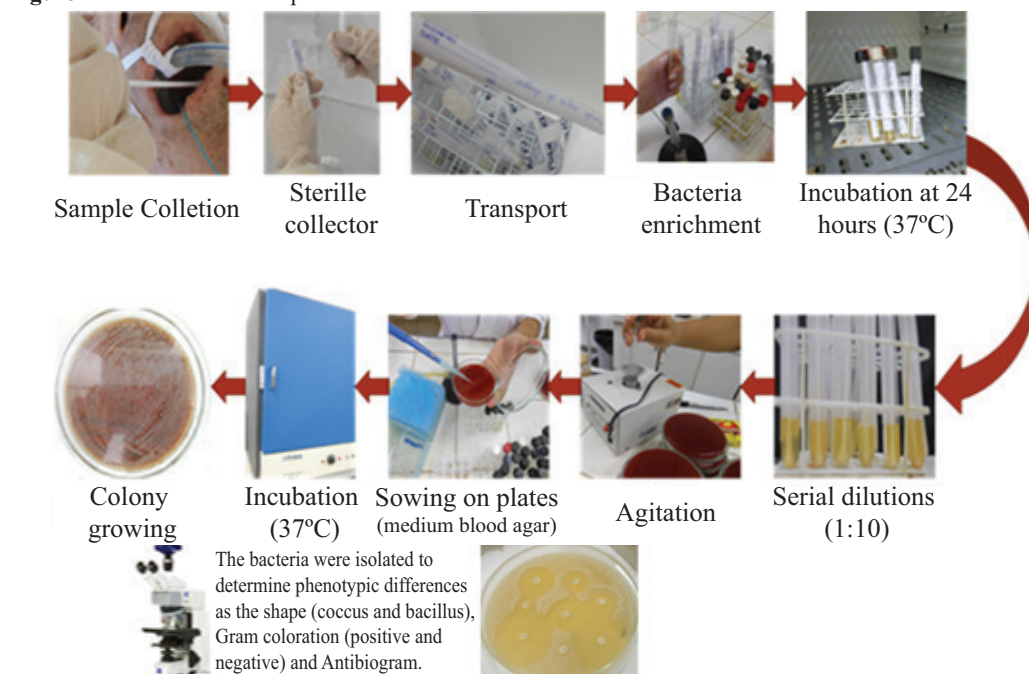
2.2 Oral Hygiene

The hygiene technique used in this study was according to the protocol of the manual of hospital of odontology[13]. The patient's position at the time of oral hygiene was 30°, avoiding aspiration pneumonia. An extra soft infant toothbrush was used, head 27, manufacturer DentalClean Londrina- PR. A non-alcoholic solution of chlorhexidine 0.12% manipulated by Odontofarma, Londrina- PR, was sprayed in the oral cavity ($\pm$ 1ml^{-1} per patient).

Before and during the procedure, a sucker was connected to the hospital vacuum system, suctioning in the oropharynx region, performing the following movements: friction of the vestibular and jugal mucous in the postero-anterior, palate in the postero-anterior, vestibular, lingual and occlusal surfaces of the teeth and the region of the orotracheal tube[14].

2.3 Samples collection

Three collections were performed for 24, 48 and 72 hours with sterile universal collectors - Swab, the first collection was performed without hygiene to quantify the patients' oral bacteria.. The second collection was performed after the nursing team orientation of the CHL to perform the cleaning of the buccal cavity three times a day and the third collection was performed after the hygiene by the dental team (Figure 1).

Figure 1 - Collection of samples and evaluation of the bacteria.

Sample Colletion   Sterille collector   Transport   Bacteria enrichment   Incubation at 24 hours (37ºC)

Colony growing   Incubation (37ºC)   Sowing on plates (medium blood agar)   Agitation   Serial dilutions (1:10)

The bacteria were isolated to determine phenotypic differences as the shape (coccus and bacillus), Gram coloration (positive and negative) and Antibiogram.

Source: Authors.

2.4 Isolation and bacteriological evaluation

The collected saliva samples were serially diluted (1:10) in NaCl 0.85% and plated on blood agar medium 5% for 48 hours at 37 °C for identification of gram-negative bacteria (Figure 1). After counting the colony forming units, the microorganisms were isolated, identified and evaluated by antibiogram (Figure 1).

3 Result and Discussion

At Table 1 the characteristics and inclusion criteria of the patients used in this study are presented. It is observed that among the 4 evaluated patients, according to their oncological characteristic, patient A presented a tumor of tongue base, B Neoplasia of Larynx, C Tumor in phase of metastasis reaching Intestine, Marrow and Lung and D Cervix Uterine Neoplasia.

Table 1 – Characteristics of the patients

Patients				
	A	**B**	**C**	**D**
Genre	**Male**	**Male**	**Female**	**Female**
Age	**50**	**67**	**40**	**64**
Pathology Oncological	Tongue base tumor	Laryngeal Neoplasms	Intestine, Marrow and Lung Tumor	Uterine Cervical Neoplasms
Dentate	X		X	
Toothless		X		
Prosthesis				X
Intubation	X	X	X	X

X: presents the characteristic.
Source: Research data.

It is shown in Table 2, the bacteria growth, oscillating between the dilutions 1:4 and 1:7 and phenotypic differences

presenting cell characteristics such as coccus and bacilus, gram negative and gram positive in all isolates.

Table 2 – Bacterial growing and cell characteristics.

Characteristics	**Collection**		
	1	**2**	**3**
Growing	Up 1:7	Up 1:7	Up 1:4
Cell type cocci	X	x	X
Cell type bacillus	X	x	X
Gram-negative	X	x	X
Gram-positive	X	x	X

Source: Research data.

According to Table 2, the collection in 24 hours presented 1,100 Colony Forming Units (CFU ml^{-1}) with bacterial growth between the dilutions (1:7).

In the second collection, 48 hours after sanitization, performed by the Nursing team obtained the average of 1,050 CFU ml^{-1} with bacterial growth between the dilutions (1:7) and the presence of fungi in a patient because he was using superior total prosthesis, and a lower removable partial prosthesis.

At the last collection,72 hours after hygiene, performed by a team of dentists, it was obtained 430 UFC ml^{-1} with bacterial growth between the dilutions (1:4). Showing that a good oral hygiene performed by a team of dentists and with suitable materials usage, such as chlorhexidine 0.12%, according to the meta-analysis study carried out by Villar et al.[7] significantly reduces the microbial load, and probably the patients' morbidity and mortality .

The antibiogram evaluated the resistance of gram-negative bacteria to antibiotics such as MER 10, CAZ 30, AMC 30, IPM 10, ATM 30, CFL 30, CPM 30, CTX 30.

For the saliva samples from the 4 patients, the bacterium *Klebsiella pneumoniae* producer of Carbapenemase resisted to all antibiotics used. It should be mentioned that after the study, the patients died, with medical report associated to pneumonia. In a study carried out by Mohanty et al.[14], in intubated patients in India, it is mentioned that demographic profiles such as patients' age, gender and underlying primary disorders do not affect the development of pneumonia. Furthermore, Mohanty comments that most of the isolated microorganisms were resistant to the antibiotics usually used, as in this study. Therefore, early diagnosis of pneumonia associated with mechanical ventilation through antibiogram and initiation of appropriate antimicrobial treatment is vital to avoid adverse outcomes.

Educational and preventive activities carried out by the dentist surgeon in the hospital environment are efficient to improve the oral hygiene standards of hospitalized individuals without limitations for self-care[15]. ICUs patients present deficient oral hygiene, with a significantly higher amount of biofilm than individuals living in society, and the quantity and complexity of oral biofilm increases with the length of hospital stay[16-17]. It is expected that the results obtained with this study can guide the planning of actions in oral health, aiming to integrate the Dentist in the multidisciplinary team in the hospital environment.

4 Conclusion

The presence of biofilm and xerostomia was the most prevalent alteration. It is inferred that according to the obtained results, all patients presented the bacterium *Klebsiella pneumoniae* producer of Carbapenemase. Thus, poor oral hygiene in these patients may have been responsible for increased length of hospital stay and mortality.

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