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# Findings of postoperative clinical assessment of swallowing in infants with congenital heart defect

## *Achados da avaliação clínica da deglutição em lactentes cardiopatas pós-cirúrgicos*

### Keywords

Heart Defects, Congenital  
Infant  
Evaluation  
Swallowing  
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### Descritores

Cardiopatas Congênicas  
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### ABSTRACT

**Purpose:** Describe the findings of postoperative clinical evaluation of swallowing in infants with congenital heart disease (CHD) in a reference hospital in southern Brazil. **Methods:** This is a cross-sectional study conducted postoperatively with infants with medical diagnosis of CHD aged 0-6 months in a Pediatric Intensive Care Unit. Exclusion criteria comprised infants with neurological and respiratory impairments, craniofacial malformation, structural alteration in the upper airways, and suspicion or diagnosis of genetic syndromes. Clinical evaluation was performed through partial application of the Assessment of Pediatric Dysphagia protocol. Regarding statistical analysis, the quantitative variables were described by median and interquartile range and the qualitative variables were described by absolute and relative frequencies. Non-parametric tests were used to evaluate the associations. **Results:** Of the 31 infants in the sample, 23 (74.2%) were classified with some degree of dysphagia. Significant difference was observed in the clinical evaluation performed with bottle-feeding compared with breast-feeding; a larger number of swallowing disorders was also found in bottle-feeding. Statistically significant correlation was observed between duration of orotracheal intubation (OTI) >24 h and presence of dysphagia. **Conclusion:** Postoperative clinical evaluation enabled description of swallowing impairments in infants with CHD regardless of the type of feeding offered, as well as identification of presence of dysphagia in a large number of individuals in the sample and its association with duration of OTI >24 h.

### RESUMO

**Objetivo:** Descrever os achados da avaliação clínica da deglutição em lactentes cardiopatas pós-cirúrgicos de um hospital de referência do sul do Brasil. **Método:** Trata-se de um estudo transversal, realizado em uma Unidade de Terapia Intensiva Pediátrica, no qual participaram lactentes com diagnóstico médico de cardiopatia congênita e idade entre 0 e 6 meses, após procedimento cirúrgico. Foram excluídos da amostra aqueles que apresentaram: comprometimento neurológico, malformação craniofacial, alterações estruturais de vias aéreas superiores, comprometimento respiratório, suspeita ou diagnóstico de síndrome genética. A avaliação clínica foi realizada por meio de aplicação parcial do Protocolo de Avaliação da Disfagia Pediátrica. Em relação às análises estatísticas, as variáveis quantitativas foram descritas por mediana e amplitude interquartilica e as variáveis qualitativas foram descritas por frequências absolutas e relativas. Testes não paramétricos foram aplicados para avaliar as associações. **Resultados:** Dos 31 lactentes que compuseram a amostra, 23 (74,2%) foram classificados com algum grau de disfagia. Houve diferença significativa na avaliação clínica realizada com a oferta de mamadeira quando comparada à oferta em seio materno, em mamadeira também foi observado maior número de alterações da deglutição. A relação entre o tempo de intubação orotraqueal maior que 24 horas e a presença de disfagia apresentaram associação estatisticamente significativa. **Conclusão:** Por meio da ACD foi possível descrever as alterações de deglutição em lactentes cardiopatas após procedimento cirúrgico, independentemente do modo de oferta. Além de identificar a presença de disfagia em número elevado da amostra e sua associação com o período de IOT maior de 24 horas.

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## INTRODUCTION

Congenital heart disease (CHD) is defined as an abnormality in the structure or cardiovascular function that is present at birth, even when subsequently discovered<sup>(1)</sup>. For classification, the CHD can be divided into cyanotic and acyanogenic according to characterization of clinical, pathophysiological and rolling conditions<sup>(2)</sup>. It is estimated that cardiovascular malformations affect approximately 0.9% of newborns and is the second leading cause of infant mortality in Brazil<sup>(3,4)</sup>. Pediatric Cardiology has recommended the early diagnosis and correction of heart defects, with heart surgery being one of the methods commonly employed for this population in order to live longer and to have better quality of life<sup>(3,5,6)</sup>. Due to increased life expectancy of this population, there is also increased demand for other resources such as the need for enteral nutrition, prolonged respiratory support, inefficient nutritional intake, risk of malnutrition, contributing to the onset of dysphagia<sup>(7,8)</sup>.

Thus, the CHD are considered a risk factor for childhood dysphagia<sup>(9)</sup>, swallowing disorder that is characterized by changes at any stage and / or between the stages of swallowing dynamics<sup>(10)</sup>, as it compromises the safe ingestion of food, possibly causing loss of nutritional aspects, hydration, pulmonary function and also related to the enjoyment of food, and the quality of social and individual life. The occurrence of dysphagia is also related to longer hospital stays and rising health care costs<sup>(7)</sup>.

The presence of dysphagia in patients after cardiac corrections may be associated with numerous procedures, surgery and post-surgery, which in turn are extremely invasive. Some of these procedures are compulsorily carried out, for example, mechanical ventilation and tracheal intubation (TI) which can be restricted only to surgery or extended during the postoperative period; while others, however, have a wider frequency, such as cardiopulmonary bypass, tracheotomy and transesophageal echocardiography. As a result, patients may have a slower postoperative recovery, with nutritional problems, neuromuscular disorders, respiratory disorders and low immunity<sup>(7)</sup>.

Dysphagia may be identified by assessing the bedside, with collection of previous history of the patient, structural and functional analysis of swallowing, and can be classified in degrees of involvement<sup>(11,12)</sup>. The speech therapist has the task of performing the clinical swallowing evaluation (CSE) with the objective of verify the biodynamics of swallowing and oral safety, early identification of possible causes of dysphagia or risk of tracheal aspiration, suggesting a secure feeding alternative when necessary<sup>(13)</sup>. Being an integral part of the interdisciplinary team, speech therapists can contribute to the clinical improvement of patients and reducing hospital stay and hospital costs<sup>(14)</sup>.

Biodynamic swallowing in pediatric patients with CHD is little studied<sup>(4,5,7,8)</sup>. It is known that heart disease in childhood affects coordination between sucking, swallowing and breathing (SxSwxB) and, therefore, considered a risk factor for dysphagia<sup>(9)</sup>. This study aims to describe the CSE findings in post-surgical cardiac infants from a major hospital in southern Brazil.

## METHODS

This is a cross-sectional study in a Pediatric Intensive Care Unit (PICU) in the period from November 2015 to October 2016, approved by the Research Ethics Committee of the Santo Antônio Children's Hospital under the number 1324927, and all the responsible staff signed the consent form.

The convenience sample was composed of infants with a diagnosis of CHD, of both genders, aged between 0 and 6 months after surgery, who were clinically stable and had medical clearance to do CSE. Presence of the following was adopted as exclusion criteria: neurological, craniofacial malformations, structural abnormalities of upper airway, respiratory compromise, known or suspected genetic syndromes.

Initially the analysis of medical records of infants was held in order to consult their clinical conditions and collect the sample data: gender; age; type of heart disease; cardiological diagnosis; previous dietary history; time of intubation; current form of nourishment; nutritional diagnosis. In this study, to investigate the association between TI and diagnosis of dysphagia, we used duration greater than 24 hours of intubation.

All infants underwent CSE, which was accomplished through the application of the Assessment of Pediatric Dysphagia protocol (APD)<sup>(15)</sup> performed until 48 hours after extubation, considering the age of the child and the oral supply, to obtain information about the biodynamic of swallowing and speech therapy clinical diagnosis of dysphagia. For those who hadn't oral prescription, choosing the form of supply occurred as the previous experience of each infant, breastfeeding or bottle. Infants who were breastfeeding before surgery were first evaluated during at least 3 minutes. In the case of infants requiring nutritional formula, the proffer was made with use of usual patient utensil (orthodontic or conventional bottle nipple with preserved hole) with half of the prescribed formula volume being interrupted upon the occurrence of stress signals. For those who had not had any previous experience of food orally, it was advocated the provision of breastfeeding and, if not possible, the evaluation was performed with supply of conventional bottle nipple.

When CSE is performed while breastfeeding, aspects relating to the labial sealing were considered within the grip and coordination between SxSwxB and presence of respiratory pauses. As for those who were evaluated with liquid (nutritional formula) in bottle, the aspects considered were for the labial sealing, grip of the bottle, coordination between SxSwxB and the presence of pauses. We also investigated the occurrence of clinical signs of risk for tracheal aspiration during feeding, such as a change in cervical auscultation (before, during or after oral supply), presence of coughing and gagging (effective cough, cough ineffective or late, choking), cyanosis or paleness and / or respiratory distress.

The CSE were divided between two speech therapists with experience in pediatric dysphagia area, according to their availability, after establishing criteria and training for uniformity of collection. Finally, infants were classified in the category that best suited them, according to the evaluation findings, in Classification of the Degree of Pediatric Dysphagia

as per protocol (Swallowing Normal Classification – absence of clinical signs of dysphagia, Mild Oropharyngeal Dysphagia – presence of clinical signs resulting from mismatches during the feeding period, oropharyngeal dysphagia moderate to severe – there is great suspicion in the pharyngeal phase of swallowing or changes in oral phase with significant impact in the maintenance of nutrition and adequate hydration; severe oropharyngeal dysphagia - oral feeding impossibility at high risk of aspiration assumed).

Statistical analysis was performed using SPSS software version 21.0. Due to the asymmetry of the quantitative variables, these were described as medians and interquartile ranges. The qualitative variables were described by absolute and relative frequencies. Nonparametric tests were applied to evaluate associations, adopting the significance level of 5% ( $p < 0.05$ ). In order to evaluate the association between qualitative variables, chi-squared tests or Fisher exact tests were applied. In comparing medians between groups, the Mann-Whitney test was used. To compare the number of changes between breastfeeding and bottle the Wilcoxon test was applied.

## RESULTS

This study consisted of 31 infants with heart disease and median age of 21 days, 18 (58.1%) being male. All patients were submitted to surgery as means of therapeutic intervention, making it necessary the use of invasive ventilation by TI with median duration of 51 hours. At the time of CSE, 15 infants (48.4%) were fed via an alternative pathway, and among these 12 (38.7%) had no prior experience with food orally. The remaining sample characterization data are shown in Table 1.

In the CSE, there was a greater number of oral supply performed with bottle-feeding (48.4%), and 5 of these infants (16.1%) were initially evaluated while breastfeeding. Table 2 describes the CSE finds according to the identification of changes encountered during partial implementation of the APD protocol<sup>(15)</sup>. It was possible to identify changes in all evaluated items related to the biodynamic swallowing, as can be seen in Table 2, and the occurrence of clinical signs suggestive of risk for tracheal aspiration, regardless of the oral supply mode. However the number of changes in swallowing with the offer of the bottle

**Table 1.** Sample characterization

Variables	n=31
Age(days) – md (P25 – P75)	21 (13-42)
Gender- n(%)	
Male	18 (58.1)
Female	13 (41.9)
Type of cardiopathy – n(%)	
Cyanotic	7 (22.6)
Acyanotic	24 (77.4)
Diagnostics – n(%)	
Atrial Septal Defect	8 (25.8)
Ventricular Septal Defect	10 (32.3)
Patent Ductus Arteriosus	9 (29.0)
Pulmonary Stenosis	6 (19.4)
Aortic Supravalvular Stenosis	1 (3.2)
Coarctation of the Aorta	11 (35.5)
Transposition of the Great Arteries	2 (6.5)
Tricuspid atresia	1 (3.2)
Intracardiac Tumor	2 (6.5)
Patent foramen Ovale	3 (9.7)
Left Heart Hypoplasia Syndrome	1 (3.2)
Atrioventricular Septal Defect	1 (3.2)
Aortic arch hypoplasia	1 (3.2)
Feeding history – n(%)	
No previous oral experience	12 (38.7)
Previous oral experience	19 (61.3)
TI (hours) – md (P25 – P75)	51 (24-148)
Current probe usage – n(%)	
Yes	15 (48.4)
No	16 (51.6)
Nutritional diagnostics – n(%)	
Low weight for the age	7 (22.6)
Eutrophic	24 (77.4)

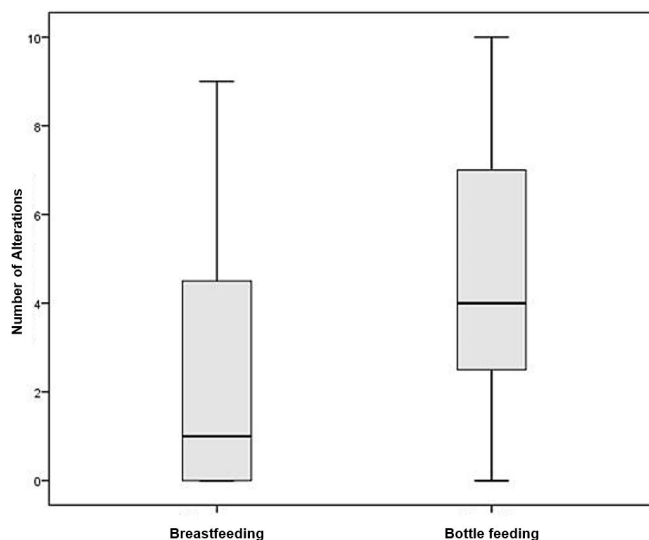
**Table 2.** Findings of the clinical evaluation of deglutition

Variables	n=31
Feeding form – n(%)	
Breastfeeding	11 (35.5)
Bottle	15 (48.4)
Breastfeeding + bottle	5 (16.1)
Changes found in breastfeeding – n(%)	
Total	24 (77.4)
Sealing	4 (25.0)
Grip	3 (18.8)
Pauses	4 (25.0)
SxSwxB Coordination	4 (25.0)
Cervical auscultation	5 (31.2)
Coughing/Choking	4 (25.0)
Respiratory distress	6 (37.5)
Cyanosis / Paleness	4 (25.0)
Changes found in bottle feeding – n(%)	
Total	29 (93.5)
Sealing	16 (84.2)
Nipple Grip	12 (63.2)
Pauses	12 (63.2)
SxSwxB Coordination	7 (36.8)
Cervical auscultation	9 (47.4)
Coughing/Choking	8 (42.1)
Respiratory distress	5 (26.3)
Cyanosis / Paleness	2 (10.5)
Classification of Dysphagia – n(%)	
Normal swallowing	8 (25.8)
Mild Oropharyngeal Dysphagia	10 (32.3)
Moderate-Severe Oropharyngeal Dysphagia	7 (22.6)
Severe Oropharyngeal Dysphagia	6 (19.4)

was significantly higher (median = 4) compared to the offer of breastfeeding (median = 1;  $p = 0.043$ ), as shown in Figure 1.

The presence of some inadequacy may also be observed during the stages of swallowing, especially: labial sealing, hold of the breast or bottle nipple, which had higher number of changes in oral and changes in cervical auscultation, which was the most frequent during the pharyngeal swallowing phase (Table 3).

According to completion of CSE, 23 infants (74.2%) were classified having some degree of dysphagia, and 6 infants (19.4%) were considered without oral feeding conditions because of high risk of aspiration. It is noted the presence of dysphagia due to mismatches during feeding situation (32.3%), as shown in Figure 2. Infants who had a speech-language diagnosis of dysphagia presented significantly higher numbers of swallowing changes (median = 5) than those without dysphagia (median = 1;  $p = 0.009$ ), as shown in Figure 3. In breastfeeding the difference was not significant (median = 2 vs median = 0,  $p = 0.133$ ). Dysphagic cardiopathy infants also had significantly longer

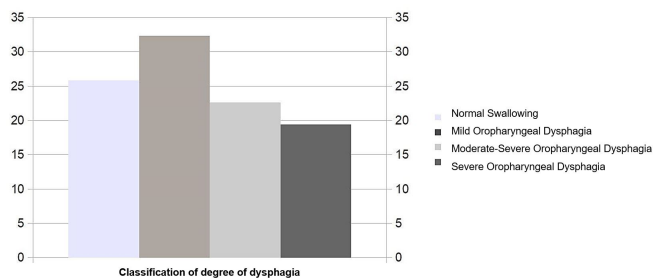


**Wilcoxon test**

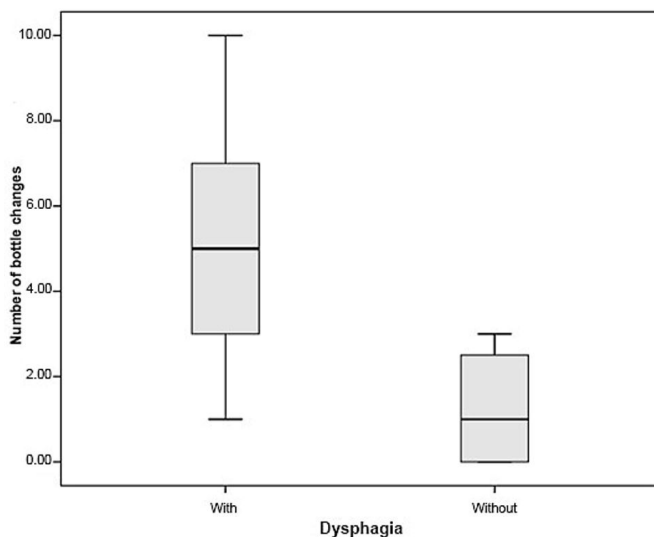
**Figure 1.** Comparison of the number of changes in the evaluation of swallowing according to breastfeeding and the use of bottle

**Table 3.** Findings of the clinical evaluation of deglutition according to the phases of swallowing

Variables	n=31
Infants with alterations in the oral phase – n(%)	
Total	22 (71.0)
Sealing	20 (64.5)
Nipple grip and hold	15 (48.4)
Pauses	16 (51.6)
SxSwxB coordination	11 (35.5)
Infants with pharyngeal changes – n(%)	
Total	15 (48.4)
Cervical auscultation	14 (45.1)
Vocal quality	11 (35.5)
Infants with changes in oral + pharyngeal phase – n(%)	
Total	14 (45.1)



**Figure 2.** Distribution of Classification of Degree of Pediatric Dysphagia

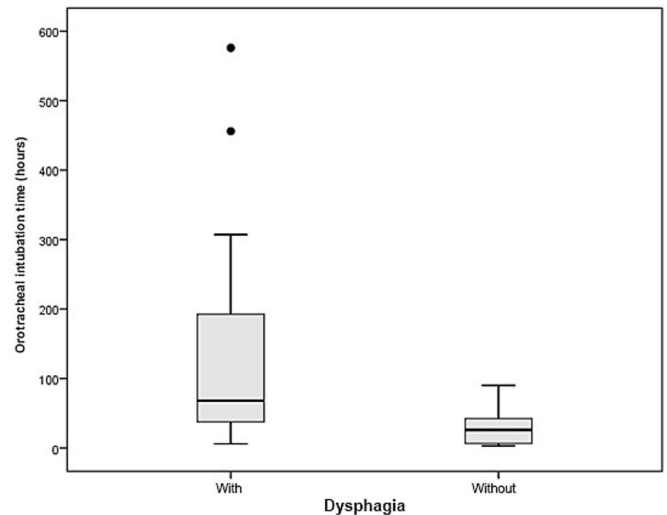


**Mann-Whitney test**

**Figure 3.** Comparison of the number of changes in bottle supply in the evaluation of swallowing according to presence and absence of dysphagia

TI (median = 68 h) when compared to those without dysphagia (median = 26 h,  $p = 0.010$ ), as shown in Figure 4.

There was no significant difference between swallowing changes and dysphagia classification between types of heart disease, food history, use of alternative route and nutritional



**Mann-Whitney test**

**Figure 4.** Comparison of TI time, in hours, according to presence and absence of dysphagia

diagnosis ( $p > 0.500$ ). However, it can be observed that infants classified as having severe dysphagia tended to present less experience in oral feeding (16.7%) when compared to those without dysphagia (87.5%), mild dysphagia (60%) and moderate dysphagia (71.4%) ( $p = 0.054$ ).

**DISCUSSION**

In this study, it was possible to identify alterations in the biodynamics of swallowing of cardiac infants after surgical procedure, as well as the presence of dysphagia in a high number of the sample, and its association with the TI period over 24 hours.

Eating difficulties in CHD patients have already been described in the literature and are characterized by difficulty in gaining weight, nutrient malabsorption, fatigue, refusal, inefficient sucking and / or lack of food competence expected for their level of development<sup>(4,5,7,8,16-18)</sup>. It is also worth mentioning that infants with severe CHD who require cardiac surgery in the first month of life are at high risk of developing feeding difficulties up to 2 years of age<sup>(19,20)</sup>.

The biodynamics of deglutition differ depending on the mode of supply, breastfeeding or bottle, because they present functional and anatomical differences, such as shape, texture, odor, taste, temperature, elasticity, extracted milk flow and extraction medium<sup>(21)</sup>. Among the changes in swallowing found during CSE in breastfeeding, we can highlight the presence of clinical signs suggestive of laryngotracheal aspiration, such as coughing and / or choking (25%), respiratory discomfort (37.5%) and pallor / cyanosis (25%). These signs are described in a study that deals with the characteristics of the transition from enteral feeding to breastfeeding, performed with premature newborns and that includes infants with CHD, and shows that this population shows signs of fatigue, saturation decrease, and

incoordination between the stomatognathic functions of SxSwxB, thus providing a risk of bronchoaspiration and worsening of the condition<sup>(22)</sup>.

The prevalence of breastfeeding in this study was 51.6%, and 5 of these infants (16.1%) also received supplementation with a nutritional formula offered in a bottle, with a conventional or orthodontic nozzle of a preserved hole, chosen according to medical criteria. In relation to CSE with bottle supply, there was a high number of swallowing changes, significantly higher (median = 4) when compared to breastfeeding (median = 1;  $p = 0.043$ ), mainly in relation to the labial sealing (84.3%), gripping (63.2%), presence of pauses (63.2%), coordination between SxSwxB (36.8%), alteration in cervical auscultation (47.4%) and episode of coughing and / or choking (42.1%). Data corroborating those observed in a study comparing post-surgical patients with and without dysphagia, which also identified incoordination between SxSwxB, in addition to other clinical signs such as stasis in oral cavity, cough, oral leakage and fatigue during sucking<sup>(8)</sup>.

In this same study, whose methodology includes infants with suspected deglutition changes in their sample, the prevalence of dysphagia was identified in 84% of the infants with heart disease<sup>(8)</sup>. This value is higher than that found in the present study (74.2%), but it should be noted that it excludes other comorbidities that may be associated with CHD and interfere with CSE findings. It is known that the presence of dysphagia can lead to the development of complications such as airway obstruction, weight loss<sup>(7)</sup>, growth deficits<sup>(8)</sup>, and increase the risk of pulmonary infections and malnutrition, increasing the degree of illness and mortality<sup>(7,8,23)</sup>. With the possible consequence of slowing the recovery after a surgical procedure<sup>(7)</sup>. It is evidenced the importance of speech-language pathology in the oral introduction after surgical procedure aiming to guarantee food safety and minimize possible postoperative complications related to feeding.

In the sample, it was observed that the oral supply in the bottle may present a higher risk of dysphagia than breastfeeding, since the infants classified with dysphagia presented a number of swallowing changes during a significantly higher bottle offer (median = 5) than those without dysphagia (median = 1,  $p = 0.009$ ). The same findings were found in a study with preterm newborns<sup>(24)</sup>, a population that has similar characteristics to those with cardiopathies<sup>(19)</sup>, which describes that the main clinical signs suggestive of risk during bottle offerings were nasal flaring (92.1%); pallor / perioral cyanosis and hypotonia (52.6%) and episodes of choking (21%). Also emphasizing that breastfeeding promotes greater synchronization between SxSwxB, which facilitates the process of preparation for swallowing and ensures that the baby is a participant in the feeding. In addition to the interference of milk flow velocity, which may also explain the differences in swallowing biodynamics and breastfeeding, since when the milk flow is rapid, the infant needs to stop breathing to swallow<sup>(24)</sup>.

There is no established consensus in the literature regarding the definition of prolonged TI. Its description varies as: greater

than 24 hours, greater than 48 hours or up to eight days<sup>(25)</sup>, being commonly considered as a period greater than 48 hours for the adult population. The present study identified that the presence of dysphagia is associated with a TI time greater than 24 hours, since, from this period, the presence of the orotracheal tube may alter the mechanics and chemoreceptors of the pharyngeal and laryngeal mucosa, causing a change in swallowing reflex and disorder to laryngeal function, which has an impact on the protection mechanisms of the lower airways<sup>(23)</sup>. One study identified that, in cases of open heart surgery with transesophageal echocardiography, 18% of the patients had dysphagia after surgery, and this incidence could be related to the age of less than three years, the preoperative state, the acuity of the patient, time of intubation and operation of obstructions on the left side<sup>(26)</sup>.

There are few studies that investigate the relationship between TI and changes in swallowing in pediatrics, there is a predominance of the publication of researches performed with adults in which a high prevalence of dysphagia is observed, with 44% to 85%, highlighting multifactor causes that include: oropharyngeal muscle inactivity, glottis lesions, mucosal inflammation and vocal fold ulcerations, as well as mechanical and sensory alterations<sup>(25-27)</sup>. A systematic review has shown that prolonged TI may be an independent predictor of dysphagia, and its use increases the risk of upper airway and larynx lesions, which in turn affect the mechanics, aerodynamics, and reflex protection of the upper airways<sup>(27)</sup>.

The safe oral introduction is recommended as early as possible, since prolonged use of enteral probe interferes with the digestive and alimentary processes due to obstruction of the area, oral cavity desensitization, deprivation of oral stimuli. Thus, the use of an alternative route for feeding may lead to impairments in the development of phonoarticulatory organs, promoting a delay in the coordination between SxSwxB and the occurrence of oral hypersensitivity due to lack of experience with oral feeding during the first months of life<sup>(28)</sup>. In our sample, 15 infants (48.4%) still used an alternative route for feeding, and 12 (38.7%) had not had previous experience with oral feeding. Consideration should be given to the numerous procedures that promote adverse stimuli that, even necessary, prevent oral stimulation and pleasant sensations, which are extremely important for development<sup>(29)</sup>.

There are few studies investigating the swallowing of the child population of cardiac patients, which underscores the relevance of the study findings. This investigates infants with CHD without other comorbidities in order to ensure homogeneity of the participants to minimize the possible interference with biodynamic swallowing, for better understanding of the characteristics presented by this population.

We considered as a limitation for our study the consequences of the routines of treatment in the PICU, implemented in a centralized way in the medical conduct, more precisely in the decision making with regard to the release of oral feeding without clear and established criteria, without necessarily realizing of previous speech and hearing assessment. The lack of a

validated protocol available in the literature, specifically for the investigation of deglutition changes in the pediatric population, may have had some type of interference in the results found. All patients were evaluated within 48 hours after extubation, but it was not possible to control the time between the surgical procedure and the CSE, since this period varied from infant to infant in relation to clinical conditions and medical release, which may have influenced the results presented.

It should be noted that constant monitoring for clinical signs of dysphagia, both pre and post-operative, with referral to a speech-language pathologist can substantially reduce patient morbidity, length of hospital stay, and the requirement for prolonged use via alternative feeding<sup>(5)</sup>. The findings of the CSE identified changes in swallowing and presence of dysphagia in a high number of the sample, which reinforces the importance of speech-language pathology in the introduction of the oral route after a surgical procedure.

The association between TI time and the presence of dysphagia is evidenced in this study. In this way, we emphasize the need to perform CSE prior to the release of oral feeding for infants undergoing a TI period of more than 24 hours, in order to guarantee food safety and minimize possible postoperative complications related to feeding. This can also contribute to the process of anticipating discharge and, as a consequence, reduce hospital costs.

## CONCLUSION

Through CSE, it was possible to describe the swallowing changes found in cardiopathic infants after surgical procedure, both oral and pharyngeal phases, regardless of the mode of supply. However, we noted that the number of changes in swallowing was significantly higher during bottle feeding. In addition, we also identified the presence of dysphagia in a high number of samples and its statistically significant association with the period of TI greater than 24 hours.

## REFERENCES

1. Bonow RO. Braunwald tratado de doenças cardiovasculares. 9 ed. Rio de Janeiro: Elsevier; 2013. vol. 2.
2. Atik E. Diagnóstico clínico e laboratorial das cardiopatias congênicas. In: Serrano CV Jr, Timerman A, Stefanini E, editores. Tratado de Cardiologia SOCESP. São Paulo: Manole; 2009. p. 2205-20.
3. Araújo JSS, Régis CT, Gomes RGS, Silva CS, Abath CMB, Mourato FA, et al. Cardiopatia congênita no nordeste brasileiro: 10 anos consecutivos. Rev Bras Cardiol. 2014;27(1):13-9.
4. Fraga DFB, Pereira KR, Dornelles S, Olchik R, Levy DS. Avaliação da deglutição em lactentes com cardiopatia congênita e Síndrome de Down: estudos de caso. Rev CEFAC. 2015;17(1):277-85. <http://dx.doi.org/10.1590/1982-0216201514613>.
5. Duarte ST. Fatores de risco para disfagia em pacientes submetidos a cirurgia cardíaca [dissertação]. Curitiba: Universidade Tuiuti do Paraná; 2010.

6. Belo WA, Oselame GB, Neves EB. Perfil clínico-hospitalar de crianças com cardiopatia congênita. Cad Saude Colet. 2016;24(2):216-20. <http://dx.doi.org/10.1590/1414-462X201600020258>.
7. Rodrigues SF. Disfagia no pós-operatório de cirurgia cardíaca pediátrica [dissertação]. Curitiba: Universidade Tuiuti do Paraná; 2011.
8. Pereira KR, Firpo C, Gasparin M, Teixeira AR, Dornelles S, Bacaltchuk T, et al. Evaluation of swallowing in infants with congenital heart defect. Int Arch Otorhinolaryngol. 2015;19(1):55-60. PMID:25992152.
9. Lefton-Greif MA. Pediatric dysphagia. Phys Med Rehabil Clin N Am. 2008;19(4):837-51, ix. PMID:18940644. <http://dx.doi.org/10.1016/j.pmr.2008.05.007>.
10. Furkim AM, Santini CRQS. Disfagias orofaríngeas. 2 ed. Barueri: Pró-Fono; 2008.
11. Martins AMS. Avaliação da disfagia: proposta de protocolo de videoesoscopia da deglutição (VED) [dissertação]. Porto: Universidade Fernando Pessoa; 2016.
12. Callado J. Uso de via alternativa de alimentação em pacientes disfágicos hospitalizados: uma revisão da literatura [dissertação]. Florianópolis: Universidade Federal de Santa Catarina; 2014.
13. Etges CL, Scheeren B, Gomes E, Barbosa LR. Instrumentos de rastreio em disfagia: uma revisão sistemática. CoDAS. 2014;26(5):343-9. PMID:25388065. <http://dx.doi.org/10.1590/2317-1782/20142014057>.
14. Mancopes R, Gonçalves BFT, Costa CC, Flores TG, Santos LD, Constantino Drozd DR. Relato de caso. A importância da atuação multiprofissional. Rev CEFAC. 2013;15(5):1379-86. <http://dx.doi.org/10.1590/S1516-18462013000500036>.
15. Almeida FCF, Bühler KEB, Limongi SCO. Protocolo de avaliação clínica da disfagia pediátrica (PAD-PED). Barueri: Pró-Fono; 2014. 34 p.
16. Croti UA, Mattos SS, Pinto VC Jr, Aiello VD, Moreira VM. Cardiologia e cirurgia cardiovascular pediátrica. 2 ed. São Paulo: Roca; 2013.
17. Maurer I, Latal B, Geissmann H, Knirsch W, Bauersfeld U, Balmer C. Prevalence and predictors of later feeding disorders in children who underwent neonatal cardiac surgery for congenital heart disease. Cardiol Young. 2011;21(3):303-9. PMID:21272426. <http://dx.doi.org/10.1017/S1047951110001976>.
18. Gaspareto N, Hinnig PF, Cardoso E, Adami F, Nakasato M, Hidaka PT. Aleitamento materno e cardiopatia congênita. Nutrire. 2013;38(1):57-66.
19. Pereira KR. Avaliação da deglutição em lactentes portadores de cardiopatia congênita: série de casos [dissertação]. Porto Alegre: Universidade Federal do Rio Grande do Sul; 2012.
20. Barbosa MDG, Germini MFCA, Fernandes RG, Almeida TM, Magnoni D. Revisão integrativa: atuação fonoaudiológica com recém-nascidos portadores de cardiopatia em Unidade de Terapia Intensiva Neonatal. Rev CEFAC. 2016;18(2):508-12. <http://dx.doi.org/10.1590/1982-021620161826815>.
21. Silva CS. Avaliação da coordenação sucção/deglutição/respiração através da ausculta cervical digital em recém-nascidos pré-termo e a termo [dissertação]. Porto Alegre: Universidade Federal do Rio Grande do Sul; 2013.
22. Medeiros AMC, Oliveira ARM, Fernandes AM, Guardachoni GAS, Aquino JPSP, Rubinick ML, et al. Caracterização da técnica de transição da alimentação por sonda enteral para seio materno em recém-nascidos

- prematturos. *J Soc Bras Fonoaudiol.* 2011;23(1):57-65. PMID:21552734. <http://dx.doi.org/10.1590/S2179-64912011000100013>.
23. Albuquerque C, David CM. Intubação orotraqueal: procedimento e complicações. In: Furkim AM, Rodrigues KA. *Disfagias nas unidades de terapia intensiva.* São Paulo: ROCA; 2014. p. 79-86.
24. Silva MHA, Fujinaga CI, Leite AM, Silva AA, Costa ML Jr, Scochi CGS. Efeitos da sucção à mamadeira e ao seio materno em bebês prematturos. *Rev Rene.* 2011;12(1):81-7.
25. Skoretz SA, Yau TM, Ivanov J, Granton JT, Martino R. Dysphagia and associated risk factors following extubation in cardiovascular surgical patients. *Dysphagia.* 2014;29(6):647-54. PMID:25119447. <http://dx.doi.org/10.1007/s00455-014-9555-4>.
26. Kohr LM, Dargan M, Hague A, Nelson SP, Duffy E, Backer CL, et al. The incidence of dysphagia in pediatric patients after open heart procedures with transesophageal echocardiography. *Ann Thorac Surg.* 2003;76(5):1450-6. PMID:14602266. [http://dx.doi.org/10.1016/S0003-4975\(03\)00956-1](http://dx.doi.org/10.1016/S0003-4975(03)00956-1).
27. Werle RW, Steidl EMS, Mancopes R. Fatores relacionados à disfagia orofaríngea no pós-operatório de cirurgia cardíaca: revisão sistemática. *CoDAS.* 2016;28(5):646-52. PMID:27683826. <http://dx.doi.org/10.1590/2317-1782/20162015199>.
28. Melo AM, Martins TGS, Santos TL, Silva AS, Santos NNS. Perfil alimentar e desenvolvimento motor oral dos neonatos nascidos com baixo peso. *Rev CEFAC.* 2016;18(1):86-94. <http://dx.doi.org/10.1590/1982-021620161814415>.
29. Lopes MMS. Alimentação por sonda e comportamento alimentar do lactente nascido prematuramente. Uma revisão sistemática da literatura [dissertação]. Porto: Escola Superior de Enfermagem do Porto; 2015.

### Author contributions

*All authors participated in the conception of the study and the preparation, revision and content of the manuscript.*