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Clinical feeding assessment: An effective screening test to predict aspiration in children in low resource settings

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Abstract.
OBJECTIVE: Diagnosis and management of swallowing problems in children is crucial for improvement of their health status and quality of life. This study aimed to determine the accuracy of clinical feeding assessment (CFA) as a screening test to detect aspiration in children using fibreoptic endoscopic evaluation of swallowing (FEES) as the gold standard.
METHODS: A prospective study of 80 children aged below 16 years who were referred to a paediatric otolaryngology clinic for swallowing complaints was completed from 2019 to 2020. Swallowing was assessed by both CFA and FEES. Presence of any one of the following symptoms was considered positive for aspiration in CFA: cough, wet vocal quality, and respiratory distress. Aspiration on FEES was measured using the Penetration Aspiration Scale. The clinical predictors of aspiration were analysed.
RESULTS: The majority of the children (78.8%) had an associated neurological condition, with cerebral palsy being the most common. CFA had a sensitivity ranging from 80% to 100% and a specificity ranging from 68% to 79% for predicting true aspiration for different food consistencies. The significant risk factors predicting aspiration (p value <0.05) were history of prior intubation ($p = 0.009$), history of nasal regurgitation ($p = 0.002$) and spasticity on examination ($p = 0.043$).
CONCLUSION: This study showed that CFA can be used as a screening test in evaluation of paediatric dysphagia. In those with negative CFA, the chances of aspiration are less while those with positive CFA need further evaluation. In addition, the availability and cost-effectiveness of the test make it a good tool for screening aspiration in low-resource settings.

Keywords: Swallowing disorders, pediatric, clinical feeding assessment, fibreoptic endoscopic evaluation of swallowing, aspiration, penetration

1. Introduction

Dysphagia refers to difficulty in swallowing affecting any phase of deglutition. The prevalence of children with swallowing disorders is increasing as the survival of neonates with prematurity, low birth weight and other medical illnesses has improved [1]. Population-based studies have reported an annual prevalence of children with swallowing problems at around nine per 1,000 [2]. This number is much higher in some clinical populations such as children with cerebral palsy, neuromuscular abnormalities,

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traumatic brain injuries, and airway malformations [2, 3]. Evaluation of these children is challenging because they present with myriad clinical symptoms and have associated complex medical conditions [4]. Detecting risk for aspiration is an important part of their evaluation.

Instrumental evaluation via a videofluoroscopic swallowing study (VFSS) or fibreoptic endoscopic evaluation of swallowing (FEES) is at present the gold standard for detecting aspiration in children [5]. However, both are limited by their availability, cost, need for special equipment, and specialised health care expertise. While VFSS has an additional risk of radiation, FEES is limited by its invasiveness, which may induce anxiety and limit its ability to assess feeding [6, 7]. A clinical feeding assessment (CFA), on the other hand, is easily available, does not need special equipment, closely resembles normal meals, and is not invasive. However, CFA may be hindered by its inability to detect silent aspiration [8]. The advantages and disadvantages of each method are acknowledged by many authors, but the clinical utility of each has yet to be clearly defined [5–7]. This study aimed to compare the diagnostic accuracy of CFA with FEES in predicting aspiration in children with swallowing disorders and to ascertain if CFA can be used as a screening test in this population, especially in resource-poor settings. In addition, it attempted to identify the clinical predictors associated with aspiration in these children.

2. Materials and methods

A prospective observational study was conducted at the pediatric otolaryngology clinic of a tertiary care centre from November 2019 to June 2020. Children aged 16 years and below who presented to the clinic with swallowing difficulties were consecutively recruited. A total of 80 children were included in the study. Swallowing disorder was defined as problems in one or more of the three phases of swallowing, namely oral, pharyngeal, and esophageal. Informed written consent was obtained from the parents and assent from children over the age of seven years. Children with a history of chest infection in the last month were excluded. Institutional Review Board approval (No. 12274/.2019) was received prior to the study.

A detailed questionnaire was administered to document demographic data including age; sex; antenatal, natal, and postnatal history; comorbidities; and feeding history. This was followed by a thorough general and otolaryngological examination. Alertness was measured on the AVPU scale in which A is fully awake, V and P (semi-alert) indicate a response to verbal or pain stimulus respectively, and U is unresponsive). CFA and FEES were performed in all children as detailed below, and a positive or negative result for aspiration was noted. These tests were scheduled within three days of each other. The speech-language pathologist (SLP) and the otolaryngologist interpreting the FEES were blinded to each other's results. The results of CFA and FEES were compared and sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated using FEES as the gold standard. The relative risk of each demographic and clinical variable to predict aspiration as reported on FEES was analysed using odds ratio, P value (significant if <0.05), and confidence intervals. Significant factors were analysed using multivariate analysis with logistic regression. All analyses were done using SPSS version 19.0.

2.1. CFA

CFA was done by an SLP (Author 3) with more than five years of experience working with pediatric patients with dysphagia. Small children were seated on their mother's lap, while older children were seated on their own. Food of three different consistencies (thin liquids, honey-thick liquids, and puree) as defined according to the National Dysphagia Diet were given as detailed in Table 1 [9]. The CFA was considered positive for aspiration if any one of the symptoms of cough, wet vocal quality, or respiratory distress were present. Wet vocal quality was defined as a perceptible change in phonation characteristics after a swallow [10–12]. Respiratory distress was appreciated by presence of laboured or fast breathing, chest retractions, nasal flaring, or change in skin colour to bluish/pale.

2.2. FEES

A 3.7 mm fibreoptic scope (Olympus) connected to a light source and charge coupled device camera (Karl Storz) were used to perform FEES by a trained otolaryngologist (Author 1) along with an SLP. The SLP performing the CFA was not part of the FEES assessment. Small children were seated on their mother's lap, while older children were seated on their own.

Table 1
Quantity of food consistencies according to age

Age group	Consistency tested	Mode of feeding	Quantity
Up to 6 months	Thin liquids	Spoon	3ml
6 months to 1 year	Thin liquids	Spoon	3ml
	Puree	Spoon	3ml
More than 1 year	Thin liquids	Spoon	5ml
	Honey-thick liquids	Spoon	5ml
	Puree	Spoon	5ml

Table 2
Penetration aspiration scale

	Score	Description
Neither Pen nor Asp	1	Material does not enter airway
Penetration	2	Material enters airway, but remains above vocal folds; ejected from airway; no residue
	3	Material remains above vocal folds; visible residue remains
	4	Material contacts vocal folds, but is ejected; no residue
	5	Material contacts vocal folds, and is not ejected; visible residue remains
Aspiration	6	Material passes glottis, but is ejected from airway; no visible subglottic residue
	7	Material passes glottis, but is not ejected from airway; visible subglottic residue despite patient's response
	8	Material passes glottis, and is not ejected; visible subglottic residue; absent patient response

Pen = penetration; Asp = aspiration.

The fibreoptic scope, lubricated with lignocaine jelly, was passed through the nose to examine the upper airway. No anaesthetic spray was used. After ruling out structural anomalies and the ability of the child to manage their own secretions, the scope was placed just below the level of the palate. Food of three different consistencies in age-appropriate quantities (Table 1) was mixed with a green dye (Apple Green by Lakshmi Chemicals) and given to the child. A senior pediatric otolaryngologist (Author 2, 4, 5) supervised all the FEESs and also reviewed the recorded swallow videos. The presence of aspiration was noted using the Penetration Aspiration Scale (PAS; [13]), in which a score of 1 was normal, 2–5 was penetration, and 6–8 was considered aspiration as shown in Table 2. Although the PAS was originally designed for use with videofluoroscopy, it has also been used with FEES in both research and clinical practice with excellent inter- and intrarater reliability [14].

3. Results

A total of 87 children with swallowing disorders were consecutively recruited. Seven were excluded (six did not tolerate and complete FEES, and one was excluded due to an active chest infection). Final results were compiled for 80 children. The mean age was 31.9 months (standard deviation 23.9 months) and the male-female ratio was 2.5.

The most common comorbidity was neurological illness, which was seen in 63 children (78.8%), followed by anatomical problems in 16 (20%) as listed in Table 3. Cerebral palsy was the most common neurological condition. Among the 80 children, 67 (83.7%) had some degree of developmental delay, with 30 (37.5%) having no head control, 13 (16.3%) having partial head control, 25 (31.3%) unable to sit without support, and 19 (23.8%) unable to walk without support. Failure to thrive was present in 68 children (85%), of which 62 (77.5%) had <5th percentile weight for their age while the rest were between the 5th and 10th percentile.

The most common reason for referral to the clinic was poor chewing, seen in 66% of the children. The other common symptoms are enumerated in Table 4. None of the children were feeding independently. Fifty-eight children were fed using a paladai (a small stainless steel tumbler with a long spout), 15 were exclusively fed using a nasogastric tube, six were fed both orally and by nasogastric tubes, and only one had a gastrostomy. The average time spent by the caregiver for feeding one meal was approximately 20 minutes (range: 10–35 minutes).

On examination, 73 were awake and alert but seven were in a semi-alert state. Tone was normal in 29 children, hypotonic in 22, and increased (spasticity)

Table 3
List of common comorbid conditions

Comorbid conditions and subclassification		Total *n* (%) out of total N = 80
Neurological*+	Cerebral palsy (21)	63 (78.8)
	Neuromuscular syndromes (5)	
	Global developmental delay of unspecified etiology (13)	
	Isolated seizure disorder (20)	
	Congenital hydrocephalus (2)	
	Brain tumour with lower cranial palsy (1)	
	Isolated bulbar palsy (1)	
Anatomical	Laryngomalacia (7)	16 (20)
	Cleft palate post repair (2)	
	Nasal stenosis (2)	
	Unilateral vocal cord palsy (2)	
	Micrognathia (1)	
	Submucosal cleft (2)	
Genetic	Down syndrome (1)	7 (8.7)
	Cornelia de Lange syndrome (1)	
	Shabbir syndrome (1)	
	Treacher Collins syndrome (1)	
	Sjogren-Larsson syndrome (1)	
	Perisylvian syndrome (1)	
	Charcot-Marie-Tooth disease (1)	
Congenital heart disease++		5 (6.3)
Gastroesophageal reflux disease**		17 (21.3)
Lactose intolerance		1 (1.3)
Ectodermal dysplasia		1 (1.3)

*This includes six children with coexisting anatomical issues, three with syndromes, and one with congential heart disease. +One child had atracheostomy. ++This includes three children with coexistent anatomical issues and one with a neurological issue. **Gastroesophageal reflux disease was not present in isolation but in some children who had neurological or anatomical issues.

Table 4
Common indications for referral

Indication for referrals to clinic	*n* (N = 80)	%
Poor chewing*	53	66%
Cough with liquids	47	59%
Recurrent pneumonia	38	48%
Drooling	36	45%
Cough with semisolids	28	35%
Cough with solids	25	31%
Difficulty taking solids	23	29%
Nasal regurgitation	11	14%
Choking episodes	8	10%

*Poor chewing overlapped with multiple complaints including difficulty taking solids, coughing, and drooling.

in 19. Pharyngeal gag could not be elicited in seven children. Laryngeal auscultation revealed a wet vocal quality on breathing in 17 children, mild inspiratory stridor in six, and a wet cough in 27.

All 80 children were evaluated by CFA and FEES with food at a consistency appropriate for their age group and developmental skills. On CFA, a positive result for aspiration was seen in 30 (37.5%), 23 (28.75%), and 20 (25%) children for thin liquids, honey-thick liquids and puree respectively. On FEES, an abnormal result (PAS score 2–5; penetration) was seen in 29 (36.2%), 23 (28.7%), and 25 (31.2%) children for thin liquids, honey-thick liquids and puree respectively. Of these, 10 (12.5%), seven (8.7%), and nine (11.2%) children had PAS scores >5 (aspiration) for thin liquids, honey-thick liquids and puree, respectively. The sensitivity, specificity, PPV, and NPV of CFA for each consistency in predicting penetration and aspiration with FEES as the gold standard is shown in Table 5. Sensitivity and NPV for detection of penetration and aspiration were highest for honey-thick liquids. Specificity and PPV tended to increase progressively from thin liquids to puree.

The univariate risk factor analysis of the clinical and demographic variables in predicting aspiration (PAS score >5) in this group of children is summarised in Table 6. Table 7 shows the multivariate analysis with logistic regression of significant factors related to aspiration. The significant risk factors were history of prior intubation ($p = 0.009$), history of nasal regurgitation ($p = 0.002$), and spasticity on examination ($p = 0.043$).

4. Discussion

The purpose of this study was to determine the clinical utility of CFA in determining aspiration status in

Table 5
Sensitivity, specificity, PPV, and NPV of CFA for penetration with three consistencies in percentages (PAS score 2–5 = Penetration, PAS sore >5 = True Aspiration)

		FEES positive (PAS score 2–5)		Penetration	FEES positive (PAS score >5)		True aspiration
Water		Present ($n = 29$)	Absent ($n = 51$)	Sensitivity - 62.1% Specificity - 76.5%	Present ($n = 10$)	Absent ($n = 70$)	Sensitivity - 80% Specificity - 68.6%
CFA	Present	18	12	NPV - 78%	8	22	NPV - 96%
	Absent	11	39	PPV - 60%	2	48	PPV - 26.7%
Honey		Present ($n = 23$)	Absent ($n = 57$)	Sensitivity - 69.5% Specificity - 85.9%	Present ($n = 7$)	Absent ($n = 73$)	Sensitivity - 100% Specificity - 76.7%
CFA	Present	16	8	NPV - 87.5%	7	17	NPV - 100%
	Absent	7	49	PPV - 66.7%	0	56	PPV - 29.1%
Puree		Present ($n = 25$)	Absent ($n = 55$)	Sensitivity - 64% Specificity - 87.2%	Present ($n = 9$)	Absent ($n = 71$)	Sensitivity - 88.8% Specificity - 78.8%
CFA	Present	16	7	NPV - 84.2%	8	15	NPV - 98.2%
	Absent	9	48	PPV - 69.5%	1	56	PPV - 34.7%

CFA – Clinical feeding assessment; FEES - Functional endoscopic evaluation of swallowing; NPV - Negative predictive value; PAS – Penetration Aspiration Scale; PPV - Positive predictive value.

children with swallowing difficulties and to identify risk factors that predict aspiration.

Suboptimal growth is the most important indicator of feeding and swallowing problems in children [15]. Failure to thrive and poor weight for age are causes of significant concern in children with swallowing problems. Among the 80 children with swallowing problems recruited in this study, 85% had failure to thrive with 77.5% reporting weight for age less than the fifth percentile.. Many factors other than feeding issues can contribute to failure to thrive including cognitive impairment, inability to communicate, and chronic medical conditions [15, 16]. These factors are commonly associated in children with neurological issues, which formed 78.8% of this study group. The prevalence of dysphagia in children with neurological conditions is reported to vary from 45–99% [17, 18]. None of the children in the current study group could feed independently, which adds to the caregiver burden in the setting of multiple challenges.

Thirty of the 80 children (37.5%) were found to have a positive test for aspiration on CFA for any one food consistency. On FEES, 29/80 (36.2%) had positive PAS scores [2–5] for any one consistency. Of these, only 10 (12.5%) had aspiration on FEES (PAS scores >5). The sensitivity, specificity, PPV, and NPV of CFA with respect to FEES was found to be comparable to similar studies [19–21]. A study by DeMatteo et al. showed clinical assessment in children to have sensitivity, specificity, PPV, and NPV of 92%, 46%, 54%, and 89%, respectively, for liquids [19]. Another similar study investigated the accuracy of CFA in the form of a three-ounce swallow test and compared it to FEES. They found the sensitivity, specificity, PPV, and NPV to be 100%, 51%, 38%, and 100% respectively [22]. This pattern of high sensitivity with low specificity is similar in most studies, including the current one [19–22]. A highly sensitive test ensures that fewer cases of aspiration are missed on CFA. A low specificity indicates that CFA carries the risk of high false positives, and more children could be erroneously determined to have a risk of aspiration.

The low positive predictive value in this study suggests that, among those who showed features of aspiration on CFA, the probability of aspiration was 26.7% for thin liquids, 30.4% for honey-thick liquids, and 40% for puree, whereas the probability of not having aspiration was 96% for thin liquids, 100% for honey-thick liquids, and 98% for puree as suggested by high NPV. As a clinical test, this implies that children with a negative test are unlikely to have aspiration while a positive test indicates that they require further evaluation. The clinical impact of this could include avoiding FEES in children with negative CFA. The low specificity and low PPV of CFA is concerning, but in a life-threatening event such as aspiration, a trade-off for a more sensitive outcome is desirable. A recent systematic review found the sensitivity of CFA in comparison to FEES to range from 1.00 to 0.33 and specificity from 0.51 to 0.14 [23]. It concluded that CFA trialling liquid consistencies might provide better accuracy estimates than CFA trialling solids exclusively. In the current study, sensitivity and NPV for detection of aspiration was highest for honey-thick liquids. Specificity and PPV tend to increase progressively from thin liquids to

Table 6
Univariate risk analysis of demographic and neonatal factors predicting risk of aspiration (N = 80)

Demographic factors		Aspiration (PAS score >5) (%)		*P* value
		Present (10)	Absent (70)	
Age group Less than 2 years ($n = 44$)		6 (60)	38 (54)	0.734
More than 2 years ($n = 36$)		4 (40)	32 (46)	0.115
Neonatal history				
Prematurity^ ($n = 15$)	1 (10)	14 (20)	0.678	
Low birth weight^^ ($n = 18$)	2 (20)	16 (23)	1.0	
Perinatal asphyxia ($n = 36$)	7 (70)	29 (41)	0.104	
Neonatal seizures& ($n = 17$)	3 (30)	14 (20)	0.470	
Neonatal jaundice& ($n = 17$)	0 (0)	17 (24)	0.109	
Neonatal sepsis& ($n = 12$)	4 (40)	8 (11)	**0.038**	
Comorbid conditions				
Neurological ($n = 63$)	7 (70)	51 (73)	0.608	
Cerebral palsy+ ($n = 21$)	5 (50)	16 (23)	0.118	
Anatomical ($n = 16$)	2 (20)	14 (20)	0.589	
Congenital heart disease ($n = 5$)	1 (10)	4 (6)	0.497	
Syndromic ($n = 7$)	1 (10)	5 (7)	0.564	
Seizures* ($n = 40$)	6 (60)	34 (49)	0.737	
Developmental delay# ($n = 67$)	10 (100)	57 (81)	0.202	
GERD ($n = 17$)	3 (30)	14 (20)	0.436	
Main reason for referral				
Poor chewing ($n = 53$)	9 (90)	44 (63)	0.090	
Difficulty taking solids ($n = 23$)	2 (20)	21 (30)	0.513	
Cough with liquids ($n = 47$)	8 (80)	39 (56)	0.144	
Cough with semisolids ($n = 28$)	6 (60)	22 (31)	0.076	
Cough with solids ($n = 25$)	6 (60)	19 (27)	**0.036**	
Recurrent vomiting ($n = 19$)	5 (50)	14 (20)	**0.037**	
Nasal regurgitation ($n = 11$)	5 (50)	6 (9)	**0.001**	
Recurrent pneumonia** ($n = 38$)	7 (70)	31 (44)	0.180	
Pneumonia requiring intubation ($n = 8$)	5 (50)	3 (4)	**0.0001**	
Clinical examination				
Drowsiness	3 (30)	4 (6)	**0.038**	
Hypotonia	2 (20)	20 (29)	0.234	
Spasticity	6 (60)	13 (19)	**0.010**	
Tachypnea	2 (20)	3 (4)	0.055	
Drooling	4 (40)	21 (30)	0.717	
Wet cough	7 (70)	20 (29)	**0.026**	
Wet gurgly sound	6 (60)	11 (16)	**0.005**	
Presence of NG/gastrostomy	5 (50)	17 (24)	0.128	

^Prematurity –less than 37 weeks of gestation. ^^Low birth weight is less than 2.5 kg. &Neonatal period refers to period within one month after birth. **Recurrent pneumonia is more than three times/year. +Cerebral palsy ($n = 21$) was the major subset of neurological disorder, hence analysed separately. *Twenty had an isolated seizure disorder, seven also had cerebral palsy, and all 13 children with global developmental delay had coexistent seizure disorder accounting for a total of 40 children with seizures. #Developmental delay is no or partial head control by four months, not sitting without support by ten months, not walking without support by 18 months. GERD: Gastroesophageal reflux disease. PAS: Penetration Aspiration Scale. NG: Nasogastric tube.

puree. If, instead of aspiration only, penetration was considered as the endpoint, the specificity and PPV of CFA increased while sensitivity and NPV decreased (Table 5).

Risk factor analysis showed that age and gender did not have a significant role in predicting aspiration. This is in contrast to earlier studies in which younger age has been associated with increased risk for aspiration [8, 24, 25]. Prematurity and low birth weight are associated as major risk factors for aspiration in some studies [1, 25, 26]. Prematurity has been established as an important risk factor for swallowing dysfunction in infants born before 34 weeks, as they may demonstrate a poor suck or suck-swallow breath coordination [2]. In this study, none of the neonatal history variables except intubation history were found to be significant in predicting aspiration ($p = 0.009$). Those with significant aspiration are predisposed to have pneumonia and may require intubation, a relationship that has been noted by Weir et al. [27].

Table 7
Table showing *P* value and adjusted odds ratio (OR) with 95% confidence interval (CI) of risk factors for aspiration using multivariate analysis with logistic regression (N = 80)

	P value	Adjusted OR (95% CI)
Perinatal asphyxia	0.251	2.8 (0.482–16.2)
Neonatal sepsis	0.392	3.2 (0.219–47)
Pneumonia requiring intubation	**0.009**	41.1 (2.5–662.7)
Spasticity	**0.043**	14.3 (1.08–190)
Cough with solids	0.331	4.3 (1.0–15.8)
Nasal regurgitation	**0.002**	12.6 (2.3–47.5)
Recurrent vomiting	0.339	4.2 (0.617–13.2)
Drowsiness	0.685	1.6 (0.134–21.8)
Wet cough	0.339	2.7 (0.345–21.9)
Wet gurgly sound	0.232	4.9 (0.358–69.7)

P value is significant if less than 0.05 and shown in bold.

Although all the children in this study had multiple comorbidities, none of the comorbid conditions could predict aspiration. Most studies have reported neurological conditions to be commonly associated with swallowing problems and aspiration [24–26, 28].

Referrals for coughing while swallowing solids, vomiting, and nasal regurgitation ($p = 0.036$, 0.037, and 0.001 respectively) had a significant relation to aspiration on univariate analysis; however, only nasal regurgitation was found to be significant on multivariate analysis with logistic regression ($p = 0.002$). Nasal regurgitation could be a sign of lower cranial nerve or bulbar palsy. A recent study found significantly increased PAS scores in patients with nasopharyngeal regurgitation as opposed to those without regurgitation [29]. History of recurrent pneumonia was not found to be a good predictor of aspiration, which has been noted by other authors as well [30]. The reason for this could be that CFA and FEES are tests that assess the current state of the feeding and swallowing and do not reflect the dynamic character of swallowing, which can be affected by position, alertness, mood, fatigability, the effect of drugs, and medical condition of the child [12, 25].

On clinical feeding examination, lack of alertness, increased spasticity, wet cough, and wet vocal quality were significant predictors of aspiration on univariate analysis. Of these, only spasticity was found to be significant on multivariate analysis. Children with spastic cerebral palsy, in particular, have been found to have a high risk of aspiration, especially silent aspiration; Mirrett et al. found aspiration in 77% of children with severe spastic cerebral palsy [30]. Lack of alertness during feeding can be affected by drugs (especially seizure medications), mood of the child, time of day, and general health of the child [12, 25]. In a study by DeMatteo et al. of children with swallowing disorders, cough was the most significant predictor for fluid aspiration with a relative risk of 1.3 [19]. In another study by Weir et al. in predicting the risk factors for aspiration, moist cough was significantly related to the risk of aspiration ($p = 0.005$) [27].

The findings of this study suggest that CFA is a sensitive test to rule out aspiration in a child with swallowing problems. The high sensitivity and NPV of CFA combined with the fact that it is inexpensive and non-invasive make it a useful screening test. However, the high rate of false positives emphasizes the need for complementing it with objective tests such as FEES or VFSS in those with a positive result on CFA. No test can be used as a standalone test in the evaluation of pediatric dysphagia and such is the case with CFA. This has clinical implications because objective tests such as FEES and VFSS are often not available, difficult to perform, expensive, and difficult to interpret in an uncooperative child.

5. Conclusion

The prevalence of pediatric dysphagia is increasing, necessitating a valid assessment protocol for the management of this condition. Diagnosing aspiration is an important aspect of evaluating such children. This study shows that CFA can be used as a screening test for aspiration in pediatric dysphagia with a sensitivity ranging from 80–100% and specificity of 68–82%. The results of CFA cannot be used in isolation but must be correlated with clinical history, examination, and instrumental evaluation as needed.

Conflict of interest

The authors have no conflict of interest. This research received no specific grant from any funding agency.

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