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Role of speech language therapist in children in dysphagia due to caustic ingestion: a systematic review

Papel do fonoaudiólogo na disfagia por ingestão cáustica em crianças: revisão sistemática

Papel del terapeuta del habla y lenguaje en niños con disfagia por ingestión cáustica: una revisión sistemática

*Gabriela Weber Eli**
*Eduarda Besen**
*Patrícia Haas**
*Fabiane Miron Stefani**
*Cláudia Tiemi Mituuti**

Abstract

Objective: To assess the role of the speech-language therapist in the management of dysphagia due to caustic ingestion in children. **Research strategy:** Databases: PubMed, SciELO, and BIREME, by Medical Subject Heading Terms (MeSH); terms: [("Dysphagia") and ("Children") and ("Caustic")]. **Selection criteria:** A 5 year restriction period of publication and articles with speech therapy, information on feeding, pediatrics and burn by caustics were included. **Results:** Five articles were included with children with 11 months to 12 years. The late esophageal stenosis was present in the majority of studies and all reported dysphagia. All carried out the evaluation of swallowing before and after medical treatment to determine the severity and the necessity of the use of an alternative food supply. **Conclusion:** Speech

Universidade Federal de Santa Catarina - UFSC - Florianópolis (SC), Brazil.

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GWE: conception and design of the study, collection, analysis, interpretation of data and writing of the article.
EB: collection, analysis and interpretation of data.
CTM and PH: conception and design of the study, data interpretation, review of the article and final approval of the version to be published.
FMS participated in the review of the article and final approval of the version to be published.

E-mail for correspondence: claudia.mituuti@ufsc.br
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therapy in the management in these cases comprise of evaluating and assisting the management of oral intake, and when this is not possible orally, to indicate an alternative food supply in conjunction with the team.

Keywords: Deglutition disorders; Child; Esophageal stenosis; Burns; Caustics.

Resumo

Objetivo: Verificar o papel do fonoaudiólogo no gerenciamento da disfagia por ingestão cáustica em crianças. **Estratégia de pesquisa:** Bases: PubMed, SciELO e Bireme, pelo Medical Subject Heading Terms (MeSH); termos: [("Dysphagia") AND ("Children") AND ("Caustic")]. **Critérios de seleção:** Restrição quanto ao período de publicação de 5 anos e incluídos artigos com atuação fonoaudiológica, informações sobre via de alimentação, pediatria e queimadura por cáusticos. **Resultados:** Cinco artigos incluídos com crianças de 11 meses a 12 anos. A estenose esofágica tardia ocorreu na maioria dos estudos e todos relataram disfagia. Todos realizaram avaliação da deglutição antes e após tratamento médico para determinar a gravidade e a necessidade de via alternativa de alimentação. **Conclusão:** A atuação fonoaudiológica nestes casos compreende avaliar e auxiliar o manejo da alimentação e, na impossibilidade de via oral, na indicação de via alternativa em conjunto com a equipe.

Palavras-chave: Transtornos de deglutição; Crianças; Estenose esofágica; Queimaduras; Cáusticos.

Resumen

Objetivo: evaluar el papel del logopeda en el tratamiento de la disfagia por ingestión cáustica en niños. Estrategia de investigación: Bases de datos: PubMed, SciELO y BIREME, por Medical Subject Heading Terms (MeSH); términos: [("Disfagia") y ("Niños") y ("Cáustico")]. Criterios de selección: Se incluyó un período de restricción de publicación de 5 años y artículos con terapia del habla, información sobre alimentación, pediatría y quemaduras por cáusticos. Resultados: se incluyeron cinco artículos con niños de 11 meses a 12 años. La estenosis esofágica tardía estuvo presente en la mayoría de los estudios y todos informaron disfagia. Todos llevaron a cabo la evaluación de la deglución antes y después del tratamiento médico para determinar la gravedad y la necesidad del uso de un suministro de alimentos alternativo. Conclusión: La terapia del habla en el manejo en estos casos consiste en evaluar y ayudar al manejo del suministro de alimentos, y cuando esto no es posible por vía oral, para indicar un suministro de alimentos alternativo en conjunto con el equipo.

Palabras clave: Trastornos de deglución; Niño; Estenosis Esofágica; Quemaduras; Cáusticos.

Introduction

The ingestion of caustic and corrosive substances is a factor of great concern in the treatment due to the severity of the injuries caused by these products. Thus, easy reach to such products brings up a worrying context: ingestion in a purposeful or accidental way[1]. Many corrosive products have packaging with appealing colors and shapes thus attracting the attention of children due to their innate curiosity[2].

Sale of chemicals that offer health risks is accessible to the population. Therefore, it is essential that the consumer be aware of their proper use and safety parameters, which must be well described on product labels[3].

In the literature, there are findings associating this kind of accident to the age at which it occurs, indicating that the age group most prone to this type of accident is zero to four years, especially in the range of one to two years [4,5]. The first years of a child's life are extremely dependent on the care provided by adults since it is during this period that the environment is explored in the oral phase, and everything children manipulate ends up in the mouth[6].

As to the severity of these agents' ingestion effects on the body, it is observed that consequences vary depending on factors such as the type of chemical agent, the amount and concentration ingested, as well as the time the substance was in contact with the mucosa[1,7].

Complications caused by caustic ingestion are also highly variable, with gastric hemorrhage, esophageal perforation, fistulas and stenosis, the latter being the main late complication of such ingestion[1]. Considering all the possible changes that follow this ingestion throughout the digestive tract, there are countless symptoms that these children can present, one of them being dysphagia. This is characterized as an abnormality of the swallowing process, in which the trajectory of the food or liquid does not occur properly, which can lead to other complications[8].

The literature indicates that dysphagia is usually present in cases resulting from caustic ingestion, as well as symptoms of pain, sialorrhea and vomiting[9]. In these cases, treatment must come in a multidisciplinary way, so that the identification, diagnosis and treatment of dysphagia occur early, reducing the risks and complications resulting from dysphagia[10].

This investigation aimed to carry out a systematic review on the performance of the speech-language therapist in the management of dysphagia due to caustic ingestion in children, aiming to answer the following question: What would be the speech-language therapist's performance in children dysphagia due to caustic ingestion?

Methods

Investigation characterization and survey strategies

The systematic review was conducted according to the recommendations of the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA).[11] Scientific articles were retrieved by two independent investigators in the electronic databases Medline (Pubmed), Bireme and SciELO, referring to the period 2014 to March 2019. The survey was structured and organized in the form PICOS, an acronym for Target population, Intervention, Control, "Outcomes", "Study" (Table 1). Considering the objective of this survey, the acronym Control was not used, as it is not applicable, as there was no comparison of treatments performed.

The descriptors were selected from the Health Sciences Descriptors (DeCS) Medical Subject Heading Terms (MeSH) dictionary, given their great use by the scientific community for indexing articles in the PubMed database. In view of the descriptors, the adequacy for the other bases used was carried out. At first, the following keywords and Boolean operator were proposed for the searches: [("Dysphagia") and ("Children") and ("Caustic")].

Table 1. Description of picos(*) components

Acronym	Definition
P	Children
I	Speech therapy
C	Not applicable
O	Caustic soda intake
S	Cross-sectional, prospective study, cohort study

(*) PICOS: Population, Intervention, Control, Outcomes, Study

Inclusion criteria

The designs of the selected studies were descriptive studies, cross-sectional studies, prospective studies and cohort studies. There was no language restriction; therefore, the studies included were translated when necessary. Period covered: from 2014 to March 2019.

Exclusion criteria

Studies published in the form of Letters to the editor, guidelines, literature reviews, systematic reviews, meta-analysis and abstracts were excluded. Articles published prior to 2014 were excluded. Studies that did not describe or were unclear or unavailable are reported in Chart 1.

Chart 1. Summary of inclusion/exclusion criteria

Inclusion criteria	
Design	Case reports Case studies and control Controlled clinical trials Cohort studies Screening studies Observational studies Randomized Studies
Location	No restriction
Language	Portuguese language English language Spanish language
Exclusion Criteria	
Design	Letters to editor Guidelines Literature reviews Systematic reviews Meta-analyses
Studies	Unclear studies Poorly described or inadequate
Form of publication	Summary only

Selection of studies

The selection of studies was carried out by two independent surveyors. Initially, duplicate studies were excluded, based on the title; then the abstracts were reviewed and only those that were potentially eligible were selected for full evaluation. Any divergence was resolved by consensus between this paper's authors and, when necessary, the third surveyor was consulted.

Data extraction

The extraction of data for the study eligibility process was performed using a form prepared by the investigators in the Excel® Program, in which the extracted data were initially added by one of the investigators and were then checked by the other investigator.

Subsequently, the methodological quality of the articles included was verified, marking the score obtained, using a protocol for qualitative

scoring of the selected studies, modified from the literature, with scores, being classified as high quality (between 13 and 11 points) , moderate quality (between 10 and 6 points) and low quality (below 6 points). Studies that scored ≥6 points were included in the study. The protocol for qualitative scoring of the methodology was that of Pithon et al, 2015[12] modified version.

Data Analysis

Initially, the survey identified 45 papers and, subsequently, repetition articles were excluded, leaving 26 articles; then, the titles were analyzed and excluded when they did not fit the criteria set, leaving 22 papers. Successively the abstracts were reviewed and only those that were potentially eligible were selected, totaling 14 articles. Based on the abstracts, the articles were selected for full reading, remaining five that met all predetermined criteria and were considered for final inclusion (Figure 1). After selecting all articles, the data were extracted systematically. Within them, objective, country of study, number of study participants, medical diagnosis, classification of the severity of the injury, medical intervention, alternative feeding route, speech therapy intervention and study results were analyzed.

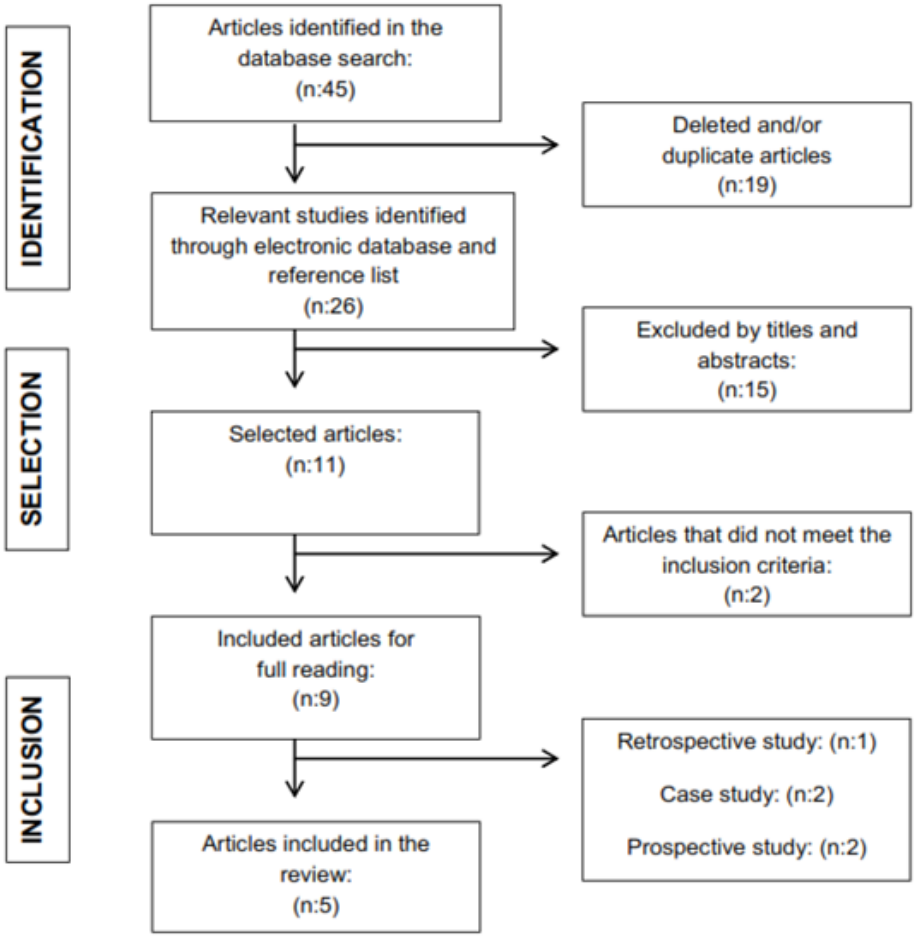

Figure 1. Search process and analysis of articles

Results

From the review, five articles were found[13,14,15,16,17] that met the criteria for final inclusion, and there was no divergence in the selection of studies among the investigators. All evaluated children from ages ranging from 11 months to 12 years and 3 months and aimed to verify the effectiveness of some specific medical treatment for alterations in the swallowing function resulting from the ingestion of caustic agents.

The methodological quality was verified by checking the score obtained, using a protocol for qualitative scoring of the studies; the articles included obtained a score ≥ 11 points. This score indicates that the quality of the studies included in this systematic review has reached high quality.

Late esophageal stenosis was present in most of these studies and, due to the narrowing of the esophageal caliber; all reported the presence of some degree of dysphagia as a secondary symptom, requiring the introduction of an alternative feeding route. The information regarding the synthesis of the studies and their results are described in Chart 2.

Chart 2. Summary of articles included in the review

Author / Year and Country of study	Objective	Methods	Results
Geng et al., 2018[11] China	To evaluate the efficacy of the treatment performed with esophageal balloon dilation in caustic esophageal constriction.	Retrospective analysis of a case series performed in a tertiary children's hospital where 43 patients were included (mean age = 3 years and 5 months), who were diagnosed with caustic esophageal stenosis and underwent endoscopic balloon dilation from August 1, 2005 to December 31, 2014.	Out of the 43 patients, one presented with grade I dysphagia, 11 grade II, 30 grade III and one grade IV. All of them were submitted to endoscopic balloon dilation, where 26 were successful reaching the dysphagia-free state within 18 months at the most. Of the other 17 patients who still had dysphagia, three had Stent placed and achieved improvement, two were placed Stent and esophageal gastric tube and 12 were placed only esophageal gastric tube. Two patients developed a fistula requiring nasogastric tube feeding until the fistula was closed (10 to 14 days). Finally, they conclude that the optimization of endoscopic balloon dilation is necessary for the treatment of caustic esophageal stenosis in children.
Follent et al., 2016[12] Austrália	Describe the history and nature of chronic dysphagia and eating difficulties in two children who have severe injury from alkali ingestion.	A study was carried out with two children (mean age = 3 years and 5 months), who presented with the management of injury from ingesting the alkali in the hospital. Inclusion criteria were preliminary diagnosis regarding injury from alkali ingestion, treatment of continuing active injury, no previous history of dysphagia and tolerating proper entry before injury.	Throughout treatment and dilatations, one child evolved from NPO with transpyloric tube to gastrostomy with modified diet PO and the other child evolved from NPO with nasogastric tube to gastrostomy with PO also adapted diet. Swallowing videofluoroscopy was performed to assess food intake. The study also shows that the involvement of a speech therapist can help in the management of dysphagia.
Miller et al., 2016[13] Estados Unidos	Report through a case the effects of caustic ingestion on the swallowing mechanism.	Case study of a child (2 years and 10 months) analyzing medical treatment and changes in the swallowing mechanism clinically, radiographically and endoscopically.	After treatment with dilation and colonic interposition, the child still had dysphagia. Then a nasogastric tube was used for nutrition. Throughout the treatment, non-instrumental evaluation, videofluoroscopy and endoscopic swallowing evaluation were performed, which outlined the dynamic aspects of swallowing. After surgery and myectomy, the child presented normal swallowing. The study shows that the collaborative approach between the services of gastroenterology, pediatric surgery, Otorhinolaryngology and Speech Therapy in the assessment and ongoing management of this patient was essential for the proper intervention.
Dehghani, Aldaghi, Javaherizadeh, 2016[14] Iran	Review the case of a child hospitalized for corrosive stenosis and report the use of endoscopic pyloroplasty and dilation with esophageal balloon.	Case report of the treatment of a child after caustic ingestion.	Initially, the child had NPO for 48 hours, then the surgical diet was started, being advanced to a liquid and soft diet and well tolerated. After 4 weeks the child started to vomit after eating. Four dilation sessions were necessary for symptomatic relief of dysphagia. After a year of continuation, he recovered from dysphagia and weight gain was normal.

Author / Year and Country of study	Objective	Methods	Results
Méndez-Nieto, Zarate-Mondragón, Ramírez-Mayans, Flores-Flores, 2015[15] México	To evaluate the effectiveness of the application of mitomycin C and triamcinolone in preventing the recurrence of esophageal strictures.	Prospective, comparative, non-random and longitudinal study, which included a cohort of 16 patients treated with mitomycin C (2009-2012) and compared with a retrospective cohort of 34 patients treated with triamcinolone (2002-2009). (mean age = 24 months).	Patients treated with triamcinolone had dysphagia grade one to four, and patients treated with mitomycin C ranged from grade one to three. The results show a clear statistical difference in favor of mitomycin C in relation to the number of dilations. Finally, they report that there is a limitation of the study comparing the cohort with a retrospective and there was no randomization. However, with the results found, they suggest the use of mitomycin C in patients with difficult to manage caustic esophageal stenosis.

Legend: NPO = (nil per os) nothing orally; PO = (per os) orally

As for speech therapy, all works performed non-instrumental swallowing assessment before and after medical treatment; two of these studies performed instrumental swallowing assessment[15,16] to determine the severity of dysphagia and the need to use an alternative route of swallowing food. The results related to the evaluation performed, the degree of dysphagia and the type of alternative feeding route are described in the Chart 3.

Chart 3. Synthesis of phonoaudiological results

Author/Year	Swallowing assessment	Degree of dysphagia before medical intervention	Degree of dysphagia post medical intervention	Alternative way of feeding
Geng et al., 2018[11] China	Non-instrumental evaluation	Grade 1 (n=1), Grade 2 (n=11), Grade 3 (n=30) and Grade 4 (n=1)	Dysphagia-free state after esophageal balloon dilation (n=26), after balloon dilation and stent (n=3), after stent and gastric tube esophagoplasty (n=2) and only gastric tube esophagoplasty (n=12)	Nasogastric tube (n=4) and Gastrostomy (n=2)
Follent et al., 2016[12] Austrália	Non-instrumental assessment and of swallowing videofluoroscopy	NPO (n=2)	Use of gastrostomy and PO of liquid only for comfort (n = 1) and use of gastrostomy and PO with a diet of soft puree and slightly thick fluids (n = 1)	Nasogastric tube (n=2) and Gastrostomy (n=2)
Miller et al., 2016[13] Estados Unidos	Non-instrumental evaluation, swallowing videofluoroscopy and videoendoscopy	NPO (N=1)	PO diet without limitation (n=1)	Nasogastric tube (n=1)
Dehghani, Aldaghi, Javaherizadeh, 2016[14] Iran	Non-instrumental evaluation	NPO (N=1)	PO diet without limitation (n=1)	Type not mentioned
Méndez-Nieto, Zarate-Mondragón, Ramírez-Mayans, Flores-Flores, 2015[15] México	Non-instrumental evaluation	Mitomycin group c: varied from grade one to grade three and Triamcinolone group: grade one to grade four	PO diet without limitation (n=50)	Type not mentioned

Legend: NPO = (nil per os) nothing orally; PO = (per os) orally

Discussion

Caustic substances ingestion is an important issue, both in relation to its consequences as well as to the incidence in which it occurs in children. From the evaluation of the studies in this review, a prevalence of cases in the age group from one to three years was detected, in line with the literature that shows that caustic ingestion occurs in most cases in children under five[18,19].

Equally to the cases in this review, one can find statistical data on human exposure to toxic substances that show a higher percentage of cases in children aged one to four years[20]. One can infer the relationship of the involvement of this age group with child development, as, at this stage, motor capacity increases and the child learns to walk. In addition, curiosity grows, thus favoring children's access and ingestion of common household products and their consequences [21,22].

All articles in this review reported dysphagia, which is commonly present in cases of caustic ingestion, becoming the main consequence due to the complications of this ingestion in the esophagus, and esophagitis, esophageal perforation and tracheoesophageal fistula are complications found in the acute phase of recovery after ingestion, whereas in the late stages, esophageal stenosis is the main complication[7,23]. Studies show that feeding difficulties resulting from the main consequences of caustic ingestion in children are commonly present, consisting of excessive salivation, odynophagia and dysphagia[24,25,26].

In cases of caustic ingestion, aggressions along the digestive tract often occur, which can compromise structures such as the oral cavity, pharynx, larynx and especially the esophagus, stomach and duodenum, which can occur alone or together[7,23].

Alterations such as ulcer and erythema in the oral cavity[14,15,16], erythema, ulcer or burn of the oropharynx and hypopharynx, epiglottis edema[14,15] and lesion (ulcer) of the stomach mucosa[13,15] were found in the studies of this review. These alterations in the oral cavity can impair oral feeding of these patients. In the anticipatory, preparatory and oral phase, children may experience difficulties mainly with suction, chewing, decreased intraoral pressure and difficulty in ejecting the bolus into the pharynx[27,28].

It is believed that in accidental caustic ingestion, lesions in the oral cavity, oropharynx and esophagus occur at a greater rate due to the bitter characteristic of the substance, causing it to be expelled quickly[23]. On the other hand, a study with children sustains that, due to their concentration, products in solid form tend to remain in contact with the mucosa for a longer time, damaging structures in the oropharyngeal region in a more intense manner. However, even if the esophageal lesions are insignificant, they cannot be excluded in these cases. On the other hand, the products in liquid form easily reach the stomach due to the progression of the liquid that occurs more quickly through the digestive tract[1].

Despite being the only study that described in its methodology[16] the consistency of the food ingested by the child, it was found that, with the ingestion of a liquid agent the child presented pyloric stenosis as a consequence, corroborating this data with those in the literature[1]. The other studies in this review[13,14,16,17] presented esophageal stricture as a consequence.

Due to its narrowing, dysphagia becomes a symptom secondary to caustic esophageal stenosis and, due to this relationship, dysphagia is an important suspicion on the existence of stricture when not yet diagnosed[29]. The diagnosis of dysphagia is made by the speech language therapist, a professional qualified to carry out the assessment of the oral feeding process. This evaluation can take place through the clinical and instrumental evaluation, which provides subjective and objective data[30]. In cases of changes in esophageal mobility, other instrumental evaluations are used, such as videofluoroscopy[14], manometry,[31] among others. All studies in this review performed non-instrumental swallowing assessments and two studies mentioned performance of instrumental assessment by videofluoroscopy[14,15] and videoendoscopy[15].

The swallowing videofluoroscopy is a diagnostic method considered of great importance to complement the clinical evaluation[31], thus becoming an important instrument for inspection of the esophageal phase[33]. Although it is not possible to visualize the esophageal phase, swallowing videoendoscopy also provides accurate and complementary information for clinical evaluation, and is considered a safe procedure, even when performed in children[34].

From the swallowing non-instrumental and/or instrumental assessment data, all studies in this review reported the presence of some degree of

dysphagia in the cases reviewed, enhancing the difficulty of oral feeding.

The assessment methods and protocols described in the studies in this review were diverse, making it difficult to standardize the findings. One study[13] classified 0 to 4, with 0 without dysphagia; 1 intermittent dysphagia for solids; 2 unable to swallow solids; 3 unable to swallow purée food; and 4 unable to swallow liquids. Another[16] classified as grade 0 without difficulty; grade 1 difficulty swallowing solids; grade 2 difficulty swallowing soft solids; grade 3 difficulty swallowing any solid and liquid; and grade 4 difficulty swallowing saliva. Only one study[14] applied several speech therapy protocols described in the literature to assess children's swallowing and feeding skills, in addition to questionnaires with caregivers. Two studies[15,16] did not describe the classification of dysphagia severity, only the progression of food consistencies, and one study[15] described the findings of the swallowing biodynamics using instrumental evaluations.

In a study with 28 children and three adolescents, 93.5% of cases of dysphagia related to esophageal stricture were found. Most of the subjects had moderate or severe dysphagia. The authors describe the worrisome condition related to the nutritional status of these patients, as it was observed that the adaptation of the consistency of the diet due to dysphagia can lead to limited consumption in relation to the portions and nutritional properties of the food[35]; in addition, the patients generally present severe pain when swallowing, making oral feeding difficult[2]. It was possible to verify that all the children in the studies covered by this review had eating difficulties, requiring a change in their diet and the use of an alternative feeding route.

In cases where oral feeding does not occur safely or impair the patient's nutrition and hydration, the speech therapist, together with the team, recommends alternative feeding. Among the studies reviewed that described the type of alternative feeding, the nasogastric tube[13,14,15] and gastrostomy[13,14] were the most frequently reported, and the selection of the type of tube used was based on the criteria that analyze the feeding capacities of the patient, evaluating the digestive tract as a whole[36,37].

Bearing this in mind, in the event that there is no possibility of adapting the oral route in a safe and efficient manner, the speech-language therapist can assist the interdisciplinary team in the development of conducts concerning the indication of an alternative feeding route, as well as the outcomes of that indication. In addition, after medical treatment, the speech-language therapist can contribute to reducing the time of use of the alternative route and to adapt the diet to return to the oral route, ensuring the patient's clinical improvement[38].

From the data found, it is evident that the speech-language therapy helps to adapt the food consistencies and joint indication of the alternative way of feeding. However, the treatment of esophageal dysphagia is performed through medical interventions, as described in all the studies of this review.

All studies in the present review reported the use of the alternative feeding route and this use was in line with the time when medical interventions occurred. The main medical intervention described was esophageal dilation, as it is a conservative treatment recommended in cases of stenosis, which is successful and improves oral intake in most cases when it is performed. However, due to the action of the caustic substance, the number of necessary dilations increases and has a relatively lower success rate[38,39]. Thus, other procedures such as surgery[13,14,15] and medications[15,17] have been reported with a view to improving oral intake.

Conclusion

From this systematic review, it was found that speech therapy in the management of dysphagia due to caustic ingestion in children aims to assess and assist feeding management when medical interventions occur and, when oral feeding is not possible, assess in the indication of alternative feeding routes together with the team.

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