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VARIATIONS OF INTRA-CUFF PRESSURES IN INTUBATED PATIENTS: CONTRIBUTION OF NURSING IN THE PREVENTION OF TRACHEAL COMPLICATIONS

VARIAÇÕES DAS PRESSÕES INTRA-CUFF EM PACIENTES ENTUBADOS: CONTRIBUIÇÕES DA ENFERMAGEM NA PREVENÇÃO DE COMPLICAÇÕES TRAQUEAIS

VARIACIONES DE LAS PRESIONES INTRA-CUFF EN PACIENTES ENTUBADOS: CONTRIBUCIONES DE LA ENFERMERÍA EN LA PREVENCIÓN DE COMPLICACIONES TRAQUEALES

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ABSTRACT

Objective: to discuss the effect of variation of the intra-cuff pressure on the trachea, by taking into account the Mean Arterial Pressure (MAP) and Tracheal Perfusion Pressure (TPP). **Method:** this is a descriptive and prospective study with quantitative approach. We analyzed the intra-cuff pressure, with the aid of a cuffometer, of nine patients intubated of an Intermediary Care Unit from Rio de Janeiro (RJ), Brazil, after the approval of the project by the Research Ethics Committee, under the Opinion nº 19/2010. **Results:** we found intra-cuff pressure values in accordance with the reference values recommended in the literature, but the hemodynamic and MAP values were altered, thereby interfering in tracheal tissue perfusion. **Conclusion:** it is necessary to perform the assessment of the MAP and of the TPP in a way concomitant to the concomitant Cuff Pressure (CP), according to the results, with a view to reducing adverse events to patients. **Descriptors:** Nursing Care; Intensive Care; Artificial Respiration.

RESUMO

Objetivo: discutir o efeito da variação da pressão intra-cuff sobre a traqueia, levando-se em consideração a Pressão Arterial Média (PAM) e a Pressão de Perfusão Traqueal (PPT). **Método:** estudo descritivo e prospectivo com abordagem quantitativa. Analisou-se a pressão intra-cuff, com auxílio de um cuffômetro, de nove pacientes entubados de uma Unidade de Cuidados Intermediários do Rio de Janeiro (RJ), Brasil, após a aprovação do projeto pelo Comitê de Ética em Pesquisa, sob o Parecer nº 19/2010. **Resultados:** encontraram-se valores de pressão intra-cuff de acordo com os valores de referência recomendados pela literatura, porém os valores hemodinâmicos e da PAM se encontraram alterados, interferindo assim na perfusão tecidual traqueal. **Conclusão:** é necessária a avaliação da PAM e da PPT de forma concomitante à Pressão de Cuff (PC), de acordo com os resultados, no intuito de diminuir eventos adversos ao paciente. **Descritores:** Cuidados de Enfermagem; Terapia Intensiva; Respiração Artificial.

RESUMEN

Objetivo: Discutir el efecto de la variación de la presión intra-cuff sobre la tráquea, teniendo en cuenta la Presión Arterial Media (PAM) y la Presión de Perfusión Traqueal (PPT). **Método:** Se trata de um estudio descriptivo y prospectivo con enfoque cuantitativo. Se analizó la presión intra-cuff, con la ayuda de un cuffômetro, de nueve pacientes entubados de una Unidad de Cuidados Intermediarios de Río de Janeiro (RJ), Brasil, después de la aprobación del proyecto por parte del Comité de Ética en Investigación, bajo el Dictamen nº 19/2010. **Resultados:** fueran encontrados valores de presión intra-cuff en consonancia con los valores de referencia recomendados en la literatura, pero los valores hemodinámicos y de PAM estaban modificados, interfiriendo así en la perfusión tisular traqueal. **Conclusión:** se hace necesaria la evaluación de la PAM y la PPT de forma concomitante com La Presión de Cuff (PC), de acuerdo con los resultados, con el fin de reducir los eventos adversos de los pacientes. **Descriptor:** Cuidados de Enfermería; Cuidados Intensivos; Respiración Artificial.

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INTRODUCTION

The Orotracheal Tube (OTT) is deployed in the therapeutic of patients requiring invasive ventilatory assistance. In its distal part, this device has a little balloon (cuff) that serves to optimize mechanical ventilation, by preventing air leakage or regurgitation of gastric contents to the lungs, through a pressure exerted on the patient's trachea, after being bloated.¹ Therefore, the critical patient needs specific nursing care, and a factor that should be monitored on a daily basis is the intra-cuff pressure.² High pressures have been blamed for changes, among them one can mention: decreased activity of ciliated epithelium, ischemia, necrosis and tracheal fistulas.³ In contrast, low pressures increase the risk of aspiration pneumonia.⁴

It is recommended that the intra-cuff pressures remain between 20 and 34cmH₂O or 15 and 25 mmHg (1 mmHg=1,36cmH₂O). One should conduct the monitoring and assessment every 8 hours with the aid of a cuffometer, in order to generate a best-fitting tracheal "seal" pressure, singularly or associated with the auscultatory method of trachea.⁵

With a view to providing safe care to patients in critical conditions, who are benefited from invasive ventilatory assistance, it is important to perform daily and concomitant assessment of intra-cuff pressure, with hemodynamic clinical findings such as the Mean Arterial Pressure (MAP) and Tracheal Perfusion Pressure (TPP).⁶

The Cerebral Perfusion Pressure (CPP) (MAP value subtracted by the Intracranial Pressure value [ICP]) was used as a reference for determining the TPP. When taking into account the CPP, the MAP value is an indicator of overall cellular perfusion and oxygenation, and the ICP is the counterforce in the cerebral mucosa. Nevertheless, in order to determine the TPP, it was performed the subtraction of MAP with the value of the counterforce exerted by the little balloon on the tracheal mucosa, obtained by means of intra-cuff pressure.⁶

In light of all the above statements, we consider that the reference value of CPP is the same for the TPP, and should be maintained above 70 mmHg. The literature also recommends that the MAP value stays between 70 and 110 mmHg, and that the intra-cuff pressures remain between 15 to 25 mmHg, which is an approximate value of what is recommended for ICP (up to 20 mmHg), another reason by which it was used the CPP as reference to determine the PPT.⁶ Under this perspective, the patient's safety emerges

as a guide to research the theme. Therefore, "the variation of intra-cuff pressures in intubated patients and the correlation with hemodynamic data" was delimited as study object.

The study was a requirement for the completion of residency program in clinical nursing and general surgery, on the part of the first author of this study, at the Federal University of the Rio de Janeiro State (UNIRIO) in the first half of 2011, and is justified by the need to pursue, through the results of research, data that can demonstrate how much the intra-cuff pressures in intubated patients are subjected to changes throughout the day and how much these variations might be harmful to the patient. It is also believed that this study might contribute to the reorganization of care and nursing assistance targeted to critically ill patients.

In light of the foregoing, this study has the following objective:

- ♦ To discuss the effect of variation of the intra-cuff pressure on the trachea, by taking into account the Mean Arterial Pressure (MAP) and Tracheal Perfusion Pressure (TPP).

METHOD

This is a descriptive and prospective study, with a quantitative approach, developed in an Intensive Care Unit of Medical Clinical (ICUMC), composed of eight beds, in a Military Health Institution, located in a municipality from the Rio de Janeiro State. The subjects who comprised the non-probabilistic sample of this study were intubated patients submitted to invasive mechanical ventilatory assistance.

The following criteria for inclusion/exclusion of sample were used: the patient should have more than 18 years of age and was intubated for invasive ventilatory assistance during the period in which the data were produced.

The data were collected between July and August 2010, in the morning (from 07 A.M. to 10:00 A.M.) and night shifts (from 07:00 P.M. to 09:00 P.M.), seven days of week, after the approval by the Research Ethics Committee from the Gaffrée and Guinle University Hospital (CEP-HUGG) on June 10th, 2010, under the Opinion n° 19/2010, thereby respecting the precepts of the Resolution n° 196/96.

A structured instrument was used for data collection, with questions related to the measurement of intra-cuff pressures and other issues pertaining to hospitalization and clinical status of patients, with reference to the medical records and instruments for measurement of vital signs and intra-cuff

pressures (stethoscope, sphygmomanometer and cuffometer). The used model of cuffometer was the Cuflator®. Data from nine intubated patients were registered, regardless of time of tracheal intubation, with a registration being performed every 12 hours during three days (not necessarily consecutive) in each patient, six registrations, thereby making a total of 54 registrations (27 in the morning and 27 in the night).

The technique for determining the sample was intentional and non-probabilistic, bearing in mind that the study was conducted only with patients who were intubated and the same probability to gather patients with different clinical and/or physiological

characteristics in the sample was not guaranteed. In order to measure the cuff, it was used a cuffometer of cmH2O, and the value was converted into mmHg; and to measure the systemic blood pressure, it was used the sphygmomanometer. The patient should be in a semi-Fowler position and the measurements were performed in such a way that the patient was not mobilized.

RESULTS

During the data collection, it was observed that the technique chosen to maintain the cuff pressure was associated with digital palpation, which is a technique not recommended in the literature.

Table 1. Variations of CP and TPP. Rio de Janeiro (RJ). Brazil, 2010.

Assesment		Average of intra-cuff pressures (mmHg)	Average of tracheal perfusion pressures (mmHg)
Patient morning	1	27,4	80,1
Patient night	1	37,2	75,1
Patient morning	2	23	74,9
Patient night	2	52,3	47,4
Patient morning	3	15,1	86,8
Patient night	3	14,6	89,9
Patient morning	4	25,4	52,0
Patient night	4	22,4	64,8
Patient morning	5	57,8	31,5
Patient night	5	54,6	23
Patient morning	6	10,7	75,3
Patient night	6	14,2	79
Patient morning	7	13,6	88,2
Patient night	7	21	79,6
Patient morning	8	17,1	61,8
Patient night	8	47,9	29,4
Patient morning	9	10,7	82,4
Patient night	9	9,7	70

According to Table 1, the results indicate that there is variation in all the investigated pressures, both in the morning and in the night, and it was not possible to identify a greater or lesser regularity of pressure at a certain moment of the day. Nonetheless,

according to the averages of intra-cuff pressures, the patients 1, 2, 6, 7 and 8 had their highest averages in the night shift, but, in contrast, the patients 3, 4, 5 and 9 had the highest averages in the morning shift.

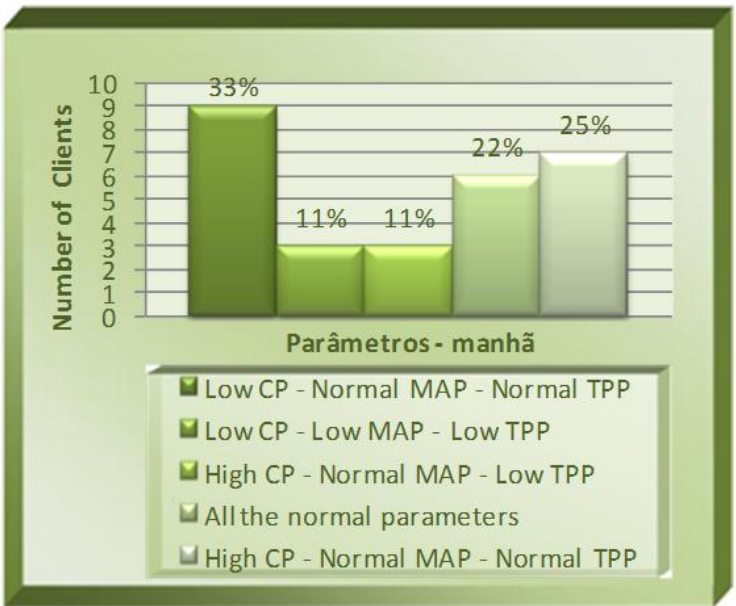


Figure 1. Ration among the intra-cuff pressures (CP), Mean Arterial Pressure (MAP) and Tracheal Perfusion Pressure (TPP) in the morning shift. Rio de Janeiro (RJ). Brazil, 2010.

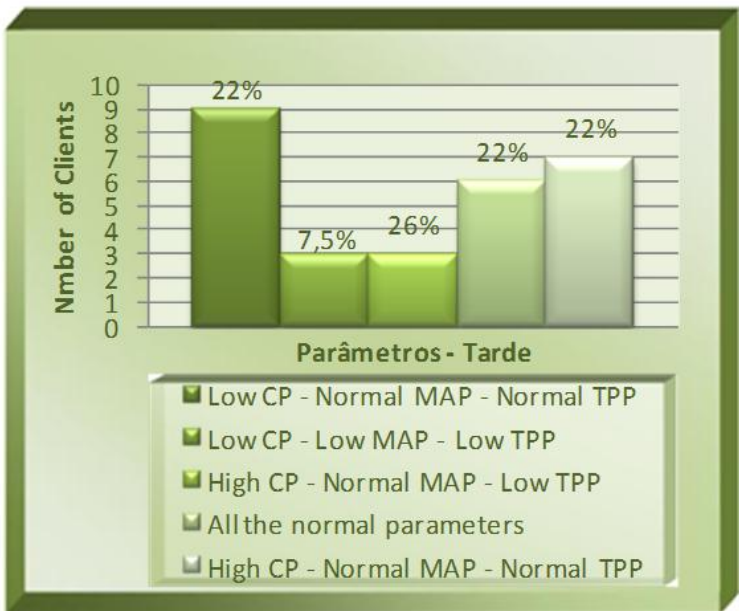


Figure 2. Ration among the intra-cuff pressures (CP), Mean Arterial Pressure (MAP) and Tracheal Perfusion Pressure (TPP) in the night shift. Rio de Janeiro (RJ). Brazil, 2010.

Figure 1 shows the ration of CP, MAP and TPP in the morning shift and Figure 2 in the night. One should observe that most of the registrations (9-33%) in the morning part presented low CP, although MAP and TPP are in normal levels. In these cases, the tracheal perfusion is suitable, but the risk of bronchoaspiration pneumonia due to low cuff pressure is high.⁷

In the morning shift, it was noticed that most of the patients were vulnerable to bronchoaspirating (in 12 assessments, the intra-cuff pressures presented low levels). In contrast, the high pressures were evidenced in 13 measurements in the night shift and in 10 in the morning shift; thus, the patient might have a greater risk of tracheal lesion in the night shift.

Table 2. Averages of tracheal perfusion pressures by shifts. Rio de Janeiro (RJ). Brazil, 2010.

	Morning	Night
Patient 1	80,1	75,1
Patient 2	74,9	47,4
Patient 3	86,8	89,9
Patient 4	52	64,8
Patient 5	31,5	23
Patient 6	75,3	79
Patient 7	88,2	79,6
Patient 8	61,8	29,4
Patient 9	82,4	70

According to the literature, when it comes to TPP, the recommended are values situated between 70 and 110 mmHg, given that values lower than this index demonstrate that there is an overall perfusion deficit in the body.⁶

According to Table 2, it is perceived that there is a large variation in TPP, exemplified through the patient 2, who had a TPP of 74,9 mmHg during morning, but kept an average of 47,4 mmHg in the night. It is important to analyze these data in a way concomitant to the intra-cuff pressures in professional practice, with a view to conducting a holistic care. Nevertheless, not always a suitable intra-cuff pressure for the patient can spare it from tracheal ischemia if the TPP data are modified.⁶

DISCUSSION

In light of the foregoing, one can observe that the average of intra-cuff pressures remained erratic in most patients. In a study conducted in the São Paulo State, there was the assessment of 3.195 measures of little balloons pressures in 1.194 patients, both males and females, hospitalized in intensive care units (ICU) and coronary units (CU), who were being submitted to mechanical ventilation with use of endotracheal prosthesis and tracheostomy cannula (tube) in the morning and afternoon shifts. During the period between March and August 2005, it was performed a monitoring of the measures collected by the professionals of physiotherapy and it was found that the measures were also erratic, on average, in 80% of cases.⁸

In most post-extubated patients, studies make clear that, in addition to the above mentioned complications, the high cuff pressures on the trachea cause discomfort and pain, thereby jeopardizing their speech and swallowing.⁹

The technique of digital palpation is usually chosen by health professionals for maintaining the intra-cuff pressure. Nevertheless, in a study performed with patients using OTT and TCT, it was observed that 38% of the encountered intra-cuff pressures were high,

with predominance of the technique of digital palpation.¹⁰

According to the described in the course of this study, one can find erratic MAP and TPP values, and, in some cases, the CP was within the range of normal values. Alterations in MAP and TPP are envisaged in critically ill patients, submitted to invasive mechanical ventilation, but there are care strategies for minimizing the generated complications. Therefore, one should highlight the need to reconcile the assessment of the CP with the MAP and the TPP.¹¹

CONCLUSION

The study has signaled the need to disseminate the results to the nursing staff, by encouraging its members to implement the suitable assessment of intra-cuff pressures in their daily practice.

One should take into account that the literature and the studies fail to reach a consensus in relation to the suitable actual value of the intra-cuff pressure, and it is justified by the fact that the tracheal mucosa of individuals is different if we take into account the anatomy, pathology, gender and age of patients. Nevertheless, by considering the importance of safe care to intubated patients, it is emphasized the importance of health institutions make available classes and training activities on this theme to health professionals. Therefore, it is also essential that the professional is committed to the health care to be provided.

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