

---

# Effects of orotracheal intubation in voice and swallowing in adults and seniors

## Efeitos da intubação oro-traqueal na voz e deglutição de adultos e idosos

## Efectos de oro-traqueal intubación en la voz y la deglución de adultos y ancianos

Nathalia Ferreira Campos\*  
Graziela Chamarelli Bougo\*  
Ana Cristina Cortes Gama\*  
Laélia Cristina Caseiro Vicente\*

### Abstract

**Objective:** describe the vocal alterations and of swallowing in patients submitted to orotracheal intubation and compare them between adults and seniors. **Methods:** Descriptive observational cross-sectional study consisting of 30 patients admitted to the intensive care unit that were intubated from 24 hours to 14 days. The sample consisted of 15 adults, aged between 18 and 59, and 15 seniors patients aged 60 to 79 years. All patients underwent clinical assessment of swallowing and voice, performed about 24 hours after extubation, and analysis of the self-perception of vocal changes. A descriptive analysis by percentage was realized. **Results:** The mean duration of intubation was higher in the seniors. In the structural evaluation of swallowing the seniors fared worse compared to adults, as well as narrower mouth. The maximum phonation time found in both groups was very low and the perceptual evaluation showed greater impact in the seniors. In the evaluation of vocal self-perception, in both groups, the subjects rated their dysphonia as of higher grade than that given by speech therapists. **Conclusion:** speech language compromises after extubation were more common in the seniors, characterized by vocal alterations and worse food pathway when compared to adults. The maximum phonation time reduced

\*Universidade Federal de Minas Gerais. UFMG, Minas Gerais, Brazil.

**Authors' contributions:** NFC responsible for designing the research project, collecting and analyzing the data and preparing the manuscript. GCB responsible for data collection and correction of the manuscript. ACCG responsible for the design of the research project, orientation and correction of the manuscript. LCCV responsible for the design and delineation of the research project, orientation, elaboration and correction of the manuscript.

**Correspondence address:** Nathalia Ferreira Campos - nathfono@yahoo.com.br

**Received:** 06/11/2016

**Accepted:** 07/01/2016

and the negative vocal self-perception were found regardless of age. Early clinical assessment should be routine because, through it, one can get an early diagnosis of laryngeal disorders, decreasing the rate of systemic complications arising.

**Keywords:** Voice; Swallowing; Intubation; Speech Therapy.

## Resumo

**Objetivo:** descrever as alterações vocais e de deglutição em pacientes submetidos à intubação orotraqueal e compará-las entre idosos e adultos. **Métodos:** estudo transversal observacional descritivo constituído por 30 pacientes internados no Centro de Terapia Intensiva, que foram intubados por períodos de 24 horas a 14 dias. A amostra foi composta por 15 participantes adultos, de idades entre 18 e 59 anos, e 15 pacientes idosos com idades entre 60 e 79 anos. Todos foram submetidos à avaliação fonoaudiológica da deglutição e da voz, realizadas aproximadamente 24 horas após a extubação, e análise da auto-percepção das alterações vocais. Realizou-se análise descritiva por meio de percentagem.

**Resultados:** o período médio de intubação orotraqueal foi maior nos pacientes idosos. Na avaliação estrutural da deglutição os idosos apresentaram resultados piores se comparados aos adultos, assim como via oral mais restrita. A média do tempo máximo de fonação de ambos os grupos encontrou-se bastante reduzida, e a avaliação perceptivo-auditiva demonstrou maior impacto nos idosos. Na avaliação da auto-percepção vocal, em ambos os grupos, os sujeitos, classificaram sua disфония como de grau superior ao atribuído pelos fonoaudiólogos. **Conclusão:** comprometimentos fonoaudiológicos após extubação foram mais frequentes nos idosos, caracterizados por alteração vocal e via de alimentação pior quando comparada aos adultos. O tempo máximo de fonação reduzido e a auto-percepção vocal negativa foram encontrados independentemente da faixa etária. A avaliação fonoaudiológica precoce deve ser rotina, pois, por meio dela, pode-se obter o diagnóstico precoce de alterações laringeas, diminuindo a taxa de complicações sistêmicas advindas.

**Palavras-chave:** Voz; Deglutição; Intubação; Fonoaudiologia.

## Resumen

**Objetivo:** Describir los trastornos vocales y la deglución en pacientes sometidos a la intubación y compararlos entre personas mayores y los adultos. **Métodos:** Estudio transversal observacional descriptivo consistió de 30 pacientes ingresados en la unidad de cuidados intensivos que fueron intubados durante 24 horas a 14 días. La muestra consistió en 15 participantes adultos, con edades comprendidas entre los 18 y 59, y 15 pacientes mayores de 60 a 79 años. Todos los pacientes fueron sometidos a la evaluación clínica de la deglución y de la voz, realizado alrededor de 24 horas después de la extubación, y análisis de la auto-percepción de los cambios vocales. Un análisis descriptivo por porcentaje. **Resultados:** El tiempo medio de intubación fue mayor en los ancianos. En la evaluación estructural de tragar los ancianos les fue peor en comparación con los adultos, así como más estrecho boca. El tiempo de fonación máxima media de ambos grupos resultó ser bastante bajo, y la evaluación perceptual mostró un mayor impacto en las personas mayores. En la evaluación de la auto-percepción vocal, en ambos grupos, los sujetos calificaron su disфония como el grado más alto dado por los terapeutas del habla. **Conclusión:** Los compromisos terapia del habla después de la extubación fueron más frecuentes en las personas mayores, que se caracteriza por vocal y peor vía de alimentos en comparación con los adultos. El tiempo máximo de fonación reducida y el auto-percepción vocal negativo se encontraron sin importar la edad. Evaluación clínica temprana debe ser rutinaria, ya que, a través de él, se puede obtener un diagnóstico precoz de los trastornos de la laringe, la disminución de la tasa de complicaciones sistémicas que surja.

**Palabras clave:** Voz; Deglución; Intubación, Terapia del Habla.

## Introduction

The Intensive Care Unit (ICU) is intended for critically ill patients and plays a decisive role in the chance of survival of patients due to diverse technological resources and a highly specialized team in permanent attention<sup>1</sup>.

Orotracheal intubation (OTI) is the placement of a tube into the trachea through the oral route to provide an unobstructed airway. Its main indication is in situations in which there is damage in the maintenance of airway permeability. OTI is a routine procedure in the intensive care units and surgical centers, and, as it is an invasive procedure, it is subject to risks and complications<sup>2</sup>.

It is common, in the literature, studies on the various complications related to OTI, such as breaking of teeth, lesions on the lips, tongue, palate, uvula, esophagus and trachea, odynophagia, sore throat, among others<sup>3,4</sup>. In addition, the functions related to these structures, such as breathing, speech and swallowing are not performed during OTI, thus causing a decrease in the laryngeal function and consequent inactivity of the musculature<sup>5</sup>, compromising vocal production and swallowing processes.

Vocal alteration is a frequent symptom due to the high occurrence of laryngeal lesions during OTI<sup>6</sup>. Post-extubation dysphagia is also widely reported in the literature, due to multiple factors, occurring with a prevalence of approximately 44 to 87%<sup>7,8</sup>.

The elderly are more susceptible to laryngeal lesions and vocal alterations than young individuals, due to the fact that the laryngeal mucosa, muscles and cartilages become more fragile and susceptible to lesions with age<sup>9,10</sup>. The fast population aging has been increasing the number of elderly patients requiring hospital care<sup>11</sup> and invasive treatments, such as OTI.

Speech assessment of voice and swallowing in patients that undergo OTI should be a routine procedure after extubation, since the early diagnosis of laryngeal complications after extubation can be decisive in reducing the morbidity rate<sup>8</sup>.

This work aims to describe the voice (speech) and swallowing alterations found in patients that underwent OTI and to compare them between the elderly and adults.

## Methods

This is a descriptive observational cross-sectional study carried out at the Intensive Care Unit (ICU) of a university hospital with a convenience sample, with patients over 18 years old, both male and female, who underwent orotracheal intubation for more than 24 hours and up to 14 days. Patients excluded from the study: the ones with neurological and/or cognitive impairments, those with clinical impairments for which the medical team did not authorize the evaluation of oral feeding, and those who reported feeding difficulties or vocal alterations prior to admission. This work was approved by the Research Ethics Committee of the Universidade Federal de Minas Gerais, under CAAE - 49480115.2.0000.5149e. All participants signed the Informed Consent Term. Data collection was performed from February to May 2015.

The 30 participants of the study were divided in two groups:

- Group 1 - Constituted by 15 subjects (8 men and 7 women) aged between 18 and 59 years, with a median of 38 years;
- Group 2 - Constituted by 15 elderly (6 men and 9 women) aged between 60 and 79 years, with a median of 70 years.

All patients underwent speech therapy evaluation, which consisted of the clinical investigation of swallowing and voice at the bedside, performed approximately 24 hours after extubation.

For the evaluation of swallowing the usual protocol of the Speech Therapy Service of the hospital (APPENDIX I) was used. This assessment was performed in two stages: structural evaluation and functional one.

In the structural evaluation it was investigated the mobility and strength of the Speech organs (articulators, SOs), number of teeth, presence of oral reflexes and presence of spontaneous swallowing of saliva. Then, the patients who presented conditions underwent functional evaluation, and the consistencies of the offered diets - honey, liquid and solid - varied according to the possibilities of each patient. During the diets supply, the biomechanics of the oral and pharyngeal phases of swallowing was observed. In addition, the hyolaryngeal elevation was verified through the digital monitoring of the region, with the positioning of the index and middle fingers on the base of the tongue and the hyoid bone, and the annular and minimal fingers on

the thyroid cartilage. It is considered adequate when the laryngeal excursion displaces, on average, two fingers of the examiner; reduced when the laryngeal elevation reaches less than two fingers of the examiner, and absent in the absence of movement<sup>12</sup>.

The feeding pathway of the patients was defined through the Functional Oral Intake Scale (FOIS<sup>13</sup>), after speech therapy evaluation. The FOIS comprises a seven-level scale, which classifies the patient according to the level of oral feeding, being: 1- no oral intake (OI); 2- dependent of alternative pathway and minimal oral intake of some food or liquid; 3-dependent of alternative pathway with consistent oral intake of food or liquid; 4- total oral intake of a single consistency; 5- total oral intake with multiple consistencies, but requiring special preparation or compensations; 6- total intake with multiple consistencies, without special preparation or compensations, but with food restrictions; 7- total intake without restrictions.

The vocal evaluation was performed through the perceptual-auditory and acoustic analyzes, as well as the filling of a visual analogical scale of vocal self-perception, in which the patient should point in a graduated line, from 0 to 10, the grade of vocal alteration perceived by him/her after the extubation. It was considered absent impact when the patient indicated 0, mild when the participant indicated a score from 1 to 3, moderate impact when the grade ranged from 4 to 6 and an intense impact when the grade was higher than 7.

The recording of the voices of each participant was made using a unidirectional condenser microphone, model CO1 of Samson®, located at a distance of 10 cm from the patient, with angle of capture of 45°, coupled to a Quad Capture soundboard - Interface Roland UA55 - 4X4 24 bit 192 kHz USB 2.0, connected to an Intel Pentium Inside Dual Core® P6200 notebook - Compaq Presario CQ - 112BR, 2.16 GHz core 2 duo 1 gb and 120 gb of HD. The speech materials were stored and processed by SONAR LE software in wave file. The recordings occurred with the patients sitting in the bed, and they were asked to emit the vowel /a/, as their usual way, at maximum phonation

time (MPT), and the chained speech of the days of the week. The emissions of the sustained vowels were transferred to the VoxMetria program, from which the acoustic measurements of fundamental frequency (F0) were extracted and the MPT was measured.

After, these voices were analyzed in a perceptual-auditory way by three speech therapists specialized in Health of the Elderly and with experience in perceptual-auditory analysis. The evaluation was performed using the GRBASI Scale<sup>14</sup> which considers G as the general grade of dysphonia, R as roughness, B as breathiness, A as asthenia, S as strain and I as instability. In this scale, the evaluator should indicate, for each evaluated parameter, the grade of alteration that ranges from 0 to 3. It is considered 0 for no alteration (neutral vocal quality), 1 for mild alteration, 2 for moderate one and 3 for intense one.

In order to determine the agreement intra-evaluators, 20% of the voices were repeated, randomly, totaling 36 voices. The reliability values used to determine the intra-examiner agreement were determined by the Kappa coefficient calculation, with the evaluator 1 = 0.80; evaluator 2 = 0.85 and evaluator 3 = 0.72, indicating good reliability<sup>15</sup>.

These three evaluations were used in the construction of a single GRBASI scale for the voice of each patient. For this, the highest occurrence classification was used, or the average of the three classifications for each parameter of the GRBASI scale. After, this single evaluation was compared to the grade given by each participant for his/her degree of vocal alteration after extubation, through the visual analogical scale.

A descriptive analysis was performed by means of percentage, to calculate the frequency of occurrence of vocal and swallowing alterations.

## Results

Table 1 shows the descriptive characteristics of the evaluated patients, distributed in Group 1 (young adults) and Group 2 (elderly). OTI time was higher in young adults.

**Table 1.** Sociodemographic and clinical characteristics of the patients admitted to the ICU and intubated

Characterization		Group 1		Group 2	
		N	%	N	%
Gender	Male	8	53.3	6	40
	Female	7	46.7	9	60
Age (years)	Minimum	18	-	60	-
	Maximum	59	-	79	-
	Mean	39	-	69.3	-
	Median	38	-	70	-
OTI Period (days)	Minimum	1	-	1	-
	Maximum	14	-	7	-
	Mean	5.06	-	3.8	-
	Median	3	-	4	-
Reason for hospitalization	Self-extirpation attempt	2	13.3	0	0
	PCW	3	20	2	13.3
	PFA	4	26.6	1	6.7
	Fall from the proper height	0	0	5	33.4
	Appendicitis	1	6.7	0	0
	Spinal cord injury	2	13.3	0	0
	AMI	1	6.7	2	13.3
	Neoplasia	0	0	2	13.3
	HIV	1	6.7	0	0
	Occlusive peripheral arterial disease	0	0	3	20
Childbirth labour	1	6.7	0	0	

Legend: N = number of subjects; OTI = orotracheal intubation; PCW: perforation by cold weapon; PFA; perforation by firearm; AMI: acute myocardial infarction; HIV: human immunodeficiency virus.

In the structural evaluation of swallowing, it was observed that the elderly presented worse results when compared to young adults, as well as

a more restricted oral intake, as it can be seen in Table 2. All patients had, before the speech therapy evaluation, suspended oral diet (FOIS 1).

**Table 2.** Characteristics of structural and functional evaluations of swallowing

		Group 1		Group 2	
		N	%	N	%
Dentition	Complete	10	66.7	2	13.3
	Incomplete	5	33.3	4	26.7
	Edentulism	0	0	9	60
SOs	Adequate	13	86.7	11	73.4
	Inadequate	0	0	1	6.6
	Adequate mobility and reduced strength	2	13.3	3	20
Laryngeal elevation	Adequate	10	66.7	1	6.6
	Reduced	4	26.7	13	86.8
	Absent	1	6.6	1	6.6
GAG	Adequate	13	86.7	12	80.1
	Hypoactive	2	13.3	2	13.3
	Absent	0	0	1	6.6
Oral phase	Altered	2	13.3	2	13.3
	Not altered	13	86.7	86,7	86.7
Pharyngeal Phase	Altered	3	20	4	26.7
	Not altered	12	80	11	73.4
FOIS	1	2	13.3	3	20
	2	0	0	1	6.6
	3	1	6.6	0	0
	4	1	6.6	3	20
	5	5	33.5	8	53.4
	6	3	20	0	0
	7	3	20	0	0

Legend: N = number of subjects; SOs = Speech organs (articulators); GAG = nausea reflex; FOIS = Functional Oral Intake Scale

In the acoustic evaluation, all participants in the study had reduced MPT and fundamental frequency within normal range. The results are shown in Table 3.

The perceptual-auditory evaluation showed a greater negative impact on the voice of the elderly, characterized by roughness and breathiness (Table 4). In the evaluation of vocal self-perception, in both groups, the subjects, for the most part, classified their dysphonia as having an intense grade (Table 5).

**Table 3.** MPT and F0 characteristics of vocal and acoustic evaluations

		Group 1		Group 2	
		Woman	Man	Woman	Man
MPT (seconds)	Minimum	4	2	2	3
	Maximum	12	16	5	5
	Mean	6.5	6.3	3.4	3.8
F0 (Hz)	Minimum	138.55	101.65	152.83	124.98
	Maximum	251.62	169.37	256.19	181.50
	Mean	215.41	138.26	198.14	142.80

Legend: MPT = Maximum phonation time; F0 = Fundamental frequency

**Table 4.** Perceptual-auditory analysis using the GRBASI scale

GRBASI	Severity	Group 1		Group 2	
		N	%	N	%
Grade of alteration	0	10	66.8	4	26.7
	1	1	6.6	2	13.3
	2	3	20	8	53.4
	3	1	6.6	1	6.6
Roughness	0	11	73.4	4	26.7
	1	2	13.3	5	33.3
	2	2	13.3	6	40
	3	0	0	0	0
Breathiness	0	11	73.5	6	40
	1	2	13.3	6	40
	2	1	6.6	3	20
	3	1	6.6	0	0
Asthenia	0	14	93.4	10	66.8
	1	0	0	2	13.3
	2	1	6.6	2	13.3
	3	0	0	1	6.6
Strain	0	14	93.4	13	80.1
	1	1	6.6	2	13.3
	2	0	0	0	0
	3	0	0	0	0
Instability	0	15	100	11	73.4
	1	0	0	3	20
	2	0	0	1	6.6
	3	0	0	0	0

Legend: N = number of subjects

**Table 5.** Results of vocal self-perception

Grade of alteration	Group 1		Group 2	
	N	%	N	%
Neutral	1	6.7	2	13.3
Light	4	26.6	4	26.6
Moderate	4	26.6	4	26.6
Intense	6	40.1	5	33.4

Legend: N = number of subjects

## Discussion

Early recognition of post-extubation alterations is fundamental in the reduction of the morbidity rate.

Periods longer than 24 or 48 hours, varying between some studies, are considered to be prolonged intubation time<sup>12</sup>. Prolonged intubations are correlated with the greater occurrence of dysphagia<sup>16</sup>. However, in the present study, although adult subjects underwent OTI for a period on average longer than the elderly did, they had a better swallowing pattern and greater FOIS progression. Although both groups underwent OTI for a period over 24 hours - which already characterizes prolonged OTI - the intubation time was relatively small, which may have influenced the low prevalence of alterations in the oral and pharyngeal phases of swallowing. Moreover, it is important to highlight that, due to the fact that this study was consisted of a convenience sample, the OTI time was very varied (from 1 to 14 days), which may also have interfered with the intensity of the alterations found. It is agreed that efforts must be made to reduce intubation time. However, other variables seem to be involved in the prognosis. Studies have shown a greater risk of dysphagia in patients with Glasgow Coma Scale scores below 14 or age over 55 years<sup>17, 18</sup>. On the other hand, another study pointed out that neither age nor duration of intubation correlate with the increase of alterations in swallowing<sup>19</sup>.

Authors report that prolonged OTI may result in muscle inactivity, as it reduces speech, breathing and swallowing functions<sup>7</sup>. In this study, however, no alterations were observed in the mobility and strength of the speech organs (articulators) in the majority of the evaluated patients, possibly as a consequence of the small mean time of OTI. Regarding the dentition, a study that analyzed the dental conditions of the Brazilian population indicates that about 25% of the young adults present incomplete dentition, and this number may be higher among the subjects with lower income and schooling<sup>20</sup>, like the participants of this study. Among the elderly, the same study indicates that the edentulism is a condition of approximately 53.7% of them, a proportion similar to that of the present study, in which edentulism was found in 60% of the evaluated elderly. The literature points out that oral health is not admittedly important for

the elderly Brazilian population, since edentulism is considered as natural of the aging<sup>21</sup>.

Studies that point to the simultaneous occurrence of dysphagia and dysphonia are found in the literature, highlighting the relationship between “wet voice” and laryngotracheal penetration/aspiration<sup>22</sup>. MPT infers the coordination between the aerodynamic respiratory and myoelastic forces of the larynx and evidences the vocal quality. The established MPT parameter for the prolonged emission of the vowel /a/ in adult individuals is 14 seconds in females and 20 seconds in males<sup>23</sup>. For the elderly, mean values are 13 seconds for women and 18 seconds for men<sup>24</sup>. MPT values in both groups of this study were very low when compared to the literature. Such results may be justified by possible vocal fold edge lesions caused by OTI, as well as pneumo-phono-articulatory incoordination and possibly the respiratory type<sup>25</sup>. MPT below 10 seconds demonstrates pathological characteristics, which may present strain, hoarseness and vocal tremor, suggesting a laryngeal alteration<sup>26</sup>. However, a study accomplished with post-stroke patients found that the MPT below 10 seconds is not significant information when it is related to laryngotracheal aspiration<sup>23</sup>.

The mean fundamental frequency found for the vowel /a/ in young adults (138 Hz for men and 215.4 Hz for women), corroborate with the literature, since the expected is from 80 to 150 Hz for male voices and from 150 to 250 Hz for the female ones<sup>27</sup>, demonstrating that the OTI did not interfere in the vocal fold structure, causing an alteration in the vibration velocity of the vocal folds.

In the aging process, studies indicate that, as in the results found in this study, the fundamental frequency is more acute in men<sup>28</sup>. Although the average F0 of the elderly women found in this study is within the expected range for the age group, when compared to the mean found for the group of young adult women, one can observe the worsening of F0, corroborating the literature<sup>28</sup>. As for women, the hormonal variation due to the menopause seems to be the main responsible for the fundamental frequency displacement. In men, a predominance of atrophy and stiffness of the mucosa is observed, shifting the frequency to acute regions<sup>28</sup>. Therefore, OTI does not seem to have caused an impact on the fundamental frequency, since the results are within the expected range for each age group and the F0 changes can be justified by the aging process.



The results of the perceptual-auditory analysis, obtained through the GRBASI scale, show a predominance of vocal alterations in the elderly, which can be explained by the greater fragility of the laryngeal mucosa because of the age<sup>9</sup>. The parameters of roughness and breathiness were apparently the most affected. A study indicated that roughness appeared between 14% and 50% of the patients that underwent OTI, and this symptom is most often temporary, lasting from 2 to 3 days. However, for a small group, roughness can become permanent<sup>5</sup>.

OTI can cause lesions in the laryngeal musculature, triggering paresis or paralysis of the vocal folds<sup>29</sup>, which can make the vocal emission more breathy, besides increasing the risk of aspiration. The exact incidence of vocal fold paralysis is not known. However, it seems to increase with age<sup>30</sup>. The OTI time may also be associated with the grade of vocal alteration, since, in this study, the patient that underwent intubation for a longer period (14 days) was considered the one with the worst vocal quality, and was evaluated with intense alteration for all the parameters of the GRBASI scale. Studies that analyze the impact of OTI time on the voice of patients are important for determining vocal and laryngeal assessment protocols in post-extubation individuals.

When analyzing the self-perception of vocal quality post-extubation by means of visual analogical scale, in general, it is noticed that the patients attributed a grade of alteration higher to that estimated by the speech therapists that performed the perceptual-auditory analysis. Extubation can lead to pharyngo-laryngo-tracheal symptoms, such as sore throat, difficulty for speaking, coughing, increase of secretions<sup>32</sup>, as well as discomfort caused by the possible dislocation and luxation of arytenoid cartilages<sup>5</sup>. Such factors, which are intrinsic to the patients, may have been considered by them in the evaluation of the self-perception. Therefore, the self-perception is an important factor and should be considered in post-extubation evaluation.

The importance of speech therapy procedures in ICU is evident. Early evaluation in extubated patients is a work in the sense of maintaining life, because it can prevent complications, as well as quality of life, since it identifies voice and swallowing alterations that negatively impact in the patients' lives.

One limitation of this study is that the long-term consequences of dysphonia and dysphagia after OTI were not evaluated, since only the data from the speech therapy evaluation were considered. We suggest, for future work, besides the sample progression, longitudinal follow up of the patients and the control of variables such as OTI time.

The causes of laryngeal complications after OTI are very diverse, as well as their severity. The early performance of vocal and swallowing evaluation in patients that underwent OTI, such as the one accomplished in this study, should be routine, because, with this measure, it can be obtained early diagnosis of laryngeal complications, thus reducing the rate of morbidity and other systemic complications.

## Conclusion

The vocal and swallowing impairment after orotracheal extubation was more frequent in the elderly population, characterized by alteration in vocal quality and in the hyolaryngeal excursion, besides the worse feeding pathway when compared to the adult. The reduced maximum phonation time and the altered vocal self-perception were the impaired aspects, independently of the age group. Thus, speech therapy evaluation in patients undergoing orotracheal intubation should focus on a detailed investigation of communication and eating skills, especially if the individual is elderly.

## References

1. Albin RMN, Soares VMN, Wolf AE, Gonçalves CGO. Conhecimento da enfermagem sobre cuidados a pacientes disfágicos internados em unidade de terapia intensiva. *Rev. CEFAC*. 2013; 15: 1512-24.
2. Yamanaka CS, Góis AFT, Vieira PCB, Alves JCD, Oliveira LM, Blanes L, Lourenço EPL, Assunção M, Machado FR. Intubação orotraqueal: avaliação do conhecimento médico e das práticas clínicas adotadas em unidades de terapia intensiva. *Rev Bras Ter Intensiva*. 2010; 22(2): 103-111.
3. Medeiros, GC. Disfagia orofaríngea em pacientes submetidos à intubação orotraqueal prolongada em UTIs [mestrado]. São Paulo (SP): Universidade de São Paulo; 2012.
4. Kunigk MRG, Chehter E. Disfagia orofaríngea em pacientes submetidos à intubação orotraqueal. *Rev Soc Bras Fonoaudiol*. 2007; 12(4): 287-91.
5. Mota LAA, Carvalho GB, Bri VA. Complicações laringeas por intubação orotraqueal: revisão da literatura. *Int. Arch. Otorhinolaryngol*. 2012, 16(2): 236-45.

6. Sue RD, Susanto I - Long-term complications of artificial airways. *Clin Chest Med*. 2003; 24: 457-71.
7. Skoretz SA, Flowers HL, Martino R. The incidence of dysphagia following endotracheal intubation: a systematic review. *Chest*. 2010; 137(3): 665-73.
8. Medeiros GC, Sassi FC, Mangilli LD, Zilberstein B, Andrade CRF. Clinical dysphagia risk predictors after prolonged orotracheal intubation. *Clinics*. 2014; 69 (1): 8-14.
9. Hamdan AL, Moukarbel RV, Farhat F, Obeid M. Vocal cord paralysis after open-heart surgery. *Eur J Cardiothorac Surg*. 2002; 21: 671-4.
10. Campos CM. Impacto da voz na qualidade de vida de mulheres idosas [mestrado]. São Paulo (SP): Pontifícia Universidade Católica de São Paulo; 2001.
11. Veras R, Lourenço R, Martins C, Sanchez M, Chaves P. Novos paradigmas do modelo assistencial no setor saúde: consequência da explosão populacional dos idosos no Brasil. In: Veras R, organizador. *Terceira idade: gestão contemporânea em saúde*. Rio de Janeiro: Relume Dumará; 2002. p. 11-79.
12. Padovani, Aline Rodrigues, *et al.* Intubação orotraqueal e disfagia: comparação entre pacientes com e sem dano cerebral. In 16o Congresso Brasileiro de Fonoaudiologia, Campos do Jordão, 2008. *Anais do 16o Congresso Brasileiro de Fonoaudiologia - Suplemento Especial da Revista da Sociedade Brasileira de Fonoaudiologia*, 2008. Resumo.
13. Furkim AM, Sacco ABF. Eficácia da fonoterapia em disfagia neurogênica usando a escala funcional de ingestão por via oral (FOIS) como marcador. *Rev CEFAC*. 2008; 10(4): 503-12.
14. Hirano M. *Clinical examination of voice*. New York: Springer-Verlag; 1981.
15. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. 1977; 33: 159-74.
16. Rumbach AF, Ward EC, Cornwell PL, Bassett LV, Muller JM. Clinical progression and outcome of dysphagia following thermal burn injury: a prospective cohort study. *J Burn Care Res*. 2012; 33 (3): 336-46.
17. Bordon A, Bokhari R, Sperry J, Testa D, Feinstein A, Ghaemmaghami V: Swallowing dysfunction after prolonged intubation: analysis of risk factors in trauma patients. *Am J Surg*. 2011; 202: 679-82.
18. Barquist E, Brown M, Cohn S, Lundy D, Jackowski J. Postextubation fiberoptic endoscopic evaluation of swallowing after prolonged endotracheal intubation: a randomized, prospective trial. *Crit Care Med*. 2001; 29(9): 1710-3.
19. El Solh A, Okada M, Bhat A, Pietrantoni C. Swallowing disorders post orotracheal intubation in the elderly. *Intensive Care Med*. 2003; 29(9): 1451-5.
20. Peres MA, Barbato PR, Reis SCGB, Freitas CHSM, Antunes JLF. Perdas dentárias no Brasil: análise da Pesquisa Nacional de Saúde Bucal 2010. *Rev Saúde Pública*. 2013; 47 (Supl 3): 78 - 89.
21. Medeiros JJ, Rodrigues LV, Azevedo AC, Neto EAL, Machado LS, Valença AMG. Edentulismo, uso e necessidade de prótese e fatores associados em município do nordeste brasileiro. *Pesq Bras OdontopedClinIntegr*. 2012; 12(4): 573-8.
22. Warms T, Richards J: "Wet voice" as a predictor of penetration and aspiration in oropharyngeal dysphagia. *Dysphagia*. 2000; 15: 84-8.
23. Valim MAB, Jurkiewicz AL, Santos RS, Zétola VF, Abdulmassih EM. Relação do Tempo Máximo de Fonação em Pacientes com Disfagia Secundária a Acidente Vascular Cerebral. *Ver Neurocienc* 2013; 21(2): 209-15.
24. Fabron EMG, Sebastião LT, Oliveira GAG, Motonaga SM. Medidas da dinâmica respiratória em idosos participantes de grupos de terceira idade. *Rev CEFAC*. 2011; 13(5): 895-901.
25. Cielo CA, Gonçalves BFT, Lima JPM, Christmann MK. Tempo máximo de fonação /a/, tempo máximo de fonação previsto e tipo respiratório de mulheres adultas sem afecções laringeas. *Rev. CEFAC*. 2015; 17(2): 358-63.
26. Valim MAB, Santos RS, Macedo ED, Silva EMA, Serrato MRF. A relação do tempo máximo de fonação nos pacientes neurológicos com disfagia neurogênica. *RevArq Inter ORL*. 2007; 7: 260-6.
27. Behlau, M, Pontes, P. A avaliação da voz. In: *Avaliação e tratamento das Disfonias*. São Paulo: Lovise, 1995. p. 79-98.
28. Cassol, M. Benefícios do canto coral para indivíduos idosos, 2004. Tese (Doutorado em Clínica Médica e Ciências da Saúde). Pontifícia Universidade Católica do Rio Grande do Sul, 2004.
29. Martins RHG, Braz JRC, Dias NH, Castilho EC, Braz LG, Camacho Navarro LH. Rouquidão após intubação traqueal. *Rev Bras de Anestesiol*. 2006; 56(2): -99.
30. Koifman ACB. Paralisia das pregas vocais: como reconhecer, como fazer e o que procurar aos métodos de imagem? *Radiol Bras*. 2009; 42(5): VII-VIII. Editorial.

## APPENDIX I

## Protocolo para avaliação da deglutição

<b>Motivo da internação:</b>	
<b>Pneumonia</b>	( ) sim ( ) não
<b>Via de alimentação</b>	( ) livre ( ) oral restrita ( ) suspensa ( ) enteral ( ) soroterapia
<b>Nível de consciência</b>	( ) alerta ( ) sonolento ( ) confuso ( ) agitado ( ) prostrado
<b>Acompanhante</b>	( ) sim ( ) não
<b>FOIS inicial</b>	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 ( ) 6 ( ) 7
<b>Comunicação oral</b>	<b>Lgg Compreensiva</b> ( ) normal ( ) alterada <b>Lgg Expressiva</b> ( ) normal ( ) alterada <b>Disartria</b> ( ) presente ( ) ausente <b>Apraxia</b> ( ) presente ( ) ausente
<b>OBS.</b>	
<b>Paralisia Facial</b>	( ) não ( ) periférica ( ) central - ( ) D ( ) E
<b>OFA's</b>	
<b>Cav oral</b>	( ) normal ( ) ressecada ( ) xerostomia ( ) acúmulo de saliva ( ) sialorréia
<b>Higintra oral</b>	( ) adequada ( ) inadequada ( ) halitose
<b>Dentição</b>	( ) completa ( ) incompleta ( ) edentulismo
<b>Prótese dentária</b>	( ) presente bem adaptada ( ) presente mal adaptada ( ) ausente
<b>Palato duro</b>	<b>Alt. Estruturais:</b> ( ) presente ( ) ausente
<b>Palato mole</b>	<b>Mobilidade:</b> ( ) adequada ( ) alterada ( ) simetria ( ) assimetria
<b>Reflexos orais</b>	<b>Reflexo nauseoso:</b> ( ) ausente ( ) adequado ( ) exarcebado ( ) hipotativo <b>Reflexo de tosse:</b> ( ) ausente ( ) eficaz ( ) ineficaz <b>Reflexos patológicos:</b> ( ) ausente ( ) presente
<b>OBS.:</b>	
<b>Dependência alimentar</b>	( ) sim ( ) não
<b>Controle cervical</b>	( ) sim ( ) não ( ) hiperextensão ( ) flexão anterior ( ) flexão posterior
<b>Deglutição de saliva</b>	( ) ausente ( ) frequente ( ) esporádica ( ) acúmulo hipofaringe ( ) penetração ( ) aspiração
<b>OBS.:</b>	
<b>Pastoso: fase oral</b>	<b>Captação:</b> ( ) adequada ( ) inadequada <b>Vedam. Labial:</b> ( ) presente ( ) ausente ( ) eficaz ( ) ineficaz <b>Preensão do bolo:</b> ( ) eficaz ( ) ineficaz <b>Mov. Língua:</b> ( ) adequada ( ) reduzida <b>Tempo gasto:</b> ( ) adequado ( ) levemente aumentado ( ) muito aumentado <b>Escape precoce:</b> ( ) ausente ( ) pqn quant. ( ) grande quant <b>Estase intra-oral:</b> ( ) ausente ( ) pqn quant. ( ) grande quant
<b>Obs.:</b>	
<b>Pastoso: fase faríngea</b>	<b>Refluxo nasal:</b> ( ) presente ( ) ausente <b>Ato motor da deglut.:</b> ( ) adequ. ( ) ausente ( ) incoordenado ( ) atrasado <b>Elevação laríngea:</b> ( ) ausente ( ) completa ( ) incompleta ( ) trepidante ( ) enfraquecida <b>Nº deglut por bolo:</b> ( ) até 3 ( ) de 4 a 5 ( ) >5 <b>Ausculat cervical:</b> <i>Resíduos em hipofaringe:</i> ( ) ausente ( ) pqnquant ( ) grande quant <i>Penetração:</i> ( ) ausente ( ) pqnquant ( ) grande quant <i>Aspiração:</i> ( ) ausente ( ) pqnquant ( ) grande quant <b>Sinais clínicos de aspiração pulmonar:</b> ( ) ausente ( ) voz molhada ( ) cansaço ( ) auscul. ruidosa ( ) alteração respiratória ( ) queda Sat O2 <b>Tosse/engasgo:</b> ( ) antes ( ) durante ( ) depois
<b>OBS.:</b>	
<b>Líquido: fase oral</b>	<b>Captação:</b> ( ) adequada ( ) inadequada <b>Vedam. Labial:</b> ( ) presente ( ) ausente ( ) eficaz ( ) ineficaz <b>Preensão do bolo:</b> ( ) eficaz ( ) ineficaz <b>Mov. Língua:</b> ( ) adequada ( ) reduzida <b>Tempo gasto:</b> ( ) adequado ( ) levemente aumentado ( ) muito aumentado <b>Escape precoce:</b> ( ) ausente ( ) pqn quant. ( ) grande quant <b>Estase intra-oral:</b> ( ) ausente ( ) pqn quant. ( ) grande quant
<b>Obs.:</b>	



<b>Líquido: fase faríngea</b>	<p><b>Refluxo nasal:</b> ( ) presente ( ) ausente  <b>Ato motor da deglut.:</b> ( ) adequ. ( ) ausente ( ) incoordenado ( ) atrasado  <b>Elevação laringea:</b> ( ) ausente ( ) completa ( ) incompleta ( ) trepidante ( ) enfraquecida  <b>Nº deglut por bolo:</b> ( ) até 3 ( ) de 4 a 5 ( ) &gt;5  <b>Ausculta cervical:</b>  <i>Resíduos em hipofaringe:</i> ( ) ausente ( ) pqnquant ( ) grande quant  <i>Penetração:</i> ( ) ausente ( ) pqnquant ( ) grande quant  <i>Aspiração:</i> ( ) ausente ( ) pqnquant ( ) grande quant  <b>Sinais clínicos de aspiração pulmonar:</b>  ( ) ausente ( ) voz molhada ( ) cansaço ( ) auscul. ruidosa  ( ) alteração respiratória ( ) queda Sat O2  <b>Tosse/engasgo:</b> ( ) antes ( ) durante ( ) depois</p>
<b>OBS.:</b>	
<b>Sólido</b>	
<b>Ex. instrumental:</b>	( ) videofluoroscopia ( ) videolaringoscopia ( ) broncoscopia ( ) endoscopia
<b>Via alternativa</b>	( ) não ( ) SNE ( ) SOE ( ) gastrostomia ( ) jejunostomia ( ) NPT
<b>Via oral sugerida</b>	( ) suspensa ( ) líq restrita ( ) líq completa ( ) pastosa ( ) branda ( ) livre
<b>FOIS indicado</b>	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 ( ) 6 ( ) 7
<b>Conduta</b>	

