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Influence of orotracheal intubation on orofacial myofuncional changes in infants

Influência da intubação orotraqueal nas alterações miofuncionais orofaciais em lactentes

Influencia de la intubación orotraqueal sobre los cambios miofuncionales orofaciales en lactantes

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Abstract

Introduction: Post-extubation swallowing changes are widely identified and studied, in which dysphagia is identified in the oral and pharyngeal phases, accompanied by laryngeal penetration and aspiration. However, orofacial myofunctional changes in post-extubation patients are still not well described in pediatrics. **Objective:** Verify the influence of orotracheal intubation on orofacial myofunctional changes in lactates. **Methods:** Cross-sectional study, performed in a Pediatric Intensive Care Unit from November 2015 to September 2016. Participants were divided into two groups: study group, with medical diagnosis of congenital heart disease, post-cardiac surgery, undergoing OTI for at least 6 hours, and the control group was composed of infants aged 0 to 6 months, previously healthy, who did not have any previous IOT. After selection, babies from both groups were submitted to the same assessment protocols.

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VGSM: Data collection, writing and review of the final manuscript.
LBS: Article writing.
RSR: Data analysis and final manuscript review.
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The clinical evaluation of the child's orofacial myofunctional structures was performed using the Pediatric Dysphagia Assessment Protocol. **Results:** Lip posture, lip tone, tongue posture, palate, and vocal quality were significantly associated with the use of OIT, intraoral pressure and suction pattern. When analyzing the frequency distribution of the comparison with and without OIT, it is observed that there is no specific pattern that indicates whether the association is harmful, protective or does not interfere in the pattern of myofunctional characteristics in these cases. **Conclusion:** OIT influence was found in orofacial myofunctional structures in infants, when compared to babies who were not intubated.

Keywords: Intubation, Intratracheal; Infants; Facial Muscles; Speech, Language and Hearing Sciences.

Resumo

Introdução: As alterações da deglutição pós-extubação são amplamente identificadas e estudadas, nas quais a disfagia é identificada nas fases oral e faríngea, acompanhada de penetração laríngea e aspiração traqueal. Entretanto, as alterações miofuncionais orofaciais em pacientes pós-extubação ainda não estão bem descritas em Pediatria. Objetivo: Verificar a influência da intubação orotraqueal (IOT) nas alterações miofuncionais orofaciais do lactente. Método: Estudo transversal, realizado em uma Unidade de Terapia Intensiva Pediátrica no período entre novembro de 2015 a setembro de 2016. Os participantes foram divididos em dois grupos: grupo estudo, com diagnóstico médico de cardiopatia congênita, pós-operatório de cirurgia cardíaca, em IOT por no mínimo 6 horas, e grupo controle composto por lactentes de 0 a 6 meses, previamente saudáveis, que não tiveram histórico de qualquer IOT anterior. Após a seleção, ambos os grupos foram submetidos ao Protocolo de Avaliação de Disfagia Pediátrica. Resultados: Postura e tônus labial, postura de língua, palato e qualidade vocal estiveram significativamente associados ao uso de IOT, pressão intraoral e padrão de sucção. Ao analisar a distribuição de frequência da comparação com e sem IOT, observa-se que não há um padrão específico que indique se a associação é prejudicial, protetora ou não interfere no padrão das características miofuncionais nesses casos. Conclusão: A influência da IOT foi encontrada nas estruturas miofuncionais orofaciais de bebês, quando comparados a bebês não intubados.

Palavras-chave: Intubação Intratraqueal; Lactentes; Músculos Faciais; Fonoaudiologia.

Resumen

Introducción: Los cambios en la deglución post-extubación están ampliamente identificados y estudiados, en los que se identifica disfagia en las fases oral y faríngea, acompañada de penetración y aspiración laríngea. Sin embargo, los cambios miofuncionales orofaciales en pacientes post-extubación todavía no están bien descritos en pediatría. Objetivo: Verificar la influencia de la intubación orotraqueal sobre los cambios miofuncionales orofaciales en lactatos. Metodos: estudio transversal, realizado en una Unidad de Cuidados Intensivos Pediátricos desde noviembre de 2015 hasta septiembre de 2016. Los participantes se dividieron en dos grupos: grupo de estudio, con diagnóstico médico de cardiopatía congénita, postoperatorio cardíaco, sometidos a IOT durante al menos 6 horas y el grupo control, compuesto por lactantes de 0 a 6 meses, previamente sanos, que no tiene alguna IOT anterior. Después de la selección, los bebés de ambos grupos fueron sometidos a los mismos protocolos de evaluación. La evaluación clínica de las estructuras miofuncionales orofaciales del niño se realizó mediante el Protocolo de Evaluación de Disfagia Pediátrica. Resultados: La postura de los labios, el tono de los labios, la postura de la lengua, el paladar, la calidad vocal se asociaron significativamente con el uso de ITO, la presión intraoral y el patrón de succión. Al analizar la distribución de frecuencias de la comparación con y sin ITO, se observa que no existe un patrón específico que indique si la asociación es dañina, protectora o no interfiere en el patrón de características miofuncionales en estos casos. Conclusión: la influencia de la ITO se encontró en las estructuras miofuncionales orofaciales en los bebés, en comparación con los bebés que no fueron intubados.

Palabras clave: Intubación Intratraqueal; Lactante; Músculos Faciales; Fonoaudiología.

Introduction

Tracheal intubation is defined as the placement of a tube inside the trachea, either through the oral or nasal routes, to maintain airway patency and control of pulmonary ventilation, and may be performed on an elective or emergency basis[1]. The maintenance time of the orotracheal tube in children differs from adults. In newborns, intubation is usually tolerated for months, with minimal development of laryngeal edema or inflammation. Older children and adolescents with irreversible underlying disease and no prospect of extubation, tracheostomy is indicated after 10 to 14 days of intubation[2,3].

Several types of laryngeal and tracheal injuries secondary to endotracheal intubation have been described in the literature, such as: lip, tongue and pharyngeal injury, epiglottis lacerations, vocal folds, esophagus and trachea, hematomas and vocal fold avulsion, displacement and dislocation of arytenoid cartilages, mucosal ulcerations, stenosis and granulomas[4]. Also, post-extubation swallowing changes are widely identified and studied, in which dysphagia is identified in the oral and pharyngeal phases, accompanied by laryngeal penetration and aspiration[5]. However, orofacial myofunctional alterations in post-extubation patients are still not well described in Pediatrics.

It is hypothesized that intubated infants present abnormal orofacial myofunctional characteristics when compared to those who were not submitted to orotracheal intubation (OTI). To answer this question, the objective of this research is to verify the influence of OTI on orofacial myofunctional alterations in infants.

Method

The study was approved by the Ethics Committee for Research in Human Beings of the Hospital da Criança Santo Antônio (Opinion No. 1.324.927/2016) and carried out after signing the Informed Consent Form.

This is a cross-sectional study, carried out at a referral pediatric hospital. Data were collected from November 2015 to September 2016. Participants were divided into two groups: study group (SG), infants aged 0 to 6 months, both genders, with medical diagnosis of congenital heart disease, post-cardiac surgery, who had undergone OTI for at least 6 hours. Infants with: structural changes in the upper airways, associated neurological impairment, viral respiratory condition at the time of assessment, corrected chronological age below 38 weeks, suspected or diagnosed with genetic syndrome, and who were undergoing speech therapy or prior to this were excluded.

The control group (CG) was composed of infants aged 0 to 6 months, both genders, who were in the hospital's Inpatient Unit. Infants with: structural changes in the upper airways, associated neurological impairments, viral respiratory status at the time of assessment, corrected chronological age below 38 weeks, suspected or diagnosed with genetic syndrome, who were undergoing speech therapy during hospitalization or before, were excluded, and that had presented some OTI.

After being selected, the infants in both groups were submitted to assessment using the Pediatric Dysphagia Assessment Protocol (PADPED)[6], which was performed up to 48 hours after extubation, thirty minutes before the diet. The protocol consists of an initial part of anamnesis and the child's feeding history, an assessment of the structures of the stomatognathic system, clinical evaluation of swallowing, with food offer, and conclusion of the protocol, with the classification of the speech-language diagnosis. For this study, the evaluation items of the structures of the stomatognathic system were used. The assessment was carried out with the infant in the supine position, in bed, needing to be in an alert state for the performance.

The application of the protocol was carried out individually by a speech therapist belonging to the hospital service, with clinical experience in pediatric dysphagia and orofacial motricity, and after undergoing training in its application. During the entire study period, two professionals with experience in the field of Orofacial Motricity, after establishing criteria and receiving training for uniform collection, analyzed the protocols and compared the groups, gathering all data.

Absolute and relative frequencies were analyzed and, when possible, associations between the use or not of the OTI were analyzed using Fisher's Exact Test, considering 95% significance. The software used was SPSS version 20.0.

Results

A total of 66 infants were evaluated, 2 of which were excluded for not presenting the myofunctional data from the initial part of the protocol. Among these, 31 were evaluated as SG, with a median chronological age of 21 days (13-42) and a mean gestational age (GA) of 269±10.75 days. In the CG, 33 infants with a median age of 27 days (14-90) and a mean gestational age (GA) of 274.12±5.25 days were evaluated. The OTI time in the SG had a median of 51 hours (24-158).

As for the SG, with regard to the type of heart disease, 7 infants (22.6%) were cyanotic and 24 (77.4%) acyanotic. As for the cardiovascular diagnosis, there was an overlapping of answers, with 8 (25.8%) cases of Interatrial Communication, 10 (32.3%) of Interventricular Communication, 9 (29%) of Arterial Canal Persistence, 6 (19.4%) of Pulmonary Stenosis, 1 (3.2%) of Supravalvar Aortic Stenosis, 11 (35.5%) of Coarctation of the Aorta, 2 (6.5%) of Transposition of the Great Arteries, 1 (3 .2%) of Tricuspid Atresia, 2 (6.5%) of Intracardiac Tumor, 3 (9.7%) of Patent Foramina Oval, 1 (3.2%) of Hypoplasia of the Left Heart Syndrome, 1 (3, 2%) of Atrioventricular Septal Defect and 1 (3.2%) of Aortic Arch Hypoplasia.

Table 1 describes the orofacial myofunctional findings identified through the PAD-PED[6] protocol. The following were significantly associated with the use or not of OTI: lips posture (p=0.002), lips tonus (p=0.004), tongue posture (p<0.001), palate (p<0.001), vocal quality (p<0.001), intraoral pressure (p=0.010) and suction pattern (p<0.001).

When analyzing the frequency distribution of the comparison of infants with and without OTI, it is observed that there is no specific pattern that indicates whether the association is harmful, protective or does not interfere with the pattern of myofunctional characteristics in these cases. No statistical significance was found when analyzing the different times of use of the OTI.

Table 1. Orofacial myofunctional characteristics of infants who underwent OTI (SG) compared to those who did not (CG).

Myofunctional Characteristics	SG (n=31)	CG (n=33)	p
Lip posture			0,002*
Normal	16 (35,6%)	29 (64,4%)	
changed	15 (78,9)	4 (21,1%)	
Lip Tone			0,004*
Normal	24 (42,1%)	33 (57,9%)	
changed	7 (100%)	0 (0%)	
Tongue posture			<0,001*
Normal	11 (26,2%)	31 (73,8%)	
changed	20 (31,2%)	2 (3,1%)	
Tongue Tone			-
Normal	31 (48,4%)	33 (51,6%)	
changed	0 (0%)	0 (0%)	
Change Tongue			0,484
Yes	30 (47,6%)	33 (52,4%)	
Not	1 (100%)	0 (0%)	
Cheek Tone			0,108
Normal	28 (45,9%)	33 (54,1%)	
changed	3 (100,0%)	0 (0%)	
Palate			
Normal	17 (34,0%)	33 (66,0%)	<0,001*
changed	14 (100%)	0 (0%)	
Vocal quality			<0,001*
Normal	17 (34.0%)	33 (66,0%)	
changed	14 (100%)	0 (0%)	

Myofunctional Characteristics	SG (n=31)	CG (n=33)	p
Oral mucosa			-
Normal	31 (48,4%)	33 (51,6%)	
Changed	0 (0%)	0 (0%)	
Salivary swallowing frequency			0,231
Normal	29 (46,8%)	33 (53,2%)	
changed	2 (100%)	0 (0%)	
Cervical Auscultation / Saliva Swallowing			0,187
Normal	28 (45,9%)	33 (54,1%)	
Changed	3 (100%)	0 (0%)	
Search reflex			0,249
Normal	24(52,2%)	22 (47,8%)	
Changed	7 (38,9%)	11 (61,1%)	
Intraoral pressure			0,010*
Normal	25 (43,1%)	33 (56,9%)	
Changed	6 (100%)	0 (0%)	
Suction Pattern			<0,001*
Normal	21 (38,9%)	33 (61,1%)	
Changed	10 (100%)	0(0%)	

*Statistical significance

Discussion

In the study, infants from both the SG and the CG were found, with low median ages, identifying that the use of invasive procedures to maintain airway patency is increasingly necessary[7]. The intubated infants in our study had a median of 51 hours of intubation. Studies show that the use of prolonged mechanical ventilation can lead to lung injury, and in order to reduce complications, it is necessary that weaning from ventilation is performed early, respecting the clinical characteristics of each child[8].

Although there is a consensus that tracheostomy should be performed within 1 or 2 weeks of tracheal intubation, there are no pre-established criteria for the maximum intubation tolerance time in Pediatrics, and that each child should be evaluated individually[9]. It is known that children tolerate intubation for a much longer time than adults[10], and some premature babies are intubated for more than three months before tracheostomy is considered[11].

The literature indicates that the most frequent complications after extubation in pediatric patients are: dysphonia and laryngeal edema. In adults, dysphonia ranges from 1 to 80%, being more frequent in women, however, these data are not confirmed in pediatric patients[12,13].

In the present study, changes in vocal quality were observed associated with infants who were intubated, when compared to patients who did not require OTI. The incidence of laryngeal edema in the pediatric age group can range from 1 to 47%[14]. This edema is more common in babies, due to the smaller diameter of the cricoid cartilage in relation to the rest of the airways, and the presence of the more fragile epithelial mucosa in this region[15,16].

In this study, the presence of statistically significant changes in posture and tonus of the lips and tongue posture in infants with OTI was identified. It is believed that these myofunctional changes are due to the possible residual effects of pharmacological sedation, and consequently, to changes in the sensitivity of the upper airways related to intubation[17]. Also, in recent studies, it was identified that patients with prolonged OTI, that is, for more than 48 hours, presented reduced salivary flow, highly prevalent sensory-motor impairment of the tongue, reduced lip seal, which could persist for up to 14 days after extubation[18-20]. Such findings corroborate and justify the findings of our study.

Changes were found in the intraoral pressure of infants submitted to OTI and in the maintenance of the sucking pattern. Such findings may be associated with other characteristics found, such as: posture and tonus of lips and tongue. Chen et al. (2018), in a study with post-extubation patients,

also identified the restriction of mouth opening, due to the weakness of the masticatory muscles that move the mandible[19]. This difficulty in moving the mandible may be directly related to the findings of changes in intraoral pressure and maintenance of the sucking pattern of infants undergoing OTI in our study.

Another finding associated with OTI is the morphological alteration of the hard palate. The pressure exerted by the orotracheal tube or by the laryngoscope would be responsible for such alteration, inhibiting the normal growth of these structures. Authors noted that palatal abnormalities began to develop after 12 hours of OTI[21].

In this study, no statistical significance was found when analyzing the different times of use of the OTI, that is, the data did not show a higher prevalence due to the intubation time being greater or less than 12 hours of intubation. Such data can be explained by the small sample of the study, which, despite having two groups, used an instrument with many possibilities of classification for each category, thus remaining few individuals in each categorization.

Although there are some potential limitations in this study (small number of participants, use of an instrument to assess pediatric dysphagia and not myofunctional changes, and because there is a possibility that myofunctional characteristics are more related to CC than to OTI), the results showed overall rates of changes on specific myofunctional effects in infants undergoing OTI when compared to infants who were not. It is suggested that studies with a larger population be carried out, as well as that specific myofunctional protocols be used for the studied population.

Conclusion

There is an influence of OTI on lip posture and tone, tongue posture, palate, vocal quality, intraoral pressure and sucking pattern when compared to infants who were not submitted to OTI.

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